Organization: LGLDHU
Search Requested: 08-Aug-2023
Mid-Way Check-in: 18-Aug-2023
PRESS Sent/Received: 05-Oct-2023
Translation of Strategy & Output of Results Due: end of September
Sent: 12-Oct-2023
Grey/Environmental Due: 30-Nov-2023

Deliverables:

☒ Draft strategy to help inform research question
☒ Finalized Draft Strategy – PRESS review
☒ Retrieval, deduplication of results
☒ Grey literature search / delivery / Environmental Scan
☐ Weekly Alert

Name	Contact Information	Role
John Cunningham 613.345.5685 ex2270	john.cunningham@healthunit.org	Lead

Background Info

Topic:
GIS in Public Health

Purpose:
Working 'living' document to be used to inform implementation of GIS by epidemiologists in Public Health across Ontario

Type of Search Required:
Literature Search
Grey Literature Search

Ongoing Research Check:
Sent out to PHO/Ministry of Health
Responses: none

Additional Client Notes:
Suggested Language: GIS, Geographic Information Systems, Spatial Analysis, Spatial Epidemiology, Public Health
Provincial working group – APHEO GIS

Re: 18-Aug-2023
Good afternoon John,
Erin ran a preliminary search on GIS and Public Health to see what type of results we might retrieve. At present, there is a large number of articles focusing on GIS specific projects (i.e., Using GIS Mapping to Target Public Health Interventions: Examining Birth Outcomes Across GIS Techniques; Modeling Seasonal and Spatiotemporal Variation: The Example of Respiratory Prescribing; etc.).

Would you like us to narrow the scope from GIS specific project outcomes to studies and reports which have evaluated/outlined GIS implementation within public health (organizations)? I think narrowing the scope might be our

best option to get at those best practices. For example: Innovations in Public Health Surveillance for Emerging Infections. [Review]; Ethical Considerations for Movement Mapping to Identify Disease Transmission Hotspots?

Please let me know if I am on the right track. I am happy to have a chat if it is easier.
If you would like to forward any relevant research you have, we can use those to test our strategy as well.

Question(s):

What are the general 'best practices' for geographic information systems (GIS) use in public health?

Definition:

- *Best Practices Include: file architecture, data flow, workflow, division of responsibilities, privacy, collection of information, implementation practices, and data governance*

Search Methodology

Concept Map:

[((GIS + PUBLIC HEALTH/POPULATION HEALTH/EPPI) OR (PUBLIC HEALTH INFORMATICS)) + (PRIVACY OR WORK PROCESSESS OR GENERAL QUALITY TERMS)]

Inclusion Criteria:

- No publication date limitation (initial test) – too many results, decision to limit 2017 - current
- Includes 'landscape epidemiology' = patterns processes and risk factors of diseases across time and space
- English language studies
- International/National recommendations, guidelines, and manuals (Grey Literature)

Exclusion Criteria:

- Non-English language articles
- Pre-2017 publications
- Excludes personal health records

Limitations:

GIS keyword terms limited to title and author supplied keywords due to sufficient coverage in MeSH as well as challenge of separating GIS products used for a study vs. methods/best practices for implementing GIS (as topic).

Librarian Notes:

- Searching for GIS + PUBLIC HEALTH too broad (10,000 + results). Required to include third concept of 'best practice' to narrow scope
- Using terms synonymous with 'measurement' or 'implementation' returned articles on public health interventions and evaluation of interventions (e.g., immunization clinic locations). These articles briefly mentioned *USING* GIS as a research method to collect the data but did not discuss best practices for implementing GIS in public health. Essentially, GIS was the method used, but not the subject of the article. I contemplated any public health intervention that uses GIS as a method could be included (as an example of how GIS is used in public health re: 'implementation practice') – but, this would include thousands of results. Decision to exclude articles using GIS as a methodology.
- To focus on GIS practices, I removed 'evaluation, meta-synthesis, program evaluation, and program development' terminology and focused on the definition of 'best practices' provided above.
- Public Health/Population Health Concepts were limited to 'organization' or 'population' – I excluded public health specific programs or outcomes such as infectious disease, etc. *Using specific programs and outcomes made the results too large and unwieldy – i.e., included articles that mention using GIS to map disease spread and results of disease within a population, but again, not implementation of GIS as a practice)*

- Recommendation for citation chaining / reference checking of relevant articles identified by team to ensure coverage of relevant materials

Librarian Notes: 27-Oct-2023
Environmental Scan of Canadian / USA Health Organizations for GIS Public Health Guidelines

- PHO; MOH; Alberta Health; BCCDC; CDC etc.

Output of Results (software):
Word & RIS

Resources / Databases Searched	Date	Results
Ovid Medline® All 1946 to October 05, 2023	05-Oct-2023	175
Ovid EMBASE 1974 to 2023 October 05, 2023 **Filter applied: Medline records removed*	05-Oct-2023	86
EBSCOhost Environment Complete/GreenFile	05-Oct-2023	20
Epistimonikos (*limited to systematic reviews*)	05-Oct-2023	11
Hand Selected	05-Oct-2023	8
Total w/ Duplicates Removed		278
Grey Literature Scan/Texts	05-Oct-2023 – ongoing	
Environmental Scan CAD/USA	Responses as of Dec-2023	6
Books/Texts		10
Additional Databases PENDING		

Grey Literature Scan

1. CDC. Building GIS capacity for chronic disease surveillance
    a. GIS Hallmarks:
    Building a GIS Savvy workforce
    Building GIS into chronic disease prevention work
    Building GIS-Ready tools & resources
    b. Tips for creating maps for public health
    c. Cartographic guidelines for public health 2012
    d. Geography and Geospatial Science Working Group

2. ESRI.
    a. Building geospatial capacity at the municipal level: a case for collaboration. Coutts S. 2022
        i. Full Report: https://opennorth.ca/resources/building-geospatial-data-capacity-at-the-municipal-level-a-case-for-collaboration
    b. Strengthening public health preparedness with GIS.
    c. ArcGIS Solutions
    d. ArcGIS Solutions: Industry: health & human services

3. NCCEH
    a. Monitoring health impacts of climate change: a GIS application to display real-time surveillance of environmental data and health outcomes combined with demographic information [webinar] 2018
    b. Putting environmental equity on the map [webinar] 2022

4. World Health Organization | Unicef
    a. Leveraging geospatial technologies and data to strengthen immunisation programmes. 2021
    b. Improving immunisation coverage and equity through the effective use of geospatial technologies and data. 2020
    c. Guidance on the use of geospatial data and technologies in immunization programs 2019

5. Data & Analytic Services BCCDC
    a. Data and Analytic Services supports BCCDC program areas across all components of the surveillance cycle, from data acquisition and data management, to data analysis and dissemination. We strive to provide surveillance information to those who need to know in order to undertake public health action.
    b. Population & Public Health Surveillance http://www.bccdc.ca/our-services/programs/population-public-health-surveillance

6. NACCHO
    a. GIS And local health departments: supporting environmental health at the community level 2015

7. ALBERTA
    a. https://geodiscover.alberta.ca/geoportal/#searchPanel
    b. https://ahs-geographic-information-systems-ahs.hub.arcgis.com/
    c. https://open.alberta.ca/dataset/a14b50c9-94b2-4024-8ee5-c13fb70abb4a/resource/70fd0f2c-5a7c-45a3-bdaa-e1b4f4c5d9a4/download/official-standard-geographic-area-document.pdf

8. Harvard
    a. Blossom, Jeffrey C., Julia L. Finkelstein, Weihe Wendy Guan, and Bonnie Burns. 2011. "Applying GIS Methods to Public Health Research at Harvard University." Journal of Map & Geography Libraries 7 (3) (September): 349–376. doi:10.1080/15420353.2011.599770 .

9. RAND Health
    a. Mapping the gaps: ideas for using GIS to enhance local health department priority setting and program planning. 2011

10. IOP Conference Series: Earth and Environmental Health Sciences
    a. GIS application for spatial analysis of public health centres in response to COVID-19 pandemic. 2022

Environmental Scan

☒ Ministry of Health – kristin.bennett@ontario.ca

"Our organization doesn't have anything on best practices for public health GIS, as we don't really do work in this area. Public Health GIS is more operational and about surveillance, whereas our GIS-related work tends to focus on network analysis, reference mapping and project-based work.

My suggestion would be to reach our to Steven Johnson (Steven.johnson@oahpp.ca) at PHO, as he might have some thoughts. "

☒ Public Health Ontario -Steven.johnson@oahpp.ca

"Hi Jane,

Thank you for the email. Unfortunately, we have nothing to share at this point. It would be great to find out what comes of this ambitious project though. This is not an easy task with requirements, capabilities and technology changing so rapidly!

Best regards and good luck,
Steven"

Steven Johnson
Senior Geospatial Analyst

Public Health Ontario | Santé publique Ontario
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Toronto, ON, M5G 1V2 - *Map* | *Carte*
t: 647 260 7406 f: 647 260 7600 e: *Steven.Johnson@oahpp.ca*

☒ International Contacts – pxbelang@gmail.com
Lead provided:
☒ Paulina Marczak BC Government as a Geomatics Specialist for the British Columbia Geological Survey BC Paulina.Marczak@gov.bc.ca
No response

☒ ESRI – bmosley@esri.ca
"Jane,

I'm sorry about the delay getting back to you. I'd love to chat about the project you're working on to see if there are resources or guidance I could provide. Would you have time to a Teams chat this week or next?

Talk soon,

Brian"

Brian Mosley | Health Solutions Lead
Esri Canada | 430-1600 Carling Ave | Ottawa ON K1Z 1G3
T 613-691-7445 | M 613-715-3788 | esri.ca

[Meeting date proposed – December 12th, 2023]

☒ Alberta Health Services - osi.support@gov.ab.ca
"Good afternoon Jane.
Thank you for contacting the Office of Statistics and Information.
I reached out to one of my GIS colleagues and she informed me that Alberta Health does not maintain much of a GIS team nor do they have any specific practices designed around their GIS data management. She recommends that you contact either geospatial teams in either Technology and Innovation sa.agsp@gov.ab.ca or geodiscoveralberta@gov.ab.ca to see if they would be willing to share what they've learned.

Regards,
Office of Statistics and Information"

☒ Technology and Innovation - sa.agsp@gov.ab.ca
No Response

☒ GeoDiscover Alberta - geodiscoveralberta@gov.ab.ca
"Hi Jane,

My manager is currently away but once he's back I'll see what documentation we can find that might be useful for you. We don't work directly with public health but our portal GeoDiscover Alberta houses GIS data from multiple ministries within the Government of Alberta, including one dataset from Alberta Health. I'm the administrator for the portal as well as the librarian for the Provincial Geospatial Centre in the Ministry of Environment and Protected Areas.

The contact email for the one Alberta Health dataset we do have published is IHDT@gov.ab.ca (Interactive Health Data Application), they may be able to provide you with some health-specific GIS infrastructure

documentation. Alberta Health does have a portal page for the same data here: https://ahs-geographic-information-systems-ahs.hub.arcgis.com/ but it appears the contact information at the bottom of the page is broken.

I'll get back to you when I've had a chance to discuss with my manager.

Thanks!"

Bethany Luther **(she/her)**
Geospatial Collections Coordinator
Provincial Geospatial Centre
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9820 – 106 St NW
Edmonton Alberta, T5K 2J6
Bethany.Luther@gov.ab.ca

Visit **GeoDiscover Alberta** to explore our geospatial collections!

☒ Interactive Health Data Application IHDT@gov.ab.ca
Kir Luong <kir.luong@gov.ab.ca>

"Hi Jane,
At Alberta Health, we rely on AHS (Alberta Health Services) and other contractors for some GIS functions, such as the creation of base layers.
Here is a document that contains other people and emails you can contact, and some details on those base layers (shapefiles), official-standard-geographic-area-document.pdf (alberta.ca)

The tools we have internally is ArcGIS, QGIS, and recently, some people have been involved with R programming , with using the Leaflet library. The usage of GIS here, the data flows and related projects are very ad hoc. You can try to contact AHS (Alberta Health Services), they have more resources, tools, and a dedicated spatial team/environment set up.

Thanks,

Kir Luong,
Surveillance Analyst.
AHW."

☒ BCCDC: admininfo@bccdc.ca
☒ Email: pph@bccdc.ca
No Response

☒ CDC
No response

☒ World Health Organization
May be worthwhile to set up an account for 'open office hour' https://gis-who.hub.arcgis.com/

Books/Texts

1. **Mapping community health: GIS for health and human services**. 2021
   Discover a modern approach to help build healthier communities. Improving health outcomes, increasing access to health care, and building healthier communities requires a modern approach to understanding health and human service issues that are more complex, costly, and devastating than ever before. Public health service agencies around the world rely on geographic information systems (GIS) technology every day to address the opioid epidemic, homelessness, food insecurity, health and racial inequities, and more. By applying GIS, you too can be better able to prepare for and respond to health emergencies and human crises and build the resilience your community will need for the future. Mapping Community Health: GIS for Health and Human Services explores a collection of real-life case studies about using geographic information system (GIS) technology to help build communities that improve health outcomes and increase accessibility to health care. A "next steps" section provides ideas, strategies, tools, and actions to help jump-start your own use of GIS for health and human services. https://www.esri.com/en-us/esri-press/browse/mapping-community-health-gis-for-health-and-human-services

2. **Strategic GIS planning and management in local government**. 2017
   This "how-to" book on planning and managing GIS within local government describes and details the key components of a successful enterprise, sustainable and enduring GIS. It describes the strategic planning process an organization must undertake prior to GIS implementation. The heart of the book is the formula for success that offers a systematic methodology for examining and benchmarking a GIS initiative and the practical and repeatable strategy for success. https://www.routledge.com/Strategic-GIS-Planning-and-Management-in-Local-Government/Holdstock/p/book/9780367867409

3. **Geospatial analysis of public health**. 2019
   This book is specifically designed to serve the community of postgraduates and researchers in the fields of epidemiology, health GIS, medical geography, and health management. It starts with the basic concepts and role of remote sensing, GIS in Kala-azar diseases. The book gives an exhaustive coverage of Satellite data, GPS, GIS, spatial and attribute data modeling, and geospatial analysis of Kala-azar diseases. It also presents the modern trends of remote sensing and GIS in health risk assessment with an illustrated discussion on its numerous applications. https://link.springer.com/book/10.1007/978-3-030-01680-7#about-this-book

4. **Learning from COVID-19: GIS for pandemics**. 2022
   This book highlights best practices, key GIS capabilities, and lessons learned during the COVID-19 response that can help communities prepare for the next crisis. Learning from COVID-19 also includes a “next steps” section that provides ideas, strategies, tools, and actions to help jump-start your own use of GIS, either as a citizen scientist or a health professional. https://www.esri.com/en-us/esri-press/browse/learning-from-covid-19-gis-for-pandemics

5. **Quantitative methods and socio-economic applications in GIS**. 2015
   The second edition of a bestseller, Quantitative Methods and Socio-Economic Applications in GIS (previously titled Quantitative Methods and Applications in GIS) details applications of quantitative methods in social science, planning, and public policy with a focus on spatial perspectives. The book integrates GIS and quantitative (computational) methods and demonstrates them in various policy-relevant socio-economic applications with step-by-step instructions and datasets. The book demonstrates the diversity of issues where GIS can be used to enhance the studies related to socio-economic issues and public policy. https://www.routledge.com/Quantitative-Methods-and-Socio-Economic-Applications-in-GIS/Wang/p/book/9781138843622#:~:text=Description,a%20focus%20on%20spatial%20perspectives.

6. **GIS and Public Health**. 2012
   Authoritative and comprehensive, this is the leading text and professional resource on using geographic information systems (GIS) to analyze and address public health problems. Basic GIS concepts and tools are explained, including ways to access and manage spatial databases. The book presents state-of-the-art methods for mapping and analyzing data on population, health events, risk factors, and health services, and for incorporating geographical knowledge into planning and policy.

https://ophc.andornot.com/en/permalink/catalog12630

7. **Geospatial Technology for Human Well-Being and Health** 2022
   Over the last thirty years or so, there have been tremendous advancements in the area of geospatial health; however, somehow, two aspects have not received as much attention as they should have received. These are a) limitations of different spatial analytical tools and b) progress in making geospatial environmental exposure data available for advanced health science research and for medical practice. This edited volume addresses those two less explored areas of geospatial health with augmented discussions on the theories, methodologies and limitations of contemporary geospatial technologies in a wide range of applications related to human well-being and health. In 20 chapters, readers are presented with an up-to-date assessment of geospatial technologies with an emphasis on understanding general geospatial principles and methodologies that are often overlooked in the research literature. As a result, this book will be of interest to both newcomers and experts in geospatial analysis and will appeal to students and researchers engaged in studying human well-being and health. Chapters are presenting new concepts, new analytical methods and contemporary applications within the framework of geospatial applications in human well-being and health. The topics addressed by the various chapter authors include analytical approaches, newer areas of geospatial health application, introduction to unique resources, geospatial modeling, and environmental pollution assessments for air, water and soil. Although geospatial experts are expected to be the primary readers, this book is designed in such a way so that the public health professionals, environmental health scientists and clinicians also find it useful with or without any familiarity with geospatial analysis

8. **Geospatial data science in healthcare for society 5.0** 2022
   The book introduces a variety of latest techniques designed to represent, enhance, and empower multi-disciplinary approaches of geographic information system (GIS), artificial intelligence (AI), deep learning (DL), machine learning, and cloud computing research in healthcare. It provides a unique compendium of the current and emerging use of geospatial data for healthcare and reflects the diversity, complexity, and depth and breadth of this multi-disciplinary area. This book addresses various aspects of how smart healthcare devices can be used to detect and analyze diseases. Further, it describes various tools and techniques to evaluate the efficacy, suitability, and efficiency of geospatial data for health-related applications. It features illustrative case studies, including future applications and healthcare challenges. This book is beneficial for computer science and engineering students and researchers, medical professionals, and anyone interested in using geospatial data in healthcare. It is also intended for experts, offering them a valuable retrospective and a global vision for the future, as well as for non-experts who are curious to learn about this important subject. The book presents an effort to draw how we can build health-related applications using geospatial big data and their subsequent analysis

9. **GIS tutorial for health, 6th edition** 2021
   Knowing how technology can improve health research and health-care management applications has never been more important. Geographic information systems (GIS) can provide health and human services professionals with the analysis and insights to make impactful, informed decisions about health-care, health policy, and public health. Doing so starts with learning ArcGIS, the popular professional GIS application from Esri, using GIS Tutorial for Health for ArcGIS Desktop 10.8. A workbook for learning the basics of ArcGIS within a health context, GIS Tutorial for Health for ArcGIS Desktop 10.8 introduces readers to preparing, visualizing, and analyzing health data. Using a hands-on approach with real-world health-care scenarios that simulate how to develop and manage a GIS health project, the included exercises guide the reader to solve health problems using ArcGIS Desktop, specifically ArcMap. Readers will learn: the basics of mapmaking and how to use spatial and tabular data how to design maps for a health study how to apply spatial analysis tools for health studies and more. This sixth edition of GIS Tutorial for Health also includes updates for use with ArcGIS Desktop 10.8, an introduction to ArcGIS Online, and an international context using international health data. Written by the authors of the popular GIS Tutorial series, GIS Tutorial for Health for ArcGIS Desktop 10.8 incorporates proven teaching methods in detailed exercises, 'Your Turn'sections, and homework assignments. Suitable as both a computer lab textbook and for self-study, this book will give health management students and practitioners, healthcare managers, IT specialists, and researchers the understanding and skill set to apply GIS to your work in the health field.-- Provided by publisher

10. **The role of GIS in COVID-19 management and control** / Esra Ozdenerol 2023
    Geographic Information System (GIS) is one of the most important tools to help us understand public health and many aspects of our lives. Because of COVID-19, GIS has been brought into the spotlight more than ever before. People and civic leaders worldwide are turning to maps and real-time surveillance data to make sense of what has been happening in the world and to get answers to important questions on every aspect of this pandemic. This book examines the role of GIS in managing and controlling the spread of COVID-19 through 12 global projects and a multidisciplinary approach. It explains the innovative uses of GIS not only limited to data organization and data access, but also how improved GIS tools are used to make decisions, plan, and communicate various measures of control in both local and full-scale outbreaks during the COVID-19 pandemic.

Published Literature

(.txt file of list also available)

1. Tutsoy O. **Graph Theory Based Large-Scale Machine Learning With Multi-Dimensional Constrained Optimization Approaches for Exact Epidemiological Modeling of Pandemic Diseases**. IEEE transactions on pattern analysis and machine intelligence. 2023;45(8):9836-45.
Multi-dimensional prediction models of the pandemic diseases should be constructed in a way to reflect their peculiar epidemiological characters. In this paper, a graph theory-based constrained multi-dimensional (CM) mathematical and meta-heuristic algorithms (MA) are formed to learn the unknown parameters of a large-scale epidemiological model. The specified parameter signs and the coupling parameters of the sub-models constitute the constraints of the optimization problem. In addition, magnitude constraints on the unknown parameters are imposed to proportionally weight the input-output data importance. To learn these parameters, a gradient-based CM recursive least square (CM-RLS) algorithm, and three search-based MAs; namely, the CM particle swarm optimization (CM-PSO), the CM success history-based adaptive differential evolution (CM-SHADE), and the CM-SHADEWO enriched with the whale optimization (WO) algorithms are constructed. The traditional SHADE algorithm was the winner of the 2018 IEEE congress on evolutionary computation (CEC) and its versions in this paper are modified to create more certain parameter search spaces. The results obtained under the equal conditions show that the mathematical optimization algorithm CM-RLS outperforms the MA algorithms, which is expected since it uses the available gradient information. However, the search-based CM-SHADEWO algorithm is able to capture the dominant character of the CM optimization solution and produce satisfactory estimates in the presence of the hard constraints, uncertainties and lack of gradient information.
https://dx.doi.org/10.1109/TPAMI.2023.3256421

2. Spang RP, Haeger C, Mumken SA, Brauer M, Voigt-Antons J-N, Gellert P. **Smartphone Global Positioning System-Based System to Assess Mobility in Health Research: Development, Accuracy, and Usability Study**. JMIR rehabilitation and assistive technologies. 2023;10:e42258.
BACKGROUND: As global positioning system (GPS) measurement is getting more precise and affordable, health researchers can now objectively measure mobility using GPS sensors. Available systems, however, often lack data security and means of adaptation and often rely on a permanent internet connection., OBJECTIVE: To overcome these issues, we aimed to develop and test an easy-to-use, easy-to-adapt, and offline working app using smartphone sensors (GPS and accelerometry) for the quantification of mobility parameters., METHODS: An Android app, a server backend, and a specialized analysis pipeline have been developed (development substudy). Parameters of mobility by the study team members were extracted from the recorded GPS data using existing and newly developed algorithms. Test measurements were performed with participants to complete accuracy and reliability tests (accuracy substudy). Usability was examined by interviewing community-dwelling older adults after 1 week of device use, followed by an iterative app design process (usability substudy)., RESULTS: The study protocol and the software toolchain worked reliably and accurately, even under suboptimal conditions, such as narrow streets and rural areas. The developed algorithms had high accuracy (97.4% correctness, F1-score=0.975) in distinguishing dwelling periods from moving intervals. The accuracy of the stop/trip classification is fundamental to second-order analyses such as the time out of home, as they rely on a precise discrimination between the 2 classes. The usability of the app and the study protocol was piloted with older adults, which showed low barriers and easy implementation into daily routines., CONCLUSIONS: Based

on accuracy analyses and users' experience with the proposed system for GPS assessments, the developed algorithm showed great potential for app-based estimation of mobility in diverse health research contexts, including mobility patterns of community-dwelling older adults living in rural areas., INTERNATIONAL REGISTERED REPORT IDENTIFIER (IRRID): RR2-10.1186/s12877-021-02739-0. Copyright ©Robert P Spang, Christine Haeger, Sandra A Mumken, Max Brauer, Jan-Niklas Voigt-Antons, Paul Gellert. Originally published in JMIR Rehabilitation and Assistive Technology (https://rehab.jmir.org), 02.03.2023.
https://dx.doi.org/10.2196/42258

3. Schaefer M, Panagiotoglou D. **Evaluating the effects of supervised consumption sites on housing prices in Montreal, Canada using controlled interrupted time series and hedonic price models**. medRxiv. 2023.
Background: In 2017, three brick and mortar supervised consumption sites (SCS) began operating in Montreal, Canada. Opponents argued the sites would attract people who use drugs to the respective neighbourhoods, contributing to reductions in residential real estate values. Method(s): We used controlled interrupted time series and hedonic price models to evaluate the effects of Montreal's SCSs on residential real estate. We linked the Quebec Professional Association of Real Estate Brokers' housing sales data provided by Centris Inc. with Statistics Canada's census tract data, neighbourhood proximity measures, and Canadian Urban Environmental Health Research Consortium's gentrification measures. We restricted analysis to sales between 1 January 2014 and 31 December 2021, and within 1,000m of a SCS (treated) or a men's homeless shelter (control). We controlled for internal (e.g., number of bed/bathrooms, unit size) and external attributes (e.g., neighbourhood demographics; proximity to amenities), and included a spatio-temporal lag to account for correlation between sales. Result(s): When controlling for census tract data and gentrification measures, the price of homes sold immediately after SCSs were implemented was 5.2% lower (95% CI: -1.4%, -8.8%) compared with control sales (level effect). However, the monthly value increased 0.6% faster (95% CI: 0.4%, 0.7%) in treated neighbourhoods (trend effect). Compared with the counterfactual (i.e., SCS never implemented), sales in treated neighbourhoods observed an absolute increase of $37,931.86 (95% CI: $12,223.35, $138,088.50) by December 2021. When we also controlled for proximity scores, the immediate level effect post-implementation disappeared (-3.3%, 95% CI: -0.7%, 1.1%), but monthly trend gains persisted (0.9%, 95% CI: 0.7%, 1.0%). Conclusion(s): We observed a modest negative effect on prices immediately following SCS implementation. However, controlling for proximity to neighbourhood amenities eliminated the level effect. Positive month-on-month price gains were consistently observed, suggesting community wide benefits of SCS implementation.Copyright The copyright holder for this preprint is the author/funder, who has granted medRxiv a license to display the preprint in perpetuity. All rights reserved. No reuse allowed without permission.
https://dx.doi.org/10.1101/2023.06.09.23291209

4. Savi MK, Yadav A, Zhang W, Vembar N, Schroeder A, Balsari S, et al. **A standardised differential privacy framework for epidemiological modelling with mobile phone data**. medRxiv. 2023.
During the COVID-19 pandemic, the use of mobile phone data for monitoring human mobility patterns has become increasingly common, both to study the impact of travel restrictions on population movement and epidemiological modelling. Despite the importance of these data, the use of location information to guide public policy can raise issues of privacy and ethical use. Studies have shown that simple aggregation does not protect the privacy of an individual, and there are no universal standards for aggregation that guarantee anonymity. Newer methods, such as differential privacy, can provide statistically verifiable protection against identifiability but have been largely untested as inputs for compartment models used in infectious disease epidemiology. Our study examines the application of differential privacy as an anonymisation tool in epidemiological models, studying the impact of adding quantifiable statistical noise to mobile phone-based location data on the bias of ten common epidemiological metrics. We find that many epidemiological metrics are preserved and remain close to their non-private values when the true noise state is less than 20, in a count transition matrix, which corresponds to a privacy-less parameter = 0.05 per release. We show that differential privacy offers a robust approach to preserving individual privacy in mobility data while providing useful population-level insights for public health. Importantly, we have built a modular software pipeline to facilitate the replication and expansion of our framework.Copyright The copyright holder for this preprint is the author/funder, who has granted medRxiv a license to display the preprint in perpetuity. It is made available under a CC-BY 4.0 International license.
https://dx.doi.org/10.1101/2023.03.16.23287382

5. Prasad RD, Ghosh K, Shri N. **Does health insurance coverage improve maternal healthcare services utilization in India? Evidence from National Family Health Survey-5, 2019-21**. Journal of Public Health (Germany). 2023.
Objective: Universal health coverage and maternal health outcomes have become a part of the global health agenda in low and middle-income countries including India. To achieve the sustainable development goals (SDG-3), maternal healthcare services utilization is a significant intervention in decreasing maternal mortality and morbidity. This study aims to assess the potential association between health insurance coverage (HIC) and maternal healthcare services utilization in India. Method(s): Data was obtained from the fifth round of the National Family Health Survey (NFHS-5), conducted during 2019-21. Bivariate, spatial analysis and logistic regression models have been used to assess association between utilization of maternal healthcare services and HIC combined with other background factors in India. Result(s): HIC among women was found to be 24%. Approximately 59%, 90% and 46% of women had full antenatal care (ANC) visits, skilled birth attendant (SBA) and post-natal care (PNC), respectively. The study results suggested that individuals with HIC were more likely to have ANC visits (OR = 1.28; 95% CI 1.25-1.31), SBA (OR = 1.41; 95% CI 1.36-1.46) and PNC (OR = 1.16; 95% CI 1.13-1.18) services, respectively. Moreover, socioeconomic characteristics and other predictor variables were significantly associated with maternal healthcare service utilization in India. Conclusion(s): The study concludes that HIC is a significant predictor for the maternal and child healthcare services in India, and women with HIC were more likely to have full ANC visits, SBA and PNC. Overall, to accelerate the progress towards achieving SDGs related to maternal and child health, the government should expand and strengthen the existing policies to increase coverage of health insurance.
https://dx.doi.org/10.1007/s10389-023-01960-y

6. Muska Nataliansyah M, Merchant KAS, Priyanka Vakkalanka J, Mack L, Parsons S, Ward MM. **Virtual Partnership Addressing Mental Health Crises: Mixed Methods Study of a Coresponder Program in Rural Law Enforcement**. JMIR Mental Health. 2023;10:e42610.
Background: A mental health crisis can create challenges for individuals, families, and communities. This multifaceted issue often involves different professionals from law enforcement and health care systems, which may lead to siloed and suboptimal care. The virtual crisis care (VCC) program was developed to provide rural law enforcement with access to behavioral health professionals and facilitated collaborative care via telehealth technology. Objective(s): This study was designed to evaluate the implementation and use of a VCC program from a telehealth hub for law enforcement in rural areas. Method(s): This study used a mixed methods approach. The quantitative data came from the telehealth hub's electronic record system. The qualitative data came from in-depth interviews with law enforcement in the 18 counties that adopted the VCC program. Result(s): Across the 181 VCC encounters, the telehealth hub's recommended disposition and the actual disposition were similar for remaining in place (n=141, 77.9%, and n=137, 75.7%, respectively), voluntary admission (n=9, 5.0%, and n=10, 5.5%, respectively), and involuntary committal (IVC; n=27, 14.9%, and n=19, 10.5%, respectively). Qualitative insights related to the VCC program's implementation, use, benefits, and challenges were identified, providing a comprehensive view of the virtual partnership between rural law enforcement and behavioral health professionals. Conclusion(s): Use of a VCC program likely averts unnecessary IVCs. Law enforcement interviews affirmed the positive impact of VCC due to its ease of use and the benefits it provides to the individuals in need, the first responders involved, law enforcement resources, and the community.
https://dx.doi.org/10.2196/42610

7. Lotto M, Hanjahanja-Phiri T, Padalko H, Oetomo A, Butt ZA, Boger J, et al. **Ethical principles for infodemiology and infoveillance studies concerning infodemic management on social media**. Frontiers in public health. 2023;11:1130079.
Big data originating from user interactions on social media play an essential role in infodemiology and infoveillance outcomes, supporting the planning and implementation of public health actions. Notably, the extrapolation of these data requires an awareness of different ethical elements. Previous studies have investigated and discussed the adoption of conventional ethical approaches in the contemporary public health digital surveillance space. However, there is a lack of specific ethical guidelines to orient infodemiology and infoveillance studies concerning infodemic on social media, making it challenging to design digital strategies to combat this phenomenon. Hence, it is necessary to explore if

traditional ethical pillars can support digital purposes or whether new ones must be proposed since we are confronted with a complex online misinformation scenario. Therefore, this perspective provides an overview of the current scenario of ethics-related issues of infodemiology and infoveillance on social media for infodemic studies. Copyright © 2023 Lotto, Hanjahanja-Phiri, Padalko, Oetomo, Butt, Boger, Millar, Cruvinel and Morita.
https://dx.doi.org/10.3389/fpubh.2023.1130079

8. Liu B, Farid S, Ullah S, Altanji M, Nawaz R, Wondimagegnhu Teklu S. **Mathematical assessment of monkeypox disease with the impact of vaccination using a fractional epidemiological modeling approach**. Scientific reports. 2023;13(1):13550.
This present paper aims to examine various epidemiological aspects of the monkeypox viral infection using a fractional-order mathematical model. Initially, the model is formulated using integer-order nonlinear differential equations. The imperfect vaccination is considered for human population in the model formulation. The proposed model is then reformulated using a fractional order derivative with power law to gain a deeper understanding of disease dynamics. The values of the model parameters are determined from the cumulative reported monkeypox cases in the United States during the period from May 10th to October 10th, 2022. Besides this, some of the demographic parameters are evaluated from the population of the literature. We establish sufficient conditions to ensure the existence and uniqueness of the model's solution in the fractional case. Furthermore, the stability of the endemic equilibrium of the fractional monkeypox model is presented. The Lyapunov function approach is used to demonstrate the global stability of the model equilibria. Moreover, the fractional order model is numerically solved using an efficient numerical technique known as the fractional Adams-Bashforth-Moulton method. The numerical simulations are conducted using estimated parameters, considering various values of the fractional order of the Caputo derivative. The finding of this study reveals the impact of various model parameters and fractional order values on the dynamics and control of monkeypox. Copyright © 2023. Springer Nature Limited.
https://dx.doi.org/10.1038/s41598-023-40745-x

9. Labzovskii LD, Hey JV, Romanov AA, Golovatina-Mora P, Belikov D, Lashkari A, et al. **Who should measure air quality in modern cities? The example of decentralization of urban air quality monitoring in Krasnoyarsk (Siberia, Russia)**. Environmental Science and Policy. 2023;140:93-103.
Researchers have warned that the paradigm about who should measure air quality (AQ) in cities can change as low-cost commercial sensors for monitoring atmospheric composition gain global popularity. The new paradigm implies the expansion of the traditionally governmental responsibilities for AQ monitoring (to collect, interpret, and explain the data) to previously uninvolved actors. This study reports a first practical example of such changed AQ paradigm that occurred in a large industrial city of Krasnoyarsk (Russia). We describe how severe problems with urban AQ and a limited access to the AQ data from governmental sensors triggered decentralization of the AQ monitoring in the city. The decentralization is manifested by the fact that both governmental network and crowdfund-based activist AQ network, are being used for scientific and, to some extent, advisory purposes. The decentralization was foremost established due to the ambiguous quantitative information about AQ provided to users by the governmental network, exacerbated by efficient alternatives for alleviating this gap, offered by the activists. The unique decentralization of AQ monitoring in Krasnoyarsk can transform into the synergy between the government and citizen action aimed on easing air pollution as the governmental organizations can efficiently reinforce the resources (funds and manpower), and provide legal and technical support, while civic action groups with established audience can consolidate targeted groups of citizens for formulating efficient city-wide strategies in AQ management. Such synergy can become an inspiring example for the cities with degraded AQ, where the official monitoring is plagued by financial or technological limitations.Copyright © 2022 Elsevier Ltd.
https://dx.doi.org/10.1016/j.envsci.2022.11.016

10. Krist AH, Huffstetler AN, Villalobos G, Rockwell MS, Richards A, Funk A, et al. **Use of population health data to promote equitable recruitment for a primary care practice implementation trial addressing unhealthy alcohol use**. Journal of Clinical and Translational Science. 2023;7(1):e110.
Background: Recruiting underrepresented people and communities in research is essential for generalizable findings. Ensuring representative participants can be particularly challenging for practice-level dissemination and implementation trials. Novel use of real-world data about practices and the communities they serve could promote more equitable and

inclusive recruitment. Method(s): We used a comprehensive primary care clinician and practice database, the Virginia All-Payers Claims Database, and the HealthLandscape Virginia mapping tool with community-level socio-ecological information to prospectively inform practice recruitment for a study to help primary care better screen and counsel for unhealthy alcohol use. Throughout recruitment, we measured how similar study practices were to primary care on average, mapped where practices' patients lived, and iteratively adapted our recruitment strategies. Result(s): In response to practice and community data, we adapted our recruitment strategy three times; first leveraging relationships with residency graduates, then a health system and professional organization approach, followed by a community-targeted approach, and a concluding approach using all three approaches. We enrolled 76 practices whose patients live in 97.3% (1844 of 1907) of Virginia's census tracts. Our overall patient sample had similar demographics to the state for race (21.7% vs 20.0% Black), ethnicity (9.5% vs 10.2% Hispanic), insurance status (6.4% vs 8.0% uninsured), and education (26.0% vs 32.5% high school graduate or less). Each practice recruitment approach uniquely included different communities and patients. Discussion(s): Data about primary care practices and the communities they serve can prospectively inform research recruitment of practices to yield more representative and inclusive patient cohorts for participation. Copyright © The Author(s), 2023. Published by Cambridge University Press on behalf of The Association for Clinical and Translational Science.
https://dx.doi.org/10.1017/cts.2023.530

11. Khan J, Gupta G, Singh NK, Bhave VN, Bhardwaj V, Upreti P, et al. **Geophysical and geostatistical assessment of groundwater and soil quality using GIS, VES, and PCA techniques in the Jaipur region of Western India**. Environmental science and pollution research international. 2023;30(31):77713-28.
In present study, geophysical and geostatistical variability of ground water and agricultural soil investigated in the Jaipur region of Rajasthan (Western India) by applying the geographic information system (GIS), vertical electrical sounding (VES) ,and statistical analysis. Ground water and soil samples collected from different sites from the selected study area and variation pattern of quality parameters were assessed. A contour map analysis of distribution of metals and other contaminants in the samples was conducted using GIS. Maximum concentration of metals recorded in the soil samples in order of Fe, 11.25 mg kg-1 > Mn, 8.6 mg kg-1 > Zn, 7.2 mg kg-1 > Cu, 0.455 mg kg-1; however, maximum concentration of metals in the ground water samples was found as Zn, 2.64 mg L-1 > Cu, 0.86 mg L-1 > Fe, 0.39 mg L-1 > Mn, 0.18 mg L-1 > Pb, 0.065 mg L-1 > Ni, 0.016 mg L-1. Observed data emphasis variability in groundwater and soil quality parameter by PCA technique indicated 84.60% and 66.98% of variance, respectively. Soil quality index (SQI) value was observed as 0.482 indicating that 46% of soil sampling sites deteriorated and shown poor quality. Similarly, water quality index (WQI) value indicates good water quality at the sampling sites TW1, TW8, TW10, and TW12; however, TW3, TW4, TW6, TW19, TW20, and TW22 sites showed very poor water quality. The present study concludes that overexploitation of groundwater and unregulated discharge of wastewater leads to depletion of water and soil quality. Further, applying geographical and geostatistical techniques in assessing water and soil quality could be more effective tools in environmental monitoring and management for environmental and health safety. Copyright © 2023. The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature.
https://dx.doi.org/10.1007/s11356-023-28004-y

12. Kamal ASMM, Al-Montakim MN, Hasan MA, Mitu MMP, Gazi MY, Uddin MM, et al. **Relationship between Urban Environmental Components and Dengue Prevalence in Dhaka City-An Approach of Spatial Analysis of Satellite Remote Sensing, Hydro-Climatic, and Census Dengue Data**. International journal of environmental research and public health. 2023;20(5).
Dengue fever is a tropical viral disease mostly spread by the Aedes aegypti mosquito across the globe. Each year, millions of people have dengue fever, and many die as a result. Since 2002, the severity of dengue in Bangladesh has increased, and in 2019, it reached its worst level ever. This research used satellite imagery to determine the spatial relationship between urban environmental components (UEC) and dengue incidence in Dhaka in 2019. Land surface temperature (LST), urban heat-island (UHI), land-use-land-cover (LULC), population census, and dengue patient data were evaluated. On the other hand, the temporal association between dengue and 2019 UEC data for Dhaka city, such as precipitation, relative humidity, and temperature, were explored. The calculation indicates that the LST in the research region varies between 21.59 and 33.33 degrees Celsius. Multiple UHIs are present within the city, with LST values ranging from 27 to 32 degrees Celsius. In 2019, these UHIs had a higher incidence of dengue. NDVI values between 0.18 and 1 indicate the presence of vegetation and plants, and the NDWI identifies waterbodies with values

between 0 and 1. About 2.51%, 2.66%, 12.81%, and 82% of the city is comprised of water, bare ground, vegetation, and settlement, respectively. The kernel density estimate of dengue data reveals that the majority of dengue cases were concentrated in the city's north edge, south, north-west, and center. The dengue risk map was created by combining all of these spatial outputs (LST, UHI, LULC, population density, and dengue data) and revealed that UHIs of Dhaka are places with high ground temperature and lesser vegetation, waterbodies, and dense urban characteristics, with the highest incidence of dengue. The average yearly temperature in 2019 was 25.26 degrees Celsius. May was the warmest month, with an average monthly temperature of 28.83 degrees Celsius. The monsoon and post-monsoon seasons (middle of March to middle of September) of 2019 sustained higher ambient temperatures (>26 degreeC), greater relative humidity (>80%), and at least 150 mm of precipitation. The study reveals that dengue transmits faster under climatological circumstances characterized by higher temperatures, relative humidity, and precipitation.
https://dx.doi.org/10.3390/ijerph20053858

13. Huang F, Chen C. **GIS-based approach and multivariate statistical analysis for identifying sources of heavy metals in marine sediments from the coast of Hong Kong**. Environmental monitoring and assessment. 2023;195(4):518. Hong Kong is an urbanized coastal city which experiences substantially different metal loads from anthropogenic activities. This study was aimed at analyzing the spatial distribution and pollution evaluation of ten selected heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, Fe, V) in the coastal sediments of Hong Kong. The distribution of heavy metal pollution in sediments has been analyzed using the geographic information system (GIS) technique, and their pollution degrees, corresponding potential ecological risks and source identifications, have been studied by applying the enrichment factor (EF) analysis, contamination factor (CF) analysis, potential ecological risk index (PEI), and integrated multivariate statistical methods, respectively. Firstly, the GIS technique was used to access the spatial distribution of the heavy metals; the result revealed that pollution trend of these metals was decreased from the inner to the outer coast sites of the studied area. Secondly, combining the EF analysis and CF analysis, we found that the pollution degree of heavy metals followed the order of Cu > Cr > Cd > Zn > Pb > Hg > Ni > Fe > As > V. Thirdly, the PERI calculations showed that Cd, Hg, and Cu were the most potential ecological risk factors compared to other metals. Finally, cluster analysis combined with principal component analysis showed that Cr, Cu, Hg, and Ni might originate from the industrial discharges and shipping activities. V, As, and Fe were mainly derived from the natural origin, whereas Cd, Pb, and Zn were identified from the municipal discharges and industrial wastewater. In conclusion, this work should be helpful in the establishment of strategies for contamination control and optimization of industrial structures in Hong Kong.

https://dx.doi.org/10.1007/s10661-023-11152-6

14. Gani MA, Sajib AM, Siddik MA, Md M. **Assessing the impact of land use and land cover on river water quality using water quality index and remote sensing techniques**. Environmental monitoring and assessment. 2023;195(4):449. The impact of land use on water quality is becoming a global concern due to the increasing demand for freshwater. This study aimed to assess the effects of land use and land cover (LULC) on the surface water quality of the Buriganga, Dhaleshwari, Meghna, and Padma river system in Bangladesh. To determine the state of water, water samples were collected from twelve locations in the Buriganga, Dhaleshwari, Meghna, and Padma rivers during the winter season of 2015 and collected samples were analysed for seven water quality indicators: pH, temperature (Temp.), conductivity (Cond.), dissolved oxygen (DO), biological oxygen demand (BOD), nitrate nitrogen (NO3-N), and soluble reactive phosphorus (SRP) for assessing water quality (WQ). Additionally, same-period satellite imagery (Landsat-8) was utilised to classify the LULC using the object-based image analysis (OBIA) technique. The overall accuracy assessment and kappa co-efficient value of post-classified images were 92% and 0.89, respectively. In this research, the root mean squared water quality index (RMS-WQI) model was used to determine the WQ status, and satellite imagery was utilised to classify LULC types. Most of the WQs were found within the ECR guideline level for surface water. The RMS-WQI result showed that the "fair" status of water quality found in all sampling sites ranges from 66.50 to 79.08, and the water quality is satisfactory. Four types of LULC were categorised in the study area mainly comprised of agricultural land (37.33%), followed by built-up area (24.76%), vegetation (9.5%), and water bodies (28.41%). Finally, the Principal component analysis (PCA) techniques were used to find out significant WQ indicators and the correlation matrix revealed that WQ had a substantial positive correlation with agricultural land ($r = 0.68$, $P < 0.01$) and a significant negative association with the built-up area ($r = - 0.94$, $P < 0.01$). To the best of the authors' knowledge, this is the first attempt in Bangladesh to assess the impact of LULC on the water quality along the longitudinal gradient of a vast river

system. Hence, we believe that the findings of this study can support planners and environmentalists to plan and design landscapes and protect the river environment. Copyright © 2023. The Author(s), under exclusive licence to Springer Nature Switzerland AG.
https://dx.doi.org/10.1007/s10661-023-10989-1

15. Du Z, Wang L, Bai Y, Feng S, Ramachandran S, Lim WW, et al. **Cost effectiveness of fractional doses of COVID-19 vaccine boosters in India**. Med. 2023;4(3):182-90.e3.
Background: Coronavirus disease 2019 (COVID-19) continues to be a major global public health crisis that exacts significant human and economic costs. Booster vaccination of individuals can improve waning immunity and reduce the impact of community epidemics. Method(s): Using an epidemiological model that incorporates population-level severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission and waning of vaccine-derived immunity, we identify the hypothetical potential of mass vaccination with fractionated vaccine doses specific to ChAdOx1 nCoV-19 (AZD1222 [Covishield]; AstraZeneca) as an optimal and cost-effective strategy in India's Omicron outbreak. Finding(s): We find that the optimal strategy is 1/8 fractional dosing under mild (Re ~ 1.2) and rapid (Re ~ 5) transmission scenarios, leading to an estimated $6 (95% confidence interval [CI]: -13, 26) billion and $2 (95% CI: -26, 30) billion in health-related net monetary benefit over 200 days, respectively. Rapid and broad use of fractional dosing for boosters, together with delivery costs divided by fractionation, could substantially gain more net monetary benefit by $11 (95% CI: -10, 33) and $2 (95% CI: -23, 28) billion, respectively, under the mild and rapid transmission scenarios. Conclusion(s): Mass vaccination with fractional doses of COVID-19 vaccines to boost immunity in a vaccinated population could be a cost-effective strategy for mitigating the public health costs of resurgences caused by vaccine-evasive variants, and fractional dosing deserves further clinical and regulatory evaluation. Funding(s): Financial support was provided by the AIR@InnoHK Program from Innovation and Technology Commission of the Government of the Hong Kong Special Administrative Region.Copyright © 2023 Elsevier Inc.
https://dx.doi.org/10.1016/j.medj.2023.02.001

16. Demir Y, Demir AD, Meral A, Yuksel A. **Determination of soil quality index in areas with high erosion risk and usability in watershed rehabilitation applications**. Environmental monitoring and assessment. 2023;195(5):572.
Erosion is an important environmental issue threatening natural resources and ecosystems, especially soil and water. Soil losses occur in many parts of the world due to erosion at different degrees, and various rehabilitation plans have been carried out to reduce these losses. However, soil protection applications are generally carried out by considering only the essential characteristics of the soil. This may decrease the chance of success of rehabilitation applications. The present study aimed to determine the soil quality index (SQI) by weighting the soil quality parameters according to the analytical hierarchy process (AHP) in the Capakcur microcatchment (Bingol, Turkiye) where soil loss is high. Accordingly, 428 soil samples were taken from the study area and analyzed. The soil losses in the Capakcur watershed were calculated employing the revised universal soil loss equation (RUSLE). To determine the soil quality index, a total of 20 indicators were used, including (i) physical soil properties, (ii) chemical soil properties, and (iii) soil nutrient content. Soil quality index results are divided into classes between 1 and 5. As a result of the study, the annual total amount of soil lost from the microcatchment was calculated as 96,915.20 tons, and the yearly average amount of soil lost from the unit area was calculated as 10.14 tons ha-1. According to SQI, the largest area in the microcatchment was Class-2 (weak), with 39.49%, whereas the smallest area was 1.4% (the most suitable). However, it was determined that there was a significant negative relationship between SQI and soil erodibility. Considering the SQI distribution of the area in the planning of soil protection and erosion prevention practices in watershed rehabilitation studies may increase success. Copyright © 2023. The Author(s), under exclusive licence to Springer Nature Switzerland AG.
https://dx.doi.org/10.1007/s10661-023-11181-1

17. Chan A. **A concept for digital transformation for improved patient care in the UK**. Health Policy and Technology. 2023;12(3):100775.

https://dx.doi.org/10.1016/j.hlpt.2023.100775

18. Carbajales-Dale P, Annan-Coultas D, Joseph A, Thompson M, Jafarifiroozabadi R, Limber SP, et al. **Using GIS to improve public health emergency response in rural areas during the COVID-19 crisis: A case study of South Carolina, US**. Transactions in GIS. 2023;27(4):975-95.
Geographic information systems (GIS) have become essential tools in the public health domain, especially when it comes to monitoring and surveillance of disease. The purpose of this article is to describe and explore the benefits of using GIS to improve public health emergency response during a global pandemic and, in particular, how to effectively optimize the allocation of public health resources in a rural setting using a data-driven approach that considers the multifactorial demand for new COVID-19 testing sites. Herein, the authors present their interprofessional project as an example of such efforts to inform applications for practice. The team developed a GIS-based multicriteria decision analysis model for use by decision-makers and public health experts in similar future planning and response scenarios. Focus is placed on rural characteristics (e.g., accessibility), vulnerable populations, and daily changing conditions (e.g., COVID-19 daily case fluctuations) that create additional challenges for public health agencies and policymakers. [ABSTRACT FROM AUTHOR]

10.1111/tgis.13069

19. Borycki EM, Kushniruk AW, Oluka H, Minshall S, Cato K, Senathirajah Y, et al. **Modelling Information Needs and Sources in a COVID-19 Designated Hospital**. Studies in health technology and informatics. 2023;302:881-5.
COVID-19 remains an important focus of study in the field of public health informatics. COVID-19 designated hospitals have played an important role in the management of patients affected by the disease. In this paper we describe our modelling of the needs and sources of information for infectious disease practitioners and hospital administrators used to manage a COVID-19 outbreak. Infectious disease practitioner and hospital administrator stakeholders were interviewed to learn about their information needs and where they obtained their information. Stakeholder interview data were transcribed and coded to extract use case information. The findings indicate that participants used many and varied sources of information in the management of COVID-19. The use of multiple, differing sources of data led to considerable effort. In modelling participants' activities, we identified potential subsystems that could be used as a basis for developing an information system specific to the public health needs of hospitals providing care to COVID-19 patients.
https://dx.doi.org/10.3233/SHTI230294

20. Battersby C, Condliffe R, Kiely DG, Elliot C, Middleton JT, Patel J, et al. **EFFECT OF COVID-19 INFECTION AND PREVENTIVE PUBLIC HEALTH MEASURES ON HAEMODYNAMICS, ACTIVITY AND QUALITY OF LIFE IN PATIENTS WITH PULMONARY ARTERIAL HYPERTENSION**. Heart. 2023;109(Supplement 3):A182-A4.
Introduction Pulmonary arterial hypertension (PAH) is a condition driven by endothelial dysfunction and vascular remodelling of the small pulmonary vasculature, causing rightheart failure. In patients with PAH, cardiopulmonary haemodynamics and exercise capacity relates to clinical outcomes, and exercise training improves cardiopulmonary function. Public health measures that limit physical activity have been widely enforced to reduce COVID-19 transmission. In addition, COVID-19 infection causes endothelial dysfunction, which is central to the pathophysiology of PAH. Here, we describe the temporal effects of UK government restriction measures on daily activity and quality of life (QoL) in patients with PAH and the acute effect of COVID-19 infection on remotely monitored cardiopulmonary haemodynamics and physical activity. Methods Patients were enrolled in FIT-PH (NCT04078243) and implanted with remote monitoring devices that provided daily measures of mean pulmonary artery pressure (mPAP), cardiac output (CO; CardioMEMS, Abbott), day/night heart rate (DHR/NHR), heart rate variability (HRV), and physical activity (PA; Medtronic LinQ). Data were transmitted and reviewed in accordance with established clinical protocols. A 7-day average was established for each patient. Data are presented as absolute measurement (mean +/- SEM) or change from individual patient baseline (mean +/- SEM) with the date of positive COVID-19 test aligned to day 0. Questionnaires were administered remotely to assess QoL (EmPHasis- 10), anxiety (GAD-7), depression (PHQ-9) and collect dates of COVID-19 infection. Results Following a lockdown, mean activity was reduced compared to pre-lockdown levels ($p<0.0001$, n=26). QoL was reduced

(p<0.01), whereas anxiety (p<0.001) and depression scores increased (p<0.001) compared to pre-lockdown levels. During lockdown measures, there was no change in mPAP, CO, DHR, NHR, or HRV. Of the cohort, 7 patients contracted COVID-19, leading to an decreased CO, increased mPAP and total pulmonary resistance. Consistent with observed changes in haemodynamics, PA, HRV, DHR were reduced and NHR increased. Conclusions In this cohort of patients with PAH, protective health measures resulted in reduced daily activity and QoL and were associated with increased anxiety and depression indicators. COVID-19 infection resulted in acute changes to haemodynamics and physical activity.
https://dx.doi.org/10.1136/heartjnl-2023-BCS.155

21. Awasthi A, Rishi MS, Khosla A, Panjgotra S. **Geographic information system-based groundwater quality assessment for drinking and irrigation purposes in transboundary aquifers of River Ravi, India**. Environmental science and pollution research international. 2023;30(12):34536-52.
Access to safe and clean drinking water is a basic human right, and assessment of groundwater suitability for drinking purpose imparts significant role in providing clean and suitable water for human consumption. The main objective of this study was to assess the groundwater quality status of Gurdaspur district falling along international boundary of Indo-Pak, thus serving as transboundary aquifers, for drinking and irrigation purpose based on physicochemical analysis of 111 samples using standard numerical indices and GIS techniques. Shannon's entropy theory was employed to assess the groundwater quality for human consumption as it removes the subjectivity problem and integral ambiguities of groundwater systems. The results of entropy water quality index revealed that the drinking groundwater quality was found to be in excellent, good and medium water class except 5 samples which were in poor to extremely poor water class. Piper trilinear plot revealed that the main water types were Ca2+ and Mg2+-HCO3-. Mineral saturation index indicated that carbonate minerals were oversaturated and the evaporative minerals were undersaturated. The outcomes of principal component analysis indicated that the ion exchange, weathering and agricultural practices were the dominant controlling factors in the study area. Furthermore, the results of the irrigation water quality index illustrated that 3 and 65 samples were placed in 'severe restriction' and 'high restriction' class respectively indicating irrigation water as an issue for sustainable agricultural production in agrarian dominant district. The study recommends the adaptation of remedial actions particularly in the regions where drinking and irrigational groundwater quality issues are reported to ensure clean and suitable drinking water for the inhabitants.
https://dx.doi.org/10.1007/s11356-022-24642-w

22. Alfas M, Shriyam S. **Discrete-event simulation and exploratory analysis of network epidemiological models**. Network Modeling Analysis in Health Informatics and Bioinformatics. 2023;12(1):30.
Simulation-based epidemiological models have been extensively studied to help policymakers make effective decisions. Carrying out sensitivity analyses on such models helps us get insights into the dynamics of how disease spreads in a population, thereby allowing healthcare experts to make sound recommendations for controlling disease outbreaks. In the present work, we explore network epidemiological models and perform systematic sensitivity analyses using the two most commonly used discrete-event simulation methodologies: incremental time progression (ITP) and next-event time progression (NTP). For smaller networks, the ITP method is found to be 10-40% more computationally efficient than NTP. But for larger networks, the NTP method is found to be 20-50% more efficient. A total of six network models having very different topologies were simulated to study the disease-spreading dynamics. We considered a wide range of 1000-node networks across these six different classes to run our experiments. The average degree of nodes in these networks was found to be around 9.27 with a variance of 2.7. The average number of triangles in the network models was 690 with a variance of 520. To estimate the impact of the disease in the initial phases and to track its impact on the population, we adopted the effective reproduction number as our preferred metric. The effective reproduction number in the initial days was observed to be around 3.5 for the case of the ITP method and 2.6 for the NTP method, while it approaches 1 for both methods over time, thus settling down to an endemic state. It often happens that real-world networks are computationally intractable, so there is an incentive to work with scaled-down models while minimizing the discrepancy between these new coarsened network models and the original real-world models. We explore the efficacy of such approaches using simulation-based experiments. The average mutual information between the resulting time series of the original and 90% coarsened networks is 0.69 for ITP and 0.85 for NTP, whereas the worst MI values drop to around 0.64 and 0.68 for ITP and NTP respectively. Thus, coarsening tends to work better with the NTP method. We also qualitatively verified that the scaled-down networks obtained by graph coarsening could reproduce the

characteristics of the original networks. Finally, we conducted sensitivity analyses by varying the epidemic model parameters to evaluate the impact of each parameter on the disease-spreading dynamics. The impact of variation in epidemic parameters was observed most significantly in the infection peak and the resulting endemic state.Copyright © 2023, The Author(s), under exclusive licence to Springer-Verlag GmbH Austria, part of Springer Nature.
https://dx.doi.org/10.1007/s13721-023-00425-2

23. Zhang J, Cong S, Zhang G, Ma Y, Zhang Y, Huang J. **Detecting Pest-Infested Forest Damage through Multispectral Satellite Imagery and Improved UNet+**. Sensors (Basel, Switzerland). 2022;22(19).
Plant pests are the primary biological threats to agricultural and forestry production as well as forest ecosystem. Monitoring forest-pest damage via satellite images is crucial for the development of prevention and control strategies. Previous studies utilizing deep learning to monitor pest-infested damage in satellite imagery adopted RGB images, while multispectral imagery and vegetation indices were not used. Multispectral images and vegetation indices contain a wealth of useful information for detecting plant health, which can improve the precision of pest damage detection. The aim of the study is to further improve forest-pest infestation area segmentation by combining multispectral, vegetation indices and RGB information into deep learning. We also propose a new image segmentation method based on UNet++ with attention mechanism module for detecting forest damage induced by bark beetle and aspen leaf miner in Sentinel-2 images. The ResNeSt101 is used as the feature extraction backbone, and the attention mechanism scSE module is introduced in the decoding phase for improving the image segmentation results. We used Sentinel-2 imagery to produce a dataset based on forest health damage data gathered by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) in British Columbia (BC), Canada, during aerial overview surveys (AOS) in 2020. The dataset contains the 11 original Sentinel-2 bands and 13 vegetation indices. The experimental results confirmed that the significance of vegetation indices and multispectral data in enhancing the segmentation effect. The results demonstrated that the proposed method exhibits better segmentation quality and more accurate quantitative indices with overall accuracy of 85.11%, in comparison with the state-of-the-art pest area segmentation methods.
https://dx.doi.org/10.3390/s22197440

24. Wang Y, Cai G, Yang L, Zhang N, Du M. **Monitoring of urban ecological environment including air quality using satellite imagery**. PloS one. 2022;17(8):e0266759.
Rapid urbanisation has highlighted problems in the urban ecological environment and stimulated research on the evaluation of urban environments. In previous studies, key factors such as greenness, wetness, and temperature were extracted from satellite images to assess the urban ecological environment. Although air pollution has become increasingly serious as urbanisation proceeds, information on air pollution is not included in existing models. The Sentinel-5P satellite launched by the European Space Agency in 2017 is a reliable data source for monitoring air quality. By making full use of images from Landsat 8, Sentinel-2A, and Sentinel-5P, this work attempts to construct a new remote sensing monitoring index for urban ecology by adding air quality information to the existing remote sensing ecological index. The proposed index was tested in the Beijing metropolitan area using satellite data from 2020. The results obtained using the proposed index differ greatly in the central urban region and near large bodies of water from those obtained using the existing remote sensing monitoring model, indicating that air quality plays a significant role in evaluating the urban ecological environment. Because the model constructed in this study integrates information on vegetation, soil, humidity, heat, and air quality, it can comprehensively and objectively reflect the quality of the urban ecological environment. Consequently, the proposed remote sensing index provides a new approach to effectively monitoring the urban ecological environment.
https://dx.doi.org/10.1371/journal.pone.0266759

25. Wang H, den Daas C, de Coul EO, Jonas KJ. **MSM with HIV: Improving prevalence and risk estimates by a Bayesian small area estimation modelling approach for public health service areas in the Netherlands**. medRxiv. 2022.
In many countries, HIV infections among MSM (MSMHIV) are closely monitored, and updated epidemiological reports are made available annually, yet the true prevalence of MSMHIV can be masked for areas with small population density or lack of data. Therefore, this study aimed to investigate the feasibility of small area estimation with a Bayesian approach to improve HIV surveillance. Data from the European MSM Internet Survey 2017 (EMIS-2017, Dutch subsample, n=3,459) and the Dutch survey'Men & Sexuality-2018' (SMS-2018, n=5,653) were utilized in this study. We first applied a frequentist calculation to compare the observed relative risk of MSMHIV per Public Health Services (GGD)

region in the Netherlands. We then applied a Bayesian spatial analysis and ecological regression to account for variance due to space and determinants associated with HIV among MSM to obtain more robust estimates. Results of the prevalence and risk estimations from EMIS-2017 and SMS-2018 converged with minor differences. Both estimations confirmed that the risk of MSMHIV is heterogenous across the Netherlands with some GGD regions, such as GGD Amsterdam [RR=1.21 (95% credible interval 1.05-1.38) by EMIS-2017; RR=1.39 (1.14-1.68) by SMS-2018], having a higher-than-average risk. Results from our ecological regression modelling revealed significant regional determinants which can impact on the risk for MSMHIV. In sum, our Bayesian approach to assess the risk of HIV among MSM was able to close data gaps and provide more robust prevalence and risk estimations. It is feasible and directly applicable for future HIV surveillance as a statistical adjustment tool.
https://dx.doi.org/10.1101/2022.05.20.22275273

26. Underwood J, McCloskey S, Raldow A, Kishan A, Zalkin C, Navarro D, et al. **Developing a Mobile Patient-Reported Outcomes Version of the Common Terminology Criteria for Adverse Events Administration System to Capture Postradiation Toxicity in Oncology: Usability and Feasibility Study**. JMIR formative research. 2022;6(4):e27775.
BACKGROUND: Accurate self-reported symptomatic toxicity documentation via the Patient-Reported Outcomes version of the Common Terminology Criteria for Adverse Events (PRO-CTCAE) is essential throughout cancer treatment to ensure safety and understand therapeutic efficacy. However, the capture of accurate toxicities from patients undergoing radiation therapy is challenging because this is generally provided only at the time of scheduled visits., OBJECTIVE: This study seeks to establish the usability and feasibility of a mobile PRO-CTCAE Administration System (mPROS) to capture toxicities related to radiation therapy., METHODS: English-speaking adult patients who were undergoing radiation therapy for cancer were enrolled and given a brief demonstration of the Say All Your Symptoms (SAYS) and Symptom Tracking Entry Program (STEP) interfaces of the mPROS app, followed by a patient-use phase where patient actions were observed as they navigated mPROS to enter toxicities. Patient feedback was captured via a semistructured interview and brief questionnaire., RESULTS: We enrolled 25 patients (age: mean 60.7 years; females: n=13, 52%; White patients: n=13; 52%; non-Hispanic patients: n=19, 76%; college graduates: n=17, 68%). Patients almost equally preferred the SAYS (n=14, 56%) or STEP (n=11, 44%) interfaces, with 21 patients (84%) agreeing that they would use mPROS to report their symptoms to their health care team and 19 patients (76%) agreeing that they would recommend mPROS to others., CONCLUSIONS: The mPROS app is usable and feasible for facilitating the patient reporting of radiation therapy-related symptomatic toxicities. A revised version of mPROS that incorporates patient input and includes electronic health record integration is being developed and validated as part of a multicenter trial.
https://dx.doi.org/10.2196/27775

27. Uddin M, Mugdha SBS, Shermin T, Chowdhury KN. **An Improved Epidemiological Model for the Underprivileged People in the Contemporary Pandemics**. BioMed research international. 2022;2022:7890821.
In this work, we introduce an improved form of the basic SEIRD model based on Python simulation for the troublesome people who are oblivious about the contemporary pandemics due to diverse social impediments, especially those economically underprivileged. In the extant epidemiological models, some unorthodox issues are yet to be considered, such as poverty, illiteracy, and carelessness towards health issues, significantly influencing the data modeling. Our focus is to overcome these issues by adding two more branches, for instance, uncovered and apathetic people, which significantly influence the practical purposes. For the data simulation, we have used the Python-based algorithm that trains the desired system based on a set of real-time data with the proposed model and provides predicted data with a certain level of accuracy. Comparative discussions, statistical error analysis, and correlation-regression analysis have been introduced to validate the proposed epidemiological model. To show the numerical evidence, the investigation comprised the figurative and tabular modes for both real-time and predicted data. Finally, we discussed some concluding remarks based on our findings.
https://dx.doi.org/10.1155/2022/7890821

28. Turnbull N, Wongkongdech A, Wongkongdech R, Chaiyakarm T, Jitsukka W, Sombateyotha K, et al. **Implementation of a Geographic Information System-Based Smartphone Application for Health Vigilance in Older Adults by Village Health Volunteers (OSOMO)**. Studies in health technology and informatics. 2022;295:242-5.
This paper mainly studies the smartphone application for health vigilance in elderly adults, based on geographic information system (GIS) for village health volunteers (OSOMO in Thai) to monitor elderly's health. Eight areas from 4 provinces of 7th health territory (Roi Et, Khon Kaen, Maha Sarakham, and Kalasin) were employed for research. The smartphone application called "OSOMO Prompt" was created for both iPhone (iOS) and Android devices for 1,246 OSOMOs. The comparison results of the difference of mean scores of knowledge of before and after using the "OSOMO Prompt" smartphone application, showed that the trial group, 240 elderly participants had the mean scores after smartphone application use of 1.69, higher than before use smartphone application. The results also indicated a statistically significant difference (p-value < .001) at 95%, confidence interval between 2.15-1.22. In conclusion, the "OSOMO Prompt" smartphone application was proved as a tool for village health volunteers to make health decision for the elderly persons. Moreover, the system was easy to use and could improve the quality of the elderly's healthcare.
https://dx.doi.org/10.3233/SHTI220707

29. Szopinska K, Cienciala A, Bieda A, Kwiecien J, Kulesza L, Parzych P. **Verification of the Perception of the Local Community concerning Air Quality Using ADMS-Roads Modeling**. International Journal of Environmental Research and Public Health. 2022;19(17):10908.
Road transport is one among the sources of air pollution in a city, which results in lowering the comfort of life and increases the occurrence of respiratory diseases. The level of pollutants emitted in the city is variable, and it depends on the type and nature of the source and the manner of land development. For this reason, the purpose of the article is an attempt at a spatial (inner) diversification of a city in terms of air quality, using a study of perception and semantic differentials (SD). The research, which covered the period from June to November 2021, was performed in Kielce-the Polish Smart City-among local experts, people well acquainted with the city and knowledgeable about air quality and the impact of pollution on human health. The results allowed the demarcation of areas with the best and the worst parameters in terms of air quality within the city. Verification of the survey was carried out using the ADMS-Roads (Atmospheric Dispersion Modeling System) software for modeling pollution levels and GIS software, using data on road traffic. The verification allowed checking whether the respondents participating in the research accurately evaluated the city space. The modeling proved that within the two selected areas, the pollution level is similar, and it does not exceed the permitted values. This might indicate that in society there is still low awareness of air quality, particularly in terms of knowing the sources of pollutants and their impact on human health, and perception of areas with the best and the worst air quality was the result of an analysis of the manner of land development and its morphology.
https://dx.doi.org/10.3390/ijerph191710908

30. Sun X, Zhang Y, Shi K, Zhang Y, Li N, Wang W, et al. **Monitoring water quality using proximal remote sensing technology**. The Science of the total environment. 2022;803:149805.
Accurate, high spatial and temporal resolution water quality monitoring in inland waters is vital for environmental management. However, water quality monitoring in inland waters by satellite remote sensing remains challenging due to low signal-to-noise ratios (SNRs) and instrumental resolution limitations. We propose the concept of proximal remote sensing for monitoring water quality. The proximal hyperspectral imager, developed by Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences (CAS) and Hikvision Digital Technology, Ltd., is a high spatial, temporal and spectral resolution (1 nm) sensor for continuous observation, allowing for effective and practical long-term monitoring of inland water quality. In this study, machine learning and empirical algorithms were developed and validated using in situ total nitrogen (TN), total phosphorus (TP), chemical oxygen demand (COD) concentrations and spectral reflectance from Lake Taihu (N = 171), the Liangxi River (N = 94) and the Fuchunjiang Reservoir (N = 109) covering different water quality. Our dataset includes a large range for three key water quality parameters of TN from 0.93 to 6.46 mg/L, TP from 0.04 to 0.62 mg/L, and COD from 1.32 to 15.41 mg/L. Overall, the back-propagation (BP) neural network model had an accuracy of over 80% for TN (R2 = 0.84, RMSE = 0.33 mg/L, and MRE = 11.4%) and over 90% for TP (R2 = 0.93, RMSE = 0.02 mg/L, and MRE = 12.4%) and COD (R2 = 0.91, RMSE = 0.66 mg/L, and MRE = 9.3%). Our results show that proximal remote sensing combined with machine learning algorithms has great potential for monitoring water quality in inland waters.

https://dx.doi.org/10.1016/j.scitotenv.2021.149805

31. Smith M, Mavoa S, Ikeda E, Hasanzadeh K, Zhao J, Rinne TE, et al. **Associations between Children's Physical Activity and Neighborhood Environments Using GIS: A Secondary Analysis from a Systematic Scoping Review**. International journal of environmental research and public health. 2022;19(3).
Regular participation in physical activity is essential for children's physical, mental, and cognitive health. Neighborhood environments may be especially important for children who are more likely to spend time in the environment proximal to home. This article provides an update of evidence for associations between children's physical activity behaviors and objectively assessed environmental characteristics derived using geographical information system (GIS)-based approaches. A systematic scoping review yielded 36 relevant articles of varying study quality. Most studies were conducted in the USA. Findings highlight the need for neighborhoods that are well connected, have higher population densities, and have a variety of destinations in the proximal neighborhood to support children's physical activity behaviors. A shorter distance to school and safe traffic environments were significant factors in supporting children's active travel behaviors. Areas for improvement in the field include the consideration of neighborhood self-selection bias, including more diverse population groups, ground-truthing GIS databases, utilising data-driven approaches to derive environmental indices, and improving the temporal alignment of GIS datasets with behavioral outcomes.
10.3390/ijerph19031033

32. Singh SK, Noori AR. **Groundwater quality assessment and modeling utilizing water quality index and GIS in Kabul Basin, Afghanistan**. Environmental monitoring and assessment. 2022;194(10):673.
Groundwater stands as a unique source of water supply in Kabul city, Afghanistan. In this investigation, 35 samples of groundwater were comprehensively analyzed to determine its hydrogeochemical characterizations, quality, water types, and its acceptability as drinking sources. A portable digital multiparameter instrument (LAB MAN Scientific instrument) was used to measure the total dissolved solids (TDS), hydrogen potential (pH), and electrical conductivity (EC). Total hardness, chloride, and bicarbonate were examined via a titrimetric approach. Sodium, calcium, magnesium, and potassium concentrations were measured with a flame photometer. Fluoride was determined by using a digital portable multiparameter. UV-VIS spectrophotometers were employed to count sulfate and nitrate concentrations. The distribution pattern of measured parameters and the Water Quality Index (WQI) in groundwater were spatially modeled utilizing the ArcGIS tool. The findings provide insight into the main anions and cations, which are found in ascending sequence F < NO3 < SO4 < Cl < HCO3 and K < Ca < Na < Mg, respectively. Based on the measurements of ion concentrations, bicarbonate (71.4%), chloride (14.28%), nitrate (2.85%), magnesium (80%), sodium (82.85%), calcium (5.71%), and potassium (17.14%) were all determined to be over the World Health Organization (WHO) limits of drinking water. Using the Piper trilinear diagram, two significant hydrochemical facies (CaNaHCO3 and NaHCO3) were discovered. Based on the mathematical model of WQI outputs, 88.57% of the research region has excellent to good water, whereas 11.43% has poor to very poor water. Copyright © 2022. The Author(s), under exclusive licence to Springer Nature Switzerland AG.
https://dx.doi.org/10.1007/s10661-022-10340-0

33. Seyedmohammadi J, Navidi MN. **Applying fuzzy inference system and analytic network process based on GIS to determine land suitability potential for agricultural**. Environmental monitoring and assessment. 2022;194(10):712.
Determining soil characteristics and land limitations through the land suitability assessment process is a very important step, due to its important role in sustainable management and reducing the effects of land degradation for the continuous production of agricultural crops. In this study, land suitability potential for wheat cultivation was determined by analytic network process (ANP)-fuzzy and traditional parametric methods including Storie and square root in lands with an area of about 4300 ha located in northwestern Iran. For this purpose, according to the land use maps, topography, slope, geology, and satellite image of the study area, the initial soil units were identified and soil was sampled by digging profiles in these units from the soil horizons of the profiles. According to the results, the ANP-fuzzy method had a more accurate evaluation in determining the land suitability potential, based on the determination coefficient (R2) value between wheat yield and land suitability index compared to parametric methods. The application of ANP-fuzzy method determined 2328.05 ha, 53.79% of land highly suitable (S1), 1577.69 ha, 36.45% moderately suitable (S2), 419.6 ha, 9.69% marginally suitable (S3), and 3.02 ha, 0.07% currently unsuitable (N1). The most important limiting characteristics were slope, soil depth, ESP, Gypsum, pH, and soil salinity. Therefore, due to optimal weighting of

characteristics, determining suitable limits of critical points, and applying ideal fuzzy membership functions, the ANP-fuzzy method can be applied as a superior method for assessing land potential for sustainable agricultural crop production in other parts of the world. Copyright © 2022. The Author(s), under exclusive licence to Springer Nature Switzerland AG.
https://dx.doi.org/10.1007/s10661-022-10327-x

34. Segal CD, Lober WB, Revere D, Lorigan D, Karras BT, Baseman JG. **Trading-off privacy and utility: the Washington State experience assessing the performance of a public health digital exposure notification system for coronavirus disease 2019**. Journal of the American Medical Informatics Association : JAMIA. 2022;29(12):2050-6.
OBJECTIVE: Digital exposure notifications (DEN) systems were an emergency response to the coronavirus disease 2019 (COVID-19) pandemic, harnessing smartphone-based technology to enhance conventional pandemic response strategies such as contact tracing. We identify and describe performance measurement constructs relevant to the implementation of DEN tools: (1) reach (number of users enrolled in the intervention); (2) engagement (utilization of the intervention); and (3) effectiveness in preventing transmissions of COVID-19 (impact of the intervention). We also describe WA State's experience utilizing these constructs to design data-driven evaluation approaches., METHODS: We conducted an environmental scan of DEN documentation and relevant publications. Participation in multidisciplinary collaborative environments facilitated shared learning. Compilation of available data sources and their relevance to implementation and operation workflows were synthesized to develop implementation evaluation constructs., RESULTS: We identified 8 useful performance indicators within reach, engagement, and effectiveness constructs., DISCUSSION: We use implementation science to frame the evaluation of DEN tools by linking the theoretical constructs with the metrics available in the underlying disparate, deidentified, and aggregate data infrastructure. Our challenges in developing meaningful metrics include limited data science competencies in public health, validation of analytic methodologies in the complex and evolving pandemic environment, and the lack of integration with the public health infrastructure., CONCLUSION: Continued collaboration and multidisciplinary consensus activities can improve the utility of DEN tools for future public health emergencies. Copyright © The Author(s) 2022. Published by Oxford University Press on behalf of the American Medical Informatics Association.
https://dx.doi.org/10.1093/jamia/ocac178

35. Sarma SK, Udaya Bhaskara Rao C. **INVESTIGATION OF GROUND WATER POTENTIAL ZONES BY USING GIS TECHNIQUESIN BEKI RIVER BASIN, ASSAM**. NeuroQuantology. 2022;20(13):2855-63.
The Beki River Basin which spreads in a space of around 3744.75 km2 in the region of Assam is defying the lack of surface water during dry season. The significant level strategies for geological information system have formed into an extraordinary engine in portraying groundwater potential zones. An undertaking has been made in this audit to depict the normal zones of groundwater in Beki Stream Bowl, Assam using remote recognizing and GIS procedures. The thematic layers such as rainfall, slope, geology, geomorphology, soils, drainage density, lineament density and land use /land cover have been integrated in ArcGIS environment by multi-criteria assessment. The guide was spatially arranged into high potential, moderate potential and low potential. The aide was spatially gathered into high potential, moderate potential and low potential. The endorsement results showed that GWPZs classes decidedly get over with the well deliveries and groundwater significance arranged in the given area.Copyright © 2022, Anka Publishers. All rights reserved.
https://dx.doi.org/10.14704/nq.2022.20.13.NQ88356

36. Saini G, Budhwar V, Choudhary M. **Review on people's trust on home use medical devices during Covid-19 pandemic in India**. Health and Technology. 2022;12(2):527-46.
With the rapid development of the medical device against COVID-19 is an excellent achievement. There are numerous obstacles effectively facing the worldwide population, from manufacture to distribution, deployment and, acceptance. Many manufacturers have entered the market rivalry as people's knowledge and demand for home-use medical equipment has increased. India represents a compelling market opportunity for global medical device manufacturers. Substantial growth for the Indian medical device industry is expected to be driven by the current low per-person spending rate for medical devices. The growth of the medical devices industry in India raises competition law issues (anti-trust) and therefore maintaining public trust in home-use medical devices during COVID-19 will be as essential. The review article aims to create awareness among people about commonly used medical devices during the COVID-19

pandemic and to survey people's trust in home usable medical devices in India. In a worldwide pandemic, manufacturers of medical devices face insufficient storage and the impossibility of meeting the requirements of the health centre. The sale of some of the most significant medical devices has increased, making it more difficult for the medical device industry to satisfy demand with high-quality goods since the quality of COVID-19 items plays a vital part in the present scenario. Despite the difficulty in providing enough medical equipment during a pandemic, they are striving to adapt to the circumstance. After recognizing the need to promote awareness and grasp the selling, and production, handling of medical instruments during COVID-19 at home was conducted. In addition, medical equipment manufacturers and distributors look at this scenario as an opportunity to profit more. This review article would enable researchers during COVID-19 to build more knowledge and widespread trust in medical technologies respectively.
https://dx.doi.org/10.1007/s12553-022-00645-y

37. Rosenkrantz L. **Leveraging geographic information systems (GIS) for environmental public health practice**. Environmental Health Review. 2022;65(2):31-6.

10.5864/d2022-013

38. Recchia D, Perignon M, Rollet P, Vonthron S, Tharrey M, Darmon N, et al. **Associations between food environment and nutritional quality of food purchases in French households: The Mont'Panier cross-sectional study**. Proceedings of the Nutrition Society. 2022;81(OCE2):E61.
Background/Objectives: There is growing interest in the role of food environment in dietary behaviors (1-2); exposure to the food environment is however complex to define (2-3). The purpose of this study was to assess whether the built food environment, measured by multiple indicators around home and in activity space, was associated with nutritional quality of food purchases. Method(s): This cross-sectional study included 462 households from a quota sampling survey conducted in the south of France (Montpellier metropolitan area). The revised Healthy Purchase Index was implemented in order to assess nutritional quality of food purchases. Food environment indicators (presence, number, relative density and proximity of food outlets) were calculated around home and in activity space (around home, work, other places of activity and along commuting journeys) using a geographical information system. Six different types of food outlets were studied: supermarkets, markets (open-air and covered markets), greengrocers, bakeries, other specialized food stores (butcher's, fishmonger's and dairy stores) and small grocery stores. Associations between food environment and nutritional quality of food purchases were assessed using multilevel models, and geographically weighted regressions to account for spatial nonstationarity. Models were adjusted for households' socioeconomic and demographic characteristics. Result(s): Nutritional quality of food purchases was positively associated with the number of greengrocers around home (1 vs 0: beta=0.26, 95%CI= [0.01, -0.50]; >1 vs 0: beta=0.28, 95%CI= [0.03, 0.52]), but negatively associated with the number of markets around home (1 vs 0: beta=-0.20, 95%CI= [-0.40, 0.00]; >1 vs 0: beta=-0.40, 95%CI= [-0.72, -0.08]), these associations varied across space in the studied area. For households with lower income, number of greengrocers in activity space was positively associated with nutritional quality of food purchases (1 vs 0: beta=0.71, 95%CI= [0.13, 1.3]; >1 vs 0: beta=0.67, 95%CI= [0.23, 1.1]). Discussion / Conclusion(s): Greengrocers might be an efficient food store type to promote healthier dietary behaviors. Further studies, particularly interventional studies, are needed to confirm these results in order to guide public health policies in actions designed to improve the food environment.
https://dx.doi.org/10.1017/S0029665122000842

39. Rastogi N. **Healthcare's new frontier: The digital front door**. BMJ Innovations. 2022:000874.
Primary care has faced long-standing access challenges in the UK National Health Service (NHS) due to an increased demand on services caused by an ageing population, inadequate funding, a shortage of General Practitioners (GPs) and GP trainees and inefficient administrative processes. The pandemic accelerated digital adoption in primary care as policy and reimbursement changes led to new ways of working including telephone triage, video consultations, remote monitoring, online consultations, and text and email communication between clinicians and patients. The agenda has moved to how innovation teams lead digital transformation to drive long term and sustainable benefits in primary care. The digital front door is defined as the channels and framework through which patients access network-wide services in a digitally enabled system. Pillars to this front door include navigation, triage, increased electronic health record (EHR)

functionality, shared care records with interoperability, a skilled workforce, key stakeholder engagement and digital inclusion. Out of hospital care has become an integrated community of health, wellness and social care providers. Primary care organisations are presented with a unique opportunity to redesign their access points, to re-evaluate how to navigate and triage users most effectively through their systems, to leverage health data and analytics to derive more insights from the EHR than ever before, and to build a skilled workforce that meets the evolving needs of the community as we move towards a more equitable health system.
https://dx.doi.org/10.1136/bmjinnov-2021-000874

40. Pereira G, Longo KM, Freitas SR, Mataveli G, Oliveira VJ, Santos PR, et al. **Improving the south America wildfires smoke estimates: Integration of polar-orbiting and geostationary satellite fire products in the Brazilian biomass burning emission model (3BEM)**. Atmospheric Environment. 2022;273:118954.
Large land extensions are subjected to environmental degradation and land-use changes by fires annually. In tropical regions, such as South America, the global demand for commodities leads to the conversion of natural vegetation into agricultural land-uses. With the new orbital fire products that have improved in spatial and temporal resolution, it is now possible to better understand fire properties at large scales, such as fire radiative power (FRP), fire spread, heat flux, and fire life cycle. This study aims to integrate polar-orbit and geostationary satellites' fire-related products to estimate biomass burning (BB) emissions on a continental-scale to better monitor smoke plumes in near-real-time (NRT) while using the Brazilian developments on the Regional Atmospheric Modeling System (BRAMS). The total aerosol optical depth at 550 nm channel from the model during the South American 2020 fire season (September-November) showed a good agreement with Modern-Era Retrospective analysis for Research and Applications (MERRA-2) and Copernicus Atmosphere Monitoring Service (CAMS) Global Near-Real-Time reanalyzes ($R = 0.97$, $p < 0.05$, student t-test). Moreover, the new improvements made in the Brazilian Biomass Burning Emission Model with fire radiative power (3BEM-FRP) better represent smoke emissions of large fire events, such as the Pantanal 2020 fires.
https://dx.doi.org/10.1016/j.atmosenv.2022.118954

41. Patel AM, Bhardwaj A, Basch E, Hudson KE, Escudier SM, Books H, et al. **Evaluating mass implementation of digital health solutions to improve quality and reduce disparities in a large multisite community oncology practice**. Journal of Clinical Oncology. 2022;40(16 Supplement 1).
Background: There is a priority to accelerate the delivery of digital health solutions (DHS) to provide patients with enhanced means for accessing care, but lack of understanding of their utility in certain populations. There are concerns that equitable adoption translate into disparities. We sought to implement a portfolio of DHS across a large practice and characterize engagement across populations to enhance clinical informatics solutions that support care delivery. Method(s): This is a retrospective evaluation of cancer patients who engaged with a portfolio of DHS between March 1, 2019 and January 15, 2022. We included four tools with opt-in and opt-out functionality: (1) a care management (CM) platform utilized by clinical staff to manage patient activities, (2) an electronic patient-reported outcomes (ePRO) remote monitoring program for tracking symptoms and oral adherence, (3) a patient portal (PP) for securely accessing patient health records, and (4) digital education (DE) for patients regarding disease and treatments. The engaged population was defined as the number of enrolled patients with at least one (1) record of triage activity, (2) completed ePRO assessment, (3) PP login, and (4) DE read activity, for each tool, respectively. The start of the index period was adjusted based on the first go-live date of each tool. We evaluated factors (age, gender, race/ethnicity, preferred-language, marital status, and distance from clinic) associated with patient engagement using Chi-Square test and multivariate logistic regression. Result(s): This analysis included a total of 267,375 unique patients. Of the enrolled population per tool, 172,840 (73.6%), 9,938 (67.7 %), 49,771 (79.2%), and 12,044 (56.9%) patients were engaged in CM, ePRO, PP and DE, respectively. The majority (>50%) of engaged patients were female, White and non-Hispanic/Latino, English-language, and aged 61-80 yrs. After adjusting for covariates, we observed that White and non-Hispanic/Latino [(CM: OR 1.15, ePRO OR 1.46, PP: OR 1.48, and DE: OR 1.36) and English-language (CM: OR 1.2, ePRO OR 1.67, PP: OR 1.8 and DE: OR 1.89) patients were significantly (p-value <0.001) more engaged compared to their counterparts. Male patients were less likely to be engaged in CM (OR: 0.79) and ePRO (OR: 0.65) but more engaged in PP (OR: 1.1) compared to females. No significant difference was observed in engagement between non-rural (<20 mile) vs. rural (>= 20 miles) and in all age groups 21-40, 41- 60, 61-80 and >80 years as compared to reference age of 0-20 years for any

digital tools except CM. Conclusion(s): DHS can be used to support the cancer patient journey and we demonstrated high utilization in an array of sociodemographic variables in our population. However, tools designed and implemented with different populations in mind to reduce staff burden and lessen the digital divide should be further explored.
https://dx.doi.org/10.1200/JCO.2022.40.16_suppl.1507

42. Palmieri M, Flores-Ayala R, Mesarina K, Mazariegos DI, Martinez C, Lopez B, et al. **Experiences and Lessons Learned in Developing and Implementing a Population-Based Nutrition and Health Surveillance System in Guatemala 2011-2021**. Current Developments in Nutrition. 2022;6(4):nzac027.
Background: Practice-based experiences documenting development and implementation of nutrition and health surveillance systems are needed. Objective(s): To describe processes, methods, and lessons learned from developing and implementing a population-based household nutrition and health surveillance system in Guatemala. Method(s): The phases and methods for the design and implementation of the surveillance system are described. Efforts to institutionalize the system in government institutions are described, and illustrative examples describing different data uses, and lessons learned are provided. Result(s): After initial assessments of data needs and consultations with officials in government institutions and partners in the country, a population-based nutrition surveillance system prototype with complex sampling was designed and tested in 5 Guatemalan Highland departments in 2011. After dissemination of the prototype, government and partners expanded the content, and multitopic nutrition and health surveillance cycles were collected in 2013, 2015, 2016, 2017/18, and 2018/19 providing nationally representative data for households, women of reproductive age (15-49 y), and children aged 0-59 mo. For each cycle, data were to be collected from 100 clusters, 30 households in each, and 1 woman and 1 child per household. Content covered ~25 health and nutrition topics, including coverage of all large-scale nutrition-specific interventions; the micronutrient content of fortifiable sugar, salt, and bread samples; anthropometry; and biomarkers to assess annually, or at least once, ~25 indicators of micronutrient status and chronic disease. Data were collected by 3-5 highly trained field teams. The design was flexible and revised each cycle allowing potential changes to questionnaires, population groups, biomarkers, survey design, or other changes. Data were used to change national guidelines for vitamin A and B-12 interventions, among others, and evaluate interventions. Barriers included frequent changes of high-level government officials and heavy dependence on US funding. Conclusion(s): This system provides high-quality data, fills critical data gaps, and can serve as a useful model for others.
https://dx.doi.org/10.1093/cdn/nzac027

43. Padilla LE, Ma GQ, Peters D, Dupuy-Todd M, Forsyth E, Stidworthy A, et al. **New methods to derive street-scale spatial patterns of air pollution from mobile monitoring**. Atmospheric Environment. 2022;270:118851.
The benefits of monitoring ambient air pollution with instruments mounted to ground-based, moving platforms include increased spatial resolution of measurements and synchronous, fast-response measurements close to road sources for emissions analyses. However, these come at the cost of obtaining a suitable number of repeat visits at each location in order to achieve reliable and representative pollution estimates at the desired spatial and temporal resolution. Thus, methods that maximize the information content derived from limited repeat coverage of mobile platforms are needed in order to realize the spatial and emissions source benefits possible from mobile air pollution data collection. This work builds upon previous methods by providing generalizable approaches to quantifying sampling uncertainty that enable greater data inclusion, make sampling uncertainty an integral component of air quality findings and provide decision-makers with options to fit uncertainty analysis to their purpose. To demonstrate the uncertainty estimation methods, we analyzed mobile monitoring data collected in the Breathe London pilot project in three distinct use cases. We derived insights from two key measures of pollution: total ambient NO2 concentrations and the ratio of NOx to CO2 enhancements - a marker of the intensity of NOx pollution from emission sources. The results were useful information for London public health policymakers on street-by-street level differences in pollution, and the effects of the Ultra Low Emission Zone. The future use of these flexible uncertainty methods will allow decision-makers to best leverage the information embedded in available air pollution data.
https://dx.doi.org/10.1016/j.atmosenv.2021.118851

44. P G, Roy P, T S, D K. **Detection of iron-bearing mineral assemblages in Nainarmalai granulite region, south India, based on satellite image processing and geochemical anomalies**. Environmental monitoring and assessment. 2022;194(12):866.

Although India's large iron ore reserves are well known, there are still few studies and research on iron ore prospecting in smaller deposits or the deposits with lower grade. Remote sensing concepts are useful to target for mineral exploration, since it covers a large area at low cost. In this research spectral remote sensing and digital image processing of ASTER data to locate and delineate the regions with iron oxide-bearing soils in granulite terrain at Nainnarmalai (southern India) that has hypothetical reserve 8.2 million tons of iron in sub-surface banded magnetite quartzites. The image-based study component involved pre-processing atmospheric correction and processing of the image data reminiscent of band ratio and band mixture to locate iron-bearing soils. We used blending of bands 5/3 + 1/2 to delineate ferrous iron oxide, band combination of 2/1 to delineate ferric iron oxide, and band ratio of 5/4 to delineate the lateritic soil. Further, the linear spectral unmixing outcome of ASRER data was evaluated concerning the ground truth of geochemical compositions of samples from the study area. Our results showed that image processing of the ASTER satellite data has the potential to delineate ferric, ferrous, and lateritic mineral assemblages in the iron-bearing soils with minimal requirement of ground truth verification. This research work aided in increasing trust in the use of space-based data for mineral prospecting. Image processing has demonstrated that ASTER data can be used to enhance iron ore exploration and the discovery of new mineralized areas. Copyright © 2022. The Author(s), under exclusive licence to Springer Nature Switzerland AG.
https://dx.doi.org/10.1007/s10661-022-10570-2

45. Ourarhi S, Barkaoui AE, Zarhloule Y. **Assessment of the Agricultural Intensification Impact on Groundwater Quality: a Case Study of the Triffa Plain**. Water, Air, and Soil Pollution. 2022;233(8):342.
Since the modernisation of the agricultural sector in Morocco, the Triffa plain has been experiencing the development of techniques and increased production. However, agricultural intensification, the uncontrolled use of fertilisers and pesticides, and the succession of years of drought have contributed to the overexploitation of water resources and the degradation of the groundwater quality in the plain. To study the impact of the poor quality of groundwater (nitric pollution and salinisation) on the health of vegetation, we examined the spatiotemporal evolution of nitrates and salinisation in the plain, as well as the chlorophyll activity of crops (NDVI) using the Google Earth Engine (GEE) associated with MOD13Q1 version 6 images, for the years 2007-2009-2016-2022. The main results show an increase of 174% of the chlorophyll activity (NDVI >= 0.6) between 2007 and 2022, which make evidence of the significant intensification of the agricultural sector in the plain accompanied by a fast spread of nitric pollution regarding the groundwater. Hence, the area covered by the poor to very poor groundwater quality has almost doubled in a time interval of years (S2007N(mgl) = 235.5 km2, S2022N(mgl) = 408.65 km2). According to the analysis of the normalised difference vegetation index maps calculated for the study periods: 2007-2009-2016-2022 and the Pearson correlation matrix between the different variables, we conclude that the degradation of groundwater quality negatively affects the chlorophyll activity, which will consequently have an impact on the crop yield. The results prove the excessive use of fertilisers and pesticides, which led to increased chlorophyll activity associated with fast degradation of the water's quality concerning nitrate concentrations.Copyright © 2022, The Author(s), under exclusive licence to Springer Nature Switzerland AG.
https://dx.doi.org/10.1007/s11270-022-05810-7

46. Muyingo S, Etoori D, Lotay P, Malamba S, Olweny J, Keesler K, et al. **The procurement and supply chain strengthening project: improving public health supply chains for better access to HIV medicines, Uganda 2011-2016**. Journal of Pharmaceutical Policy and Practice. 2022;15(1):72.
Background: With countries moving towards reaching the UNAIDS 90-90-90 goal to achieve HIV epidemic control, there are going to be an unprecedented number of persons who will need to be tested, treated, and regularly monitored for viral suppression. However, most of the countries with the greatest burden of HIV/AIDS experience regular stock outages which could be detrimental to reaching these targets. ART and other commodities such as HIV test kits and laboratory supplies need to be readily and consistently available to achieve these targets. The main objective was to improve access to HIV/AIDS related commodities and strengthening institutional capacity for the management of HIV/AIDS logistics services through the MAUL procurement and supply chain strengthening project (PSSP) that rolled out four interventions on mentorship and support supervision, stock level monitoring, spatial visualization of stock indicators using GIS, and using WhatsApp to submit order reports as photo images. Method(s): Medical Access Uganda Limited, a private-not-for-profit supply chain management company in Uganda, implemented these interventions as part of a procurement and supply chain strengthening project (PSSP). These interventions were evaluated using performance monitoring indicators from 2011-2016. We tested for the significance in the change in scores of

performance monitoring indicators using the test for difference in proportions. Health facilities were scored on 6 categories and accredited as bronze, silver or gold based on their total scores. Kaplan-Meier estimates were computed for time to silver, and gold ranking and univariate and multivariate Cox proportional hazards models were computed for time to gold ranking. Result(s): We observed a significant reduction in reported stock-outs from 46 to 4% ($p < 0.001$) in the analysis period. Accurate stock card inventory rose from 79 to 91% ($p < 0.001$); adequate stock levels rose from 54 to 71% ($p = 0.002$) and stock reporting rates from 91 to 100% ($p < 0.001$). The stock order fill rate improved from a high of 93% to 97% ($p = 0.375$). Patient load (medium vs low adjusted hazard ratio (aHR): 2.19, $p = 0.026$; high vs low aHR: 2.97, $p = 0.034$) and number of support supervision visits (6-10 aHR: 3.33, $p = 0.024$; > 10 aHR: 5.78, $p = 0.003$) were associated with better stock management ranking scores. Conclusion(s): Improvements in supply chain management in countries committed to achieving the 90-90-90 goals are crucial to achieving HIV epidemic control. Health system strengthening and mentorship investments in Uganda were feasible and are essential for sustainable disease control efforts.
https://dx.doi.org/10.1186/s40545-022-00467-3

47. Moreno A, Rescia AJ, Pascual S, Ortega M. **Methodological approach to spatial analysis of agricultural pest dispersal in olive landscapes**. Environmental monitoring and assessment. 2022;194(6):411.
The effectiveness of a Geographical Information Systems cost-distance tool for detecting landscape permeability in relation to the movement of pests in olive landscapes was established. The simplification of agricultural systems is linked to an increased incidence of pests on crops. Therefore, it is important to understand the impact of different land uses surrounding olive groves on pests. In this work, we analysed the effect of the structure of the olive landscape on the movement of two main olive pests-the olive fruit fly, Bactrocera oleae (Rossi) (Diptera: Tephritidae) and the olive moth, Prays oleae (Bernard) (Lepidopetera: Praydidae). We applied linear mixed effects models to analyse the relationship between pest abundance and cost-distance, using different hypotheses to evaluate those land uses that are favourable or unfavourable for the movement of these pests. The results show that this methodology is effective in detecting possible unfavourable land uses with a barrier effect, such as woodland and artificial land uses, and favourable land uses with a corridor effect such as olive groves. Whether other land uses, such as scrubland or riverbanks, act as a barrier or corridor depends on the pest and its life cycle stage. The effect that different land uses have in maintaining low levels of pest populations and ensuring the long-term sustainability of these agricultural systems are discussed. The implications of landscape permeability for the physical structure of the landscape and the dispersal of organisms, and the potential of that landscape to impact the continuous flow of natural processes are also addressed.
https://dx.doi.org/10.1007/s10661-022-10068-x

48. Mohseni F, Saba F, Mirmazloumi SM, Amani M, Mokhtarzade M, Jamali S, et al. **Ocean water quality monitoring using remote sensing techniques: A review**. Marine environmental research. 2022;180:105701.
Ocean Water Quality (OWQ) monitoring provides insights into the quality of water in marine and near-shore environments. OWQ measurements can contain the physical, chemical, and biological characteristics of oceanic waters, where low OWQ values indicate an unhealthy ecosystem. Many parameters of water can be estimated from Remote Sensing (RS) data. Thus, RS offers significant opportunities for monitoring water quality in estuaries, coastal waterways, and the ocean. This paper reviews various RS systems and techniques for OWQ monitoring. It first introduces the common OWQ parameters, followed by the definition of the parameters and techniques of OWQ monitoring with RS techniques. In this study, the following OWQ parameters were reviewed: chlorophyll-a, colored dissolved organic matter, turbidity or total suspended matter/solid, dissolved organic carbon, Secchi disk depth, suspended sediment concentration, and sea surface temperature. This study presents a systematic analysis of the capabilities and types of spaceborne systems (e.g., optical and thermal sensors, passive microwave radiometers, active microwave scatterometers, and altimeters) which are commonly applied to OWQ assessment. The paper also provides a summary of the opportunities and limitations of RS data for spatial and temporal estimation of OWQ. Overall, it was observed that chlorophyll-a and colored dissolved organic matter are the dominant parameters applied to OWQ monitoring. It was also concluded that the data from optical and passive microwave sensors could effectively be applied to estimate OWQ parameters. From a methodological perspective, semi-empirical algorithms generally outperform the other empirical, analytical, and semi-analytical methods for OWQ monitoring.
https://dx.doi.org/10.1016/j.marenvres.2022.105701

49. Missaoui R, Abdelkarim B, Ncibi K, Hamed Y, Choura A, Essalami L. **Assessment of Groundwater Vulnerability to Nitrate Contamination Using an Improved Model in the Regueb Basin, Central Tunisia**. Water, Air, and Soil Pollution. 2022;233(8):320.
In recent years, Regueb basin has been facing groundwater quality degradation due to the excessive use of fertilizers and pesticides, which is the result of strong agricultural activities. Physicochemical elements (TDS, NO3 -) and several factor types (geologic, hydrogeologic, and geomorphologic) were used in this study. The weighted model (TDLFSGC) was used to determine the groundwater vulnerability index (VI) to the pollution which is subsequently validated by Pearson correlation with nitrate concentrations. The results show that the TDS in groundwater ranged between 1.19 and 16.92 g/L and the NO3 - concentrations varied from 150 to 920 mg/L. The vulnerability map generated using GIS shows three classes of VI in the study area, namely low (31.5-60), moderate (60-75), and high (75-13). The validation of the vulnerability model revealed a good correlation with NO3 - and provided a high discretization of the groundwater vulnerability from anthropogenic pollution. This approach implies that more efforts should be taken to preserve the groundwater of the Regueb basin from contamination. And it could be used as a tool for water resource management in the future in similar regions.
https://dx.doi.org/10.1007/s11270-022-05806-3

50. Miller EB, Seyfried AP, Pender SE, Heard K, Meindl GA. **Racial Disparities in Access to Public Green Spaces: Using Geographic Information Systems to Identify Underserved Populations in a Small American City**. Environmental Justice (19394071). 2022;15(4):246-56.
Green spaces are integral components of urban environments, as they provide numerous health benefits to people. However, urban green spaces are often inequitably distributed. Understanding the relationship between green space access and socioeconomic status is critical for identifying and eliminating environmental injustices. This study utilized Geographic Information Systems to examine the relationship between green space accessibility and racial groups in Binghamton, New York, a small city with known socioeconomic disparities and public health concerns. Using network analysis to measure distances of census blocks from green spaces, we found that most neighborhoods, regardless of overall minority composition, have equitable access to green spaces when considering all green spaces. However, when increasing the minimum threshold to 5000 m green spaces, the standard used by the World Health Organization to define high-quality green space, we found that low-Asian census blocks have significantly less access to green spaces, whereas high-Hispanic blocks have relatively greater access to green space. This underscores the importance of considering each racial category separately rather than lumping people of color into a single category, which is common practice in studies of social inequity. Our results highlight disparities between access to green space across different racial groups in a small-sized American city and can be used by urban planners to inform future initiatives that value social equity. [ABSTRACT FROM AUTHOR]

10.1089/env.2021.0067

51. Meng F, Liang X, Xiao C, Wang G. **Hydrochemical characteristics and identification of pollution ions of the springs in the south of Yanbian City, China**. Environmental geochemistry and health. 2022;44(7):2215-33.
Mathematical statistics, correlation analysis, Piper and Gibbs diagrams, and geographic information system- based multi-criteria decision analysis were used to study the hydrochemical characteristics and identification of hydrochemical ions affected by human activities of the springs in the south of Yanbian City, China. Four criteria were selected: land use/land cover, village density, distance to towns, and distance to main roads. The improved entropy method was used to assign weight to each criterion, followed by evaluating the human activities impact index map, which was used to extract the human activities impact index of springs. The correlation coefficient was calculated to identify the hydrochemical parameters affected by human activities. The results show that the main hydrochemical parameters are Ca2+ among cations and HCO3- among anions. Ca2+, Mg2+, HCO3-, Cl-, and total dissolved solids (TDS) have a strong correlation and similar spatial distribution, showing a decreasing trend from northwest to southeast. Most hydrochemical parameters

show a similar spatial distribution trend. The hydrochemical types of springs are HCO3-Ca, HCO3-Ca*Mg, HCO3-Na*Ca, and HCO3-Ca. In the study area, Na+, K+, TFe, Mn2+, F-, PO43-, and oxygen consumption are negligibly affected by human activities, Mg2+, HCO3-, and Cl- were slightly affected, and TDS and total hardness (TH) were strongly affected. With a correlation coefficient of 0.913, nitrate exhibited the highest correlation with the human activities impact index; it was significantly affected by human activities. We conclude that nitrate was the most affected by human activities, followed by TH, TDS, and other hydrochemical parameters. Copyright © 2021. The Author(s), under exclusive licence to Springer Nature B.V.
https://dx.doi.org/10.1007/s10653-021-01070-2

52. McPherson B, Mayfield HJ, McLure A, Gass K, Naseri T, Thomsen R, et al. **Evaluating Molecular Xenomonitoring as a Tool for Lymphatic Filariasis Surveillance in Samoa, 2018-2019**. Tropical Medicine and Infectious Disease. 2022;7(8):203.
Molecular xenomonitoring (MX), the detection of filarial DNA in mosquitoes using molecular methods (PCR), is a potentially useful surveillance strategy for lymphatic filariasis (LF) elimination programs. Delay in filarial antigen (Ag) clearance post-treatment is a limitation of using human surveys to provide an early indicator of the impact of mass drug administration (MDA), and MX may be more useful in this setting. We compared prevalence of infected mosquitoes pre- and post-MDA (2018 and 2019) in 35 primary sampling units (PSUs) in Samoa, and investigated associations between the presence of PCR-positive mosquitoes and Ag-positive humans. We observed a statistically significant decline in estimated mosquito infection prevalence post-MDA at the national level (from 0.9% to 0.3%, OR 0.4) but no change in human Ag prevalence during this time. Ag prevalence in 2019 was higher in randomly selected PSUs where PCR-positive pools were detected (1.4% in ages 5-9; 4.8% in ages >=10), compared to those where PCR-positive pools were not detected (0.2% in ages 5-9; 3.2% in ages >=10). Our study provides promising evidence for MX as a complement to human surveys in post-MDA surveillance.Copyright © 2022 by the authors.
https://dx.doi.org/10.3390/tropicalmed7080203

53. Masood A, Aslam M, Pham QB, Khan W, Masood S. **Integrating water quality index, GIS and multivariate statistical techniques towards a better understanding of drinking water quality**. Environmental science and pollution research international. 2022;29(18):26860-76.
Groundwater is considered as an imperative component of the accessible water assets across the world. Due to urbanization, industrialization and intensive farming practices, the groundwater resources have been exposed to large-scale depletion and quality degradation. The prime objective of this study was to evaluate the groundwater quality for drinking purposes in Mewat district of Haryana, India. For this purpose, twenty-five groundwater samples were collected from hand pumps and tube wells spread over the entire district. Samples were analyzed for pH, electrical conductivity (EC), total dissolved solids (TDS), total hardness (TH), turbidity, total alkalinity (TA), cations and anions in the laboratory using the standard methods. Two different water quality indices (weighted arithmetic water quality index and entropy weighted water quality index) were computed to characterize the groundwater quality of the study area. Ordinary Kriging technique was applied to generate spatial distribution map of the WQIs. Four semivariogram models, i.e. circular, spherical, exponential and Gaussian were used and found to be the best fit for analyzing the spatial variability in terms of weighted arithmetic index (GWQI) and entropy weighted water quality index (EWQI). Hierarchical cluster analysis (HCA), principal component analysis (PCA) and discriminant analysis (DA) were applied to provide additional scientific insights into the information content of the groundwater quality data available for this study. The interpretation of WQI analysis based on GWQI and EWQI reveals that 64% of the samples belong to the "poor" to "very poor" bracket. The result for the semivariogram modeling also shows that Gaussian model obtains the best fit for both EWQI and GWQI dataset. HCA classified 25 sampling locations into three main clusters of similar groundwater characteristics. DA validated these clusters and identified a total of three significant variables (pH, EC and Cl) by adopting stepwise method. The application of PCA resulted in three factors explaining 69.81% of the total variance. These factors reveal how processes like rock water interaction, urban waste discharge and mineral dissolution affect the groundwater quality. Copyright © 2021. The Author(s).
https://dx.doi.org/10.1007/s11356-021-17594-0

54. Martinez-Garcia L, Gonzalez-Alba JM, Puerta T, Comunion A, Rodriguez-Jimenez MC, Orviz E, et al. **Specific high-resolution scheme to improve understanding of the spatio-temporal dispersion of lymphogranuloma venereum epidemic**. Frontiers in Microbiology. 2022;13:1056216.
Introduction: Lymphogranuloma venereum (LGV) is already endemic in vulnerable populations in several European countries; however, molecular epidemiology data with improved accuracy are necessary to better understand LGV epidemic in these countries. Current strategies to study the molecular epidemiology of LGV cases involve schemes based on a few genetic fragments of Chlamydia trachomatis, which have demonstrated limited discriminatory power for LGV. Therefore, this study aimed to propose a new combination of molecular markers based on the most variable genes of L-genotype genomes to improve the characterization of the current LGV epidemic in Madrid, Spain. Method(s): Four genes were selected according to their diversity index (CTLon_0054, CTLon_0087, CTLon_0243 and CTLon_0301) for use in combination with ompA. In silico and experimental studies were performed to compare the previously described multilocus sequence typing (MLST) schemes with our proposal. Moreover, the proposed scheme was applied (n = 68) to analyze the spatio-temporal spread of the LGV cases. Result(s): Our proposal demonstrated higher diversity allowing the identification of three main groups compared to the previously published MLST based on hypervariable genes wherein only a single sequence type was identified. The temporal analysis showed that the major cluster was progressively diversifying, revealing a very active transmission chain. Furthermore, an L2b genome identical to that of the origin of the epidemic was detected, suggesting reintroductions or a low screening rate in vulnerable populations. The spatial distribution suggests that the selection and spread of new variants occurs from the central district to the peripheral regions. Discussion(s): The scheme proposed in this study has proven to be useful for appropriate discrimination of LGV strains. This study, to our knowledge for the first time, demonstrates a spatio-temporal spread that increases our understanding and identifies areas with special susceptibility for maintenance of the endemic situation of LGV.Copyright © 2022 Martinez-Garcia, Gonzalez-Alba, Puerta, Comunion, Rodriguez-Jimenez, Orviz, Sanchez-Conde, Rodriguez-Dominguez, Canton and Galan.
https://dx.doi.org/10.3389/fmicb.2022.1056216

55. Marin GH, Fonseca J, Etchegoyen G, Marin L, Aramburu IK, Rodriguez R, et al. **Management model of the COVID-19 pandemic in socially vulnerable communities**. BMJ Innovations. 2022;8(4):261-72.
Introduction Several public policies were proposed to reduce the negative impact of COVID-19 pandemic. This work aimed to determine how a management model is capable of strengthening the community network, providing support, healthcare and channelling public government's aid during COVID-19 pandemic situation. Methods It is an intervention study that tested the effectiveness of a management model for both healthcare and essential goods access in a socially vulnerable neighbourhood called 'Puente de Fierro' in La Plata the capital of Buenos Aires State, Argentina, during the COVID-19 pandemic. Altos de San Lorenzo suburb area was considered as control group. Variables studied were: level of contagion and death due to the SARS-CoV-2 virus; access to food, medicine and other goods; strengthening of community networks; performance of government programmes in territory. Results A new management paradigm was tested by moving essential goods towards the people, instead of making the people move to obtain those benefits. Accessibility to 'Food Bag' and 'Food Bank' were significantly increased, a reduction of contagion level and mortality rate for COVID-19 was achieved (2.3/100 000 vs 3.6/100 000 inhabitants in control area; and 'fatality rate' was 2.8% vs 3.6%, respectively). Support was also provided to installed in local stores virtual payment devices for food cards acceptance. Conclusion The management model based in healthcare and goods and service supplies during COVID-19 pandemic reduced the negative impact of disease and its measures of isolation in socially vulnerable neighbourhoods.Copyright ©.
https://dx.doi.org/10.1136/bmjinnov-2021-000870

56. Liu Q, Yu F, Mu X. **Evaluation of the Ecological Environment Quality of the Kuye River Source Basin Using the Remote Sensing Ecological Index**. International Journal of Environmental Research and Public Health. 2022;19(19):12500.
Landsat remote sensing images obtained from 2000, 2005, 2010, 2015, and 2020 were analyzed. The normalized vegetation index (NDVI), moisture index (WET), land surface temperature (LST), and normalized building-soil index (NDBSI) were extracted based on the four aspects of greenness, humidity, heat, and dryness. The Remote Sensing Ecological Index (RSEI) was calculated using principal component analysis to quantitatively analyze and dynamically monitor and evaluate the ecological environment changes in the Kuye River Basin over the past 20 years. From the perspective of spatial and temporal distribution, the ecological and environmental quality of Kuye River Basin had a

downward trend from 2000 to 2020. The overall RSEI grade was medium or poor, and the average RSEI decreased. The proportion of excellent and good grade watershed areas decreased, whereas that of medium, low, and poor grade watershed areas increased over the study period. Spatially, RSEI decreased gradually from southeast to northwest. The degraded areas were mainly distributed in urban areas with frequent human activities. Conversely, the superior eco-environmental quality areas were mainly distributed in eastern sections of the watershed. Compared with 2000, the eco-environmental quality of the Yulin urban area and Shenmu County in the southern section of the watershed are worsening.
https://dx.doi.org/10.3390/ijerph191912500

57. Kim J, Kim DH, Lee J, Cheon Y, Yoo S. **A scoping review of qualitative geographic information systems in studies addressing health issues**. Social Science & Medicine. 2022;314:N.PAG-N.PAG.
Qualitative Geographic Information Systems (QGIS) represent an emerging geospatial and qualitative approach to comprehensively understand health issues. This scoping review gathers evidence from 38 articles to illuminate when and how QGIS is used to address health issues. QGIS can contribute to recent health-related studies focusing on determinants of health and health equity at the community rather than individual level, highlight relationships between place and health, and encourage participation from people and communities in health-decision making. If more studies attempt to specify detailed data analysis methods and develop ways to use rich contexts of qualitative data, QGIS can provide greater scope for those working to solve health problems. • QGIS are emerging as comprehensive methods for the investigation of health issue. • QGIS enhance understanding of place, an important health determinant. • QGIS have potential in participatory health research and practice. • Clearly defined analysis methods ensure transparency and reproducibility of QGIS. • QGIS' context-oriented qualitative data has potential to better inform health issues. [ABSTRACT FROM AUTHOR]

10.1016/j.socscimed.2022.115472

58. Kikaki K, Kakogeorgiou I, Mikeli P, Raitsos DE, Karantzalos K. **MARIDA: A benchmark for Marine Debris detection from Sentinel-2 remote sensing data**. PloS one. 2022;17(1):e0262247.
Currently, a significant amount of research is focused on detecting Marine Debris and assessing its spectral behaviour via remote sensing, ultimately aiming at new operational monitoring solutions. Here, we introduce a Marine Debris Archive (MARIDA), as a benchmark dataset for developing and evaluating Machine Learning (ML) algorithms capable of detecting Marine Debris. MARIDA is the first dataset based on the multispectral Sentinel-2 (S2) satellite data, which distinguishes Marine Debris from various marine features that co-exist, including Sargassum macroalgae, Ships, Natural Organic Material, Waves, Wakes, Foam, dissimilar water types (i.e., Clear, Turbid Water, Sediment-Laden Water, Shallow Water), and Clouds. We provide annotations (georeferenced polygons/ pixels) from verified plastic debris events in several geographical regions globally, during different seasons, years and sea state conditions. A detailed spectral and statistical analysis of the MARIDA dataset is presented along with well-established ML baselines for weakly supervised semantic segmentation and multi-label classification tasks. MARIDA is an open-access dataset which enables the research community to explore the spectral behaviour of certain floating materials, sea state features and water types, to develop and evaluate Marine Debris detection solutions based on artificial intelligence and deep learning architectures, as well as satellite pre-processing pipelines.
https://dx.doi.org/10.1371/journal.pone.0262247

59. Karim MA, Kum H-C, Schmit CD. **A Study of Publicly Available Resources Addressing Legal Data-Sharing Barriers: Systematic Assessment**. Journal of medical Internet research. 2022;24(9):e39333.
BACKGROUND: United States data protection laws vary depending on the data type and its context. Data projects involving social determinants of health often concern different data protection laws, making them difficult to navigate., OBJECTIVE: We systematically aggregated and assessed useful online resources to help navigate the data-sharing landscape., METHODS: We included publicly available resources that discussed legal data-sharing issues with some

health relevance and published between 2010 and 2019. We conducted an iterative search with a common string pattern using a general-purpose search engine that targeted 24 different sectors identified by Data Across Sectors for Health. We scored each online resource for its depth of legal and data-sharing discussions and value for addressing legal barriers., RESULTS: Out of 3710 total search hits, 2721 unique URLs were reviewed for scope, 322 received full-text review, and 154 were selected for final coding. Legal agreements, consent, and agency guidance were the most widely covered legal topics, with HIPAA (The Health Insurance Portability and Accountability Act), Family Educational Rights and Privacy Act (FERPA), Title 42 of the Code of Federal Regulations Part 2 being the top 3 federal laws discussed. Clinical health care was the most prominent sector with a mention in 73 resources., CONCLUSIONS: This is the first systematic study of publicly available resources on legal data-sharing issues. We found existing gaps where resources covering certain laws or applications may be needed. The volume of resources we found is an indicator that real and perceived legal issues are a substantial barrier to efforts in leveraging data from different sectors to promote health. Copyright ©Mohammad A Karim, Hye-Chung Kum, Cason D Schmit. Originally published in the Journal of Medical Internet Research (https://www.jmir.org), 06.09.2022.
https://dx.doi.org/10.2196/39333

60. Hystad P, Amram O, Oje F, Larkin A, Boakye K, Avery A, et al. **Bring Your Own Location Data: Use of Google Smartphone Location History Data for Environmental Health Research**. Environmental Health Perspectives. 2022;130(11):117005-1--9.
BACKGROUND: Environmental exposures are commonly estimated using spatial methods, with most epidemiological studies relying on home addresses. Passively collected smartphone location data, like Google Location History (GLH) data, may present an opportunity to integrate existing long-term timeâ€“activity data. OBJECTIVES: We aimed to evaluate the potential use of GLH data for capturing long-term retrospective timeâ€“activity data for environmental health research. METHODS: We included 378 individuals who participated in previous Global Positioning System (GPS) studies within the Washington State Twin Registry. GLH data consists of location information that has been routinely collected since 2010 when location sharing was enabled within android operating systems or Google apps. We created instructions for participants to download their GLH data and provide it through secure data transfer. We summarized the GLH data provided, compared it to available GPS data, and conducted an exposure assessment for nitrogen dioxide (NO2) air pollution. RESULTS: Of 378 individuals contacted, we received GLH data from 61 individuals (16.1%) and 53 (14.0%) indicated interest but did not have historical GLH data available. The provided GLH data spanned 2010â€“2021 and included 34 million locations, capturing 66,677 participant days. The median number of days with GLH data per participant was 752, capturing 442 unique locations. When we compared GLH data to 2-wk GPS data (~1.8 million points), 95% of GPS timeâ€“activity points were within 100 m of GLH locations. We observed important differences between NO2 exposures assigned at home locations compared with GLH locations, highlighting the importance of GLH data to environmental exposure assessment. DISCUSSION: We believe collecting GLH data is a feasible and cost-effective method for capturing retrospective timeâ€“activity patterns for large populations that presents new opportunities for environmental epidemiology. Cohort studies should consider adding GLH data collection to capture historical timeâ€“activity patterns of participants, employing a â€œbring-your-own-location-dataâ€• citizen science approach. Privacy remains a concern that needs to be carefully managed when using GLH data. [ABSTRACT FROM AUTHOR] Copyright of Environmental Health Perspectives is the property of National Institute of Environmental Health Sciences and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use. This abstract may be abridged. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material for the full abstract. (Copyright applies to all Abstracts.).
10.1289/EHP10829

61. Huang L, Han X, Wang X, Zhang Y, Yang J, Feng A, et al. **Coupling with high-resolution remote sensing data to evaluate urban non-point source pollution in Tongzhou, China**. The Science of the total environment. 2022;831:154632.
Urban non-point source (NPS) pollution has gradually become one of the important factors affecting the urban water environment. The quantitative evaluation of urban NPS pollution is the priority to identify key control area of urban NPS pollution. Current model applied in China is mainly focused on small-scale area, large-scale spatial continuous simulation is lacking. In this study A spatial continuous evaluation method coupled with high-resolution remote sensing data has

been established and the method was applied to Tongzhou, China. With the spatial distribution of land-use type and built-up area which were been obtained by remote sensing technology, the accumulative and wash-off load of urban NPS nitrogen and phosphorus were estimated for the prominent problems of nitrogen and phosphorus nutrient pollution in the rivers in the study area. The main sources of urban NPS Nitrogen and phosphorus pollution are roof and road rainfall runoff respectively. Compared to other urban NPS pollution models, the method developed in this study can quickly realize spatial visualization assessment of urban NPS pollution and provide a means to estimate urban NPS loads in entire city or urban agglomeration, it is applicable for common urban NPS pollutants and also has advantages in areas without data.
https://dx.doi.org/10.1016/j.scitotenv.2022.154632

62. Hoxha K, Hung YW, Irwin BR, Grepin KA. **Understanding the challenges associated with the use of data from routine health information systems in low- and middle-income countries: A systematic review**. Health information management : journal of the Health Information Management Association of Australia. 2022;51(3):135-48.
BACKGROUND: Routine health information systems (RHISs) are crucial to informing decision-making at all levels of the health system. However, the use of RHIS data in low- and middle-income countries (LMICs) is limited due to concerns regarding quality, accuracy, timeliness, completeness and representativeness., OBJECTIVE: This study systematically reviewed technical, behavioural and organisational/environmental challenges that hinder the use of RHIS data in LMICs and strategies implemented to overcome these challenges., METHOD: Four electronic databases were searched for studies describing challenges associated with the use of RHIS data and/or strategies implemented to circumvent these challenges in LMICs. Identified articles were screened against inclusion and exclusion criteria by two independent reviewers., RESULTS: Sixty studies met the inclusion criteria and were included in this review, 55 of which described challenges in using RHIS data and 20 of which focused on strategies to address these challenges. Identified challenges and strategies were organised by their technical, behavioural and organisational/environmental determinants and by the core steps of the data process. Organisational/environmental challenges were the most commonly reported barriers to data use, while technical challenges were the most commonly addressed with strategies., CONCLUSION: Despite the known benefits of RHIS data for health system strengthening, numerous challenges continue to impede their use in practice., IMPLICATIONS: Additional research is needed to identify effective strategies for addressing the determinants of RHIS use, particularly given the disconnect identified between the type of challenge most commonly described in the literature and the type of challenge most commonly targeted for interventions.
https://dx.doi.org/10.1177/1833358320928729

63. Hossain Bhuiyan MA, Chandra Karmaker S, Saha BB. **Nexus between potentially toxic elements' accumulation and seasonal/anthropogenic influences on mangrove sediments and ecological risk in Sundarbans, Bangladesh: An approach from GIS, self-organizing map, conditional inference tree and random forest models**. Environmental pollution (Barking, Essex : 1987). 2022;309:119765.
Mangroves play a vital role in protecting the coastal community from the climate change effect and in the restoration of the coastal ecosystem. This research has been designed to determine the spatial and seasonal changes of potentially toxic elements' (PTEs) concentration in sediments and their potential source contribution among the different human-driven processes in Sundarbans, Bangladesh. Different pollution evaluation indices, random forest (RF) model, conditional inference tree (CIT), self-organizing map (SOM), geographical information system (GIS), and principal component analysis (PCA) were used for the interpretation of sources and risk assessment of PTEs. The mean concentration of PTEs both in winter and monsoon seasons has fallen below the threshold effect level but exceeded the rare effect level of marine sediments quality standards. Results showed that the PTEs were significantly enriched (EF > 1.00 < 70.00) in sediments, whereas the Cd enrichment (7.00% samples) was very alarming (EF = 60-70). Except for Zn and Cd, other PTEs were enriched in 30-60% samples. The highest geoaccumulation and contamination factors for Cd were observed in 46-72% of samples. The ecological risk (ER) factors showed similar results where Cd showed strong to very strong factors (ER = 110-2218) in 80% of samples. The CIT explained the natural/geogenic and anthropogenic sources of pollution, where the higher CIT values for Cd indicated industrial, aquaculture, and coal-based thermal powerplant. The RF model provided that shrimp firms, power plants, industry, and seaport were recognized as the influential sources for Zn, Pb, Cr, Cd, and As in sediments. Though Pb and As were found as the most significant pollutants, Cd was identified as a severe threat to ecology and public health. Based on CIT, RF, SOM and PCA the order of PTEs in mangroves sediment were:industrial/urban > aquaculture/shrimpfirm > powerplant > seaportoperation >

tourism > geogenic/natural. The present study will help the policymakers for effective and sustainable management of the mangrove ecosystem.
https://dx.doi.org/10.1016/j.envpol.2022.119765

64. Hallgren KA, Cohn EB, Ries RK, Atkins DC. **Delivering Remote Measurement-Based Care in Community Addiction Treatment: Engagement and Usability Over a 6-Month Clinical Pilot**. Frontiers in Psychiatry. 2022;13:840409.
Objective: Measurement-based care (MBC) is an evidence-based practice in which patients routinely complete standardized measures throughout treatment to help monitor clinical progress and inform clinical decision-making. Despite its potential benefits, MBC is rarely used in community-based substance use disorder (SUD) treatment. In this pilot study, we evaluated the feasibility of incorporating a digital and remotely delivered MBC system into SUD treatment within a community setting by characterizing patients' and clinicians' engagement with and usability ratings toward the MBC system that was piloted. Method(s): A pilot study was conducted with 30 patients receiving SUD treatment and eight clinicians providing SUD treatment in a large, publicly funded addiction and mental health treatment clinic. Services as usual within the clinic included individual psychotherapy, case management, group therapy, peer support, and medication management for mental health and SUD, including buprenorphine. Patients who enrolled in the pilot continued to receive services as usual and were automatically sent links to complete a 22-item questionnaire, called the weekly check-in, via text message or email weekly for 24 weeks. Results of the weekly check-in were summarized on a clinician-facing web-based dashboard. Engagement was characterized by calculating the mean number of weekly check-ins completed by patients and the mean number times clinicians logged into the MBC system. Ratings of the MBC system's usability and clinical utility were provided by patients and clinicians. Result(s): Patient participants (53.3% male, 56.7% white, 90% Medicaid enrolled) completed a mean of 20.60 weekly check-ins (i.e., 85.8% of the 24 expected per patient). All but one participating clinician with a patient enrolled in the study logged into the clinician-facing dashboard at least once, with an average of 12.20 logins per clinician. Patient and clinician ratings of usability and clinical utility were favorable: most patients agreed with statements that the weekly check-in was easy to navigate and aided self-reflection. All clinicians who completed usability questionnaires agreed with statements indicating that the dashboard was easy to navigate and that it provided meaningful information for SUD treatment. Conclusion(s): A digital and remotely delivered MBC system can yield high rates of patient and clinician engagement and high ratings of usability and clinical utility when added into SUD treatment as usual. The success of this clinical pilot may be attributable, in part, to the user-centered design processes that were used to develop and refine the MBC system that was piloted. Future efforts may focus on strategies to test whether MBC can be sustainably implemented and offers clinical benefits to patients in community SUD treatment settings.
https://dx.doi.org/10.3389/fpsyt.2022.840409

65. Everest T, Gur E. **A GIS-based land evaluation model for peach cultivation by using AHP: a case study in NW Turkey**. Environmental monitoring and assessment. 2022;194(4):241.
Crop-based land suitability studies constitute an important component of precision and sustainable agricultural practices. In this study, a model was created to determine suitable lands for peach farming with the use of the analytic hierarchy process (AHP). The land suitability model was carried out in Derekolu region of Bayramic town of Canakkale province. Within the scope of the study, a total of 12 parameters, namely soil depth, soil texture, EC, pH, organic matter content, CaCO3 content, nitrogen, phosphorus, potassium, elevation, aspect, and slope, were used. Present assessments revealed that of the assessed lands, 367.50 ha was highly suitable, 7085.25 ha moderately suitable, 6341.25 ha marginally suitable, and 378.50 ha not suitable for peach cultivation. Texture, slope, and CaCO3 content were respectively identified as the most effective factors in peach cultivation. The combined use of AHP and GIS techniques in the identification of suitable lands for peach farming facilitated assessments and provided significant advantages in terms of time and economic aspects. Further research is recommended to test the validity of the present model for different geographies under different climate and soil conditions.
https://dx.doi.org/10.1007/s10661-022-09898-6

66. England R, Khodorov G, Anand J, Wangari F, Muruka J, Mollura D, et al. **Abstract No. 9 Evaluating global interventional radiology services to improve maternal morbidity and mortality: geographic information system**

mapping of postpartum hemorrhage and interventional radiology availability in Kenya. Journal of Vascular and Interventional Radiology. 2022;33(6 Supplement):S6.
Purpose: Postpartum hemorrhage (PPH) is the leading preventable cause of maternal illness and death globally, accounting for up to 20% of deaths in developing regions. Improving availability and awareness of interventional radiology (IR) services such as uterine artery embolization may improve maternal morbidity and mortality in these regions. The purpose of this study was to evaluate PPH and IR services landscapes in Kenya using geographic information systems (GIS) analytic mapping. Material(s) and Method(s): GIS analysis of Kenya was performed using open-source data sets for geospatial analysis. Data at the regional and county levels for Kenya from 2014-2018 was collected to evaluate demographics, the incidence of maternal morbidity and mortality due to postpartum hemorrhage and availability of interventional radiology services as a representation of access to uterine artery embolization. Detailed multi-layered GIS mapping was performed to produce visual data representation of the findings for outreach planning. Result(s): Demographic data demonstrated a larger percentage of maternal-age Kenyan females live within the Nairobi metropolitan region and central, southern, and southwestern regions of the country. From 2014 to 2018, incidence of maternal hemorrhage was found to increase from 15,457 to 21,332 (38% increase over 4 years). A total of 6 hospitals were identified in Kenya that offered IR services able to treat PPH, all located in Nairobi, which was found to have a neutral maternal mortality ratio (MMR) of -0.5 to 0.5. MMRs were highest in the southeastern and northwestern regions of the country, with 1.5-2.3 and 0.5-1.5 standard deviation increases, respectively. These regions correlated with lower density healthcare facilities, longer travel times to healthcare facilities, and lack of IR services. Conclusion(s): In this study, GIS analysis demonstrated disproportionate rates of maternal morbidity and mortality due to PPH in areas without IR services. GIS was shown to be a valuable tool to better understand population health and can be leveraged to strategically target global interventional radiology services.
https://dx.doi.org/10.1016/j.jvir.2022.03.082

67. Chishtie J, Bielska IA, Barrera A, Marchand J-S, Imran M, Tirmizi SFA, et al. **Interactive Visualization Applications in Population Health and Health Services Research: Systematic Scoping Review**. Journal of medical Internet research. 2022;24(2):e27534.
BACKGROUND: Simple visualizations in health research data, such as scatter plots, heat maps, and bar charts, typically present relationships between 2 variables. Interactive visualization methods allow for multiple related facets such as numerous risk factors to be studied simultaneously, leading to data insights through exploring trends and patterns from complex big health care data. The technique presents a powerful tool that can be used in combination with statistical analysis for knowledge discovery, hypothesis generation and testing, and decision support., OBJECTIVE: The primary objective of this scoping review is to describe and summarize the evidence of interactive visualization applications, methods, and tools being used in population health and health services research (HSR) and their subdomains in the last 15 years, from January 1, 2005, to March 30, 2019. Our secondary objective is to describe the use cases, metrics, frameworks used, settings, target audience, goals, and co-design of applications., METHODS: We adapted standard scoping review guidelines with a peer-reviewed search strategy: 2 independent researchers at each stage of screening and abstraction, with a third independent researcher to arbitrate conflicts and validate findings. A comprehensive abstraction platform was built to capture the data from diverse bodies of literature, primarily from the computer science and health care sectors. After screening 11,310 articles, we present findings from 56 applications from interrelated areas of population health and HSR, as well as their subdomains such as epidemiologic surveillance, health resource planning, access, and use and costs among diverse clinical and demographic populations., RESULTS: In this companion review to our earlier systematic synthesis of the literature on visual analytics applications, we present findings in 6 major themes of interactive visualization applications developed for 8 major problem categories. We found a wide application of interactive visualization methods, the major ones being epidemiologic surveillance for infectious disease, resource planning, health service monitoring and quality, and studying medication use patterns. The data sources included mostly secondary administrative and electronic medical record data. In addition, at least two-thirds of the applications involved participatory co-design approaches while introducing a distinct category, embedded research, within co-design initiatives. These applications were in response to an identified need for data-driven insights into knowledge generation and decision support. We further discuss the opportunities stemming from the use of interactive visualization methods in studying global health; inequities, including social determinants of health; and other related areas. We also allude to the challenges in the uptake of these methods., CONCLUSIONS: Visualization in health has strong historical roots, with an upward trend in the use of these methods in population health and HSR. Such applications are being fast used by

academic and health care agencies for knowledge discovery, hypotheses generation, and decision support., INTERNATIONAL REGISTERED REPORT IDENTIFIER (IRRID): RR2-10.2196/14019. Copyright ©Jawad Chishtie, Iwona Anna Bielska, Aldo Barrera, Jean-Sebastien Marchand, Muhammad Imran, Syed Farhan Ali Tirmizi, Luke A Turcotte, Sarah Munce, John Shepherd, Arrani Senthinathan, Monica Cepoiu-Martin, Michael Irvine, Jessica Babineau, Sally Abudiab, Marko Bjelica, Christopher Collins, B Catharine Craven, Sara Guilcher, Tara Jeji, Parisa Naraei, Susan Jaglal. Originally published in the Journal of Medical Internet Research (https://www.jmir.org), 18.02.2022.
https://dx.doi.org/10.2196/27534

68. Chen J, Li R, Tao M, Lin C, Wang J, Wang L, et al. **Overview of the performance of satellite fire products in China: Uncertainties and challenges**. Atmospheric Environment. 2022;268:118838.
Satellite fire observations provide an essential constraint for the estimation of global biomass burning emissions. In this study, we present a comprehensive insight into the performance of the common satellite fire products in eastern China. Despite consistent spatial patterns, both polar-orbiting and geostationary satellite observations have large omission errors for the agricultural burning fires. Owing to a coarse resolution of 2 km, approximately 90% of the concurrent 375 m Visible infrared Imaging Radiometer (VIIRS) fires are not detected in Himawari-8 products. Nevertheless, the total amount of daily Himawari-8 fires is much higher than those of VIIRS and 1 km Moderate resolution imaging spectroradiometer (MODIS). The peak time of diurnal fire counts in eastern China has obvious seasonal variations, some of which are missed by polar-orbiting satellite detection. Validation by 3 m PlanetScope images shows that VIIRS and MODIS have a very high accuracy in detecting crop straw burning fires. However, Himawari-8 fires have obvious false alarms due largely to their algorithm defects. Also, the coarse resolution of Himawari-8 tends to make fire detection more likely to be obscured by dense smoke. The unmanned aerial vehicle (UAV) supervisions reveal prevalent small agricultural fires (<0.5 x 104 m2) in the extensive croplands that are not detected in the common satellite fires. As control measures get more stringent, spatial-temporal patterns as well as the scales of biomass burning activities in China have undergone dramatic changes. Considering the crucial role of satellite fires in estimating biomass burning emissions, it is necessary to improve satellite fire detection with more advanced observations and retrieval methods.Copyright © 2021 Elsevier Ltd.
https://dx.doi.org/10.1016/j.atmosenv.2021.118838

69. Canfell OJ, Davidson K, Sullivan C, Eakin E, Burton-Jones A. **Data sources for precision public health of obesity: a scoping review, evidence map and use case in Queensland, Australia**. BMC public health. 2022;22(1):584.
BACKGROUND: Global action to reduce obesity prevalence requires digital transformation of the public health sector to enable precision public health (PPH). Useable data for PPH of obesity is yet to be identified, collated and appraised and there is currently no accepted approach to creating this single source of truth. This scoping review aims to address this globally generic problem by using the State of Queensland (Australia) (population > 5 million) as a use case to determine (1) availability of primary data sources usable for PPH for obesity (2) quality of identified sources (3) general implications for public health policymakers., METHODS: The Preferred Reporting Items for Systematic Review and Meta-Analyses extension for scoping reviews (PRISMA-ScR) was followed. Unique search strategies were implemented for 'designed' (e.g. surveys) and 'organic' (e.g. electronic health records) data sources. Only primary sources of data (with stratification to Queensland) with evidence-based determinants of obesity were included. Primary data source type, availability, sample size, frequency of collection and coverage of determinants of obesity were extracted and curated into an evidence map. Data source quality was qualitatively assessed., RESULTS: We identified 38 primary sources of preventive data for obesity: 33 designed and 5 organic. Most designed sources were survey (n 20) or administrative (n 10) sources and publicly available but generally were not contemporaneous (> 2 years old) and had small sample sizes (10-100 k) relative to organic sources (> 1 M). Organic sources were identified as the electronic medical record (ieMR), wearables, environmental (Google Maps, Crime Map) and billing/claims. Data on social, biomedical and behavioural determinants of obesity typically co-occurred across sources. Environmental and commercial data was sparse and interpreted as low quality. One organic source (ieMR) was highly contemporaneous (routinely updated), had a large sample size (5 M) and represented all determinants of obesity but is not currently used for public health decision-making in Queensland., CONCLUSIONS: This review provides a (1) comprehensive data map for PPH for obesity in Queensland and (2) globally translatable framework to identify, collate and appraise primary data sources to advance PPH for obesity and other noncommunicable diseases. Significant challenges must be addressed to achieve PPH, including: using designed and

organic data harmoniously, digital infrastructure for high-quality organic data, and the ethical and social implications of using consumer-centred health data to improve public health. Copyright © 2022. The Author(s).
https://dx.doi.org/10.1186/s12889-022-12939-x

70. Brunelli L, Poelzl L, Hirsch J, Engler C, Naegele F, Egelseer-Bruendl T, et al. **The effectiveness of a telemedical program for COVID-19 positive high-risk patients in domestic isolation**. European Respiratory Journal. 2022;60(Supplement 66):2802.
Background: For almost two years, the Covid-19 pandemic has posed an enormous challenge to healthcare systems. Recurrent waves of disease brought the health systems to the limit of their resilience. Purpose(s): The Tele-Covid telemedicine care program was installed in December 2020 to monitor high-risk patients in home isolation. Close monitoring allows early detection of disease deterioration and timely intensification of therapy, ideally avoiding intensive care. Conversely, if the course of the disease is stable, unnecessary hospitalisation can be avoided, thus reducing the burden on the healthcare system. Method(s): Patient acquisition was performed in collaboration with the local public health service and primary care physicians. Covid-19 positive highrisk patients (age >65 years and/or severe comorbidities) from the greater Innsbruck area were fitted with an ear sensor-based home monitoring system. The ear sensor measures SpO2, respiratory rate, body temperature and heart rate. The monitoring team (25 medical students supervised by 6 physicians) provided continuous monitoring of vital signs (24/7). After validation of the measurements, the collected parameters were evaluated using a specially developed risk score. If a defined risk score was exceeded, the patient was contacted by telephone. The combination of the clinical condition and the risk score determined the further course of action: (a) wait and see, (b) notify the primary care physician, or (c) refer for inpatient admission. The program was active from December 2020 to March 2022. In Summer 2021, the program was temporarily paused due to the epidemiological situation. Result(s): A total of 132 patients (59.8% women) were monitored. The median age was 74 years (IQR: [67.3-80.8]). 91 patients (68.9%) had at least one relevant comorbidity. During the monitoring period, hospitalisation was required in 20 patients (15.2%), 3 of whom were transferred to the intensive care unit. Of the hospitalised patients, 3 (15%) patients died. During the same monitoring period, the Austrian Ministry of Health reported a mortality rate of 20.5% of all hospitalised patients in Austria aged 70-79 years. Subjectively, the patients felt safe due to close monitoring. Conclusion(s): The Tele-Covid program is the successful implementation of a remote monitoring system in a pandemic situation. In the future, a broad application of the program is feasible.
https://dx.doi.org/10.1093/eurheartj/ehac544.2802

71. Booth D. **Building Capacity With GIS**. Journal of Environmental Health. 2022;84(10):34-5.
In the article, the author discusses how environmental health professionals can use geographic information systems (GIS), which are collection of data, software and people that maintain, collect and analyze data with geospatial components. Also cited are the possible data that could be collected like traffic patterns, family demographics, and home and businesses in the region, and the state of GIS in environmental health.

72. Boonnuk T, Poomphakwaen K, Kumyoung N. **Application for simulating public health problems during floods around the Loei River in Thailand: the implementation of a geographic information system and structural equation model**. BMC public health. 2022;22(1):1651.
BACKGROUND: Floods cause not only damage but also public health issues. Developing an application to simulate public health problems during floods around the Loei River by implementing geographic information system (GIS) and structural equation model (SEM) techniques could help improve preparedness and aid plans in response to such problems in general and at the subdistrict level. As a result, the effects of public health problems would be physically and mentally less severe., METHODS: This research and development study examines cross-sectional survey data. Data on demographics, flood severity, preparedness, help, and public health problems during floods were collected using a five-part questionnaire. Calculated from the population proportion living within 300 m of the Loei River, the sample size was 560 people. The participants in each subdistrict were recruited proportionally in line with the course of the Loei River. Compared to the empirical data, the data analysis examined the causal model of public health problems during floods, flood severity, preparedness, and help. The standardized factor loadings obtained from the SEM analysis were substituted as the loadings in the equations for simulating public health problems during floods., RESULTS: The results revealed that the causal model of public health problems during floods, flood severity, preparation, and help agreed with the empirical data. Flood severity, preparedness, and aid (chi2 = 479.757, df = 160, p value <.05, CFI = 0.985, RMSEA

= 0.060, chi2/df = 2.998) could explain 7.7% of public health problems. The computed values were applied in a GIS environment to simulate public health problem situations at the province, district, and subdistrict levels., CONCLUSIONS: Flood severity and public health problems during floods were positively correlated; in contrast, preparedness and help showed an inverse relationship with public health problems. A total of 7.7% of the variance in public health problems during floods could be predicted. The analysed data were assigned in the GIS environment in the developed application to simulate public health problem situations during floods. Copyright © 2022. The Author(s).
https://dx.doi.org/10.1186/s12889-022-14018-7

73. Ballard M. **Implementation Support Guide: Development of a National Georeferenced Community Health Worker Master List Hosted in a Registry**. Journal of Public Health in Africa. 2022;13(Supplement 1):76. Introduction/ Background: Community Health Workers (CHWs) have been a cornerstone of health delivery across the globe for over a century. Unfortunately, this vital cadre is often not counted: information on numbers and location of active CHWs is frequently unavailable and/or inaccurate. This undermines health system planning and impedes CHWs' provision of care. Method(s): A functional and institutionalized national georeferenced CHW master list (CHWML) closes these gaps. This document was drafted in response to the urgent need to count and identify CHWs as part of the COVID-19 response. It was a collaborative effort by the Clinton Health Access Initiative (CHAI), Community Health Impact Coalition (CHIC), Global Fund, Living Goods, Health GeoLab Collaborative (HGLC), and UNICEF. More than 50 organizations provided technical review, including Africa CDC, USAID and WHO. Representatives from the ministries of health of Ethiopia, Kenya, Mali, Rwanda, Uganda, Sierra Leone, Togo and Zambia inputted their technical expertise and ongoing needs. Result(s): A CHWML is a single source of truth containing the data elements required to uniquely identify, effectively describe, enumerate, locate, and contact all CHWs in a country. This guidance was developed to support national governments and their technical/financial partners to develop functional, continuously maintained, shared, and institutionalized CHWML hosted in a national registry. It describes a 7-step process for generating, sharing, and maintaining the CHWML in a registry. Each step includes a decision checklist and key considerations for implementation. The guidance also includes a 3-stage maturity continuum, five candid national-level experiences implementing CHWMLs, and practical resources to aid in operationalization. Impact: Accurate, up-to-date, reliable data on CHWs, which captures their location, qualifications and activities, is critical for strategic decision-making. Hosted and kept up to date in a CHWML, these data are vital not only to support existing CHWs, but to identify and close coverage gaps in pursuit of universal health coverage. Conclusion(s): While one-off georeferenced censuses of CHWs may be effective for establishing a baseline, it is only a first step toward establishing a functional and institutionalized CHWML. Investing in the development and use of a CHWMLs is a fundamental step in maximizing the impact, efficiency, and equity of health service delivery.

74. Baldwin H, Landesman WJ, Borgmann-Winter B, Allen D. **A Geographic Information System Approach to Map Tick Exposure Risk at a Scale for Public Health Intervention**. Journal of medical entomology. 2022;59(1):162-72. Tick-borne disease control and prevention have been largely ineffective compared to the control of other vector-borne diseases. Although control strategies exist, they are costly or ineffective at large spatial scales. We need tools to target these strategies to places of highest tick exposure risk. Here we present a geographic information system (GIS) method for mapping predicted tick exposure risk at a 200 m by 200 m resolution, appropriate for public health intervention. We followed the approach used to map tick habitat suitability over large areas. We used drag-cloth sampling to measure the density of nymphal blacklegged ticks (Ixodes scapularis, Say (Acari: Ixodidae)) at 24 sites in Addison and Rutland Counties, VT, United States. We used a GIS to average habitat, climatological, land-use/land-cover, and abiotic characteristics over 100 m, 400 m, 1,000 m, and 2,000 m buffers around each site to evaluate which characteristic at which buffer size best predicted density of nymphal ticks (DON). The relationships between predictor variables and DON were determined with random forest models. The 100 m buffer model performed best and explained 37.7% of the variation in DON, although was highly accurate at classifying sites as having below or above average DON. This model was applied to Addison County, VT, to predict tick exposure risk at a 200 m resolution. This GIS approach to map predicted DON over a small area with fine resolution, could be used to target public health campaigns and land management practices to reduce human exposure to ticks.
https://dx.doi.org/10.1093/jme/tjab169

75. Arumugam T, Kinattinkara S, Kannithottathil S, Velusamy S, Krishna M, Shanmugamoorthy M, et al. **Comparative assessment of groundwater quality indices of Kannur District, Kerala, India using multivariate statistical approaches and GIS**. Environmental monitoring and assessment. 2022;195(1):29.
The aim of the study was to determine the groundwater characteristics of rural and industrial zones in the Kannur region. In 2011, 25 groundwater data were collected from the centre for water resource development management (CWRDM), and in 2019, 25 groundwater samples from rural and near-industrial areas were collected and analysed for major anions (HCO3-, CO32-, Cl-, NO3- and SO42-), and cations (TH, Ca2+, Mg2+, Na+, K+ and Fe2+) using APHA standards. To better understand the link between water quality parameters, multivariate statistical analysis approaches such as principal component analysis (PCA), hierarchical cluster analysis (HCA), correlation matrix analysis (CMA), and Pearson correlation bivariate one-tailed analysis (PCBOTA) were used to analyse the inter-relationship of data. The Inverse Distance Weighed (IDW) method was used to generate the spatial distribution of the groundwater quality index (GWQI). In 2011, the water quality index (WQI) value of groundwater samples was excellent at 24.42% and good at 54.14%, which were used for drinking purposes and moderate at 17.22% and poor at 4.22% for irrigation purposes in this study area. In 2019, excellent 21.62%, good 51.56% were used for drinking purpose, and moderate at 18.14%, and poor at 8.68% for irrigation purposes. By comparing the data with BIS and WHO standards, it is clear that groundwater in Kannur district is of good quality. In groundwater samples, the PCA eigen values were reported in 2011 (84.7%) and 2019 (73.4%) for statistical approaches. This study uses HCA and PCBOTA to analyse the elements, resulting in a better understanding of groundwater quality development. GIS based WQI maps were obtained and utilised to gain a better knowledge of the study area's past and present water quality status. We observed that the quality of groundwater in the study region's north-western portion is insufficient for drinking water. Copyright © 2022. The Author(s), under exclusive licence to Springer Nature Switzerland AG.
https://dx.doi.org/10.1007/s10661-022-10538-2

76. Anwar MZ, Gill IS, Iseminger M, Sehar A, Igwacho KD, Vora K, et al. **COVID-MVP: an interactive visualization for tracking SARS-CoV-2 mutations, variants, and prevalence, enabled by curated functional annotations and portable genomics workflow**. bioRxiv. 2022.
The SARS-CoV-2 pandemic has reemphasized the importance of genomic epidemiology to track the evolution of the virus, dynamics of epidemics, geographic origins, and the emerging variants. It is vital in understanding the epidemiological spread of the virus on global, national, and local scales. Several analytical (bioinformatics) resources have been developed for molecular surveillance. However, a resource that combines genetic mutations and functional annotations on the impact of these mutations has been lacking in SARS-CoV-2 genomics surveillance. COVID-MVP provides an interactive visualization application that summarizes the mutations and their prevalence in SARS-CoV-2 viral lineages and provides functional annotations from the literature curated in an ongoing effort, Pokay. COVID-MVP is a tool that can be used for routine surveillance including spatio-temporal analyses. We have powered the visualization through a scalable and reproducible genomic analysis workflow nf-ncov-voc wrapped in Nextflow. COVID-MVP allows users to interactively explore data and download summarized surveillance reports. COVID-MVP, Pokay, and nf-ncov-voc are open-source tools available under the Massachusetts Institute of Technology (MIT) and GPL-3.0 licenses. COVID-MVP source code is available at https://github.com/cidgoh/COVID-MVP and an instance is hosted at https://covidmvp.cidgoh.ca.Copyright The copyright holder for this preprint is the author/funder, who has granted bioRxiv a license to display the preprint in perpetuity. It is made available under a CC-BY 4.0 International license.
https://dx.doi.org/10.1101/2022.06.07.493653

77. Antony S, Unnikrishnan K, Aswin S, Dev VV, Arun V, Krishnan KA. **Heavy metals in coral reef sediments of Kavaratti Island, India: An integrated quality assessment using GIS and pollution indicators**. Marine pollution bulletin. 2022;180:113721.
The present study aims to document the contamination levels and ecological risks of heavy metals in the sediments of Kavaratti lagoon, India. A total of 15 sediment samples were collected for the analysis of Al, Pb, Cd, Cu, Cr, Mn, Ni and Zn. The decreasing trend of heavy metals was observed in the lagoon sediment as Pb > Zn > Al > Mn > Ni > Cr > Cd > Cu. The Geo-accumulation index (Igeo) results indicate that Cu, Cr, Mn, Ni and Zn were uncontaminated, while Cd was strong to extremely contaminated and Al and Pb were moderately contaminated. The enrichment factors (EF) of Cd and Pb range from moderate to extremely high (EF > 1) indicating that they have anthropogenic origin on Kavaratti Island.

The Contamination factor (Cf) indicated that Cd, Pb and Al belong to a high risk of contamination (Cf > 6). The pollution load index (PLI) value near one suggested that a moderate level of pollution occurs in the study area. The modified degree of contamination (mCd) shows that Al, Cd and Pb have an ultra- higher degree of contamination (mCd <= 32). The potential ecological risk (RI) index confirmed that Pb and Cd have considerable to the serious thread of ecological risk (RI > 600). Additionally, multivariate statistical analysis and pollution indexes showed that the Kavaratti lagoon is moderate to considerably polluted by heavy metals. Diesel-based power generation, activities related to shipping, untreated sewage, fishing and tourism activities are the main anthropogenic sources of heavy metal pollution on Kavaratti Island.
https://dx.doi.org/10.1016/j.marpolbul.2022.113721

78. Ansari B, Martin EG. **Development of a usability checklist for public health dashboards to identify violations of usability principles**. Journal of the American Medical Informatics Association : JAMIA. 2022;29(11):1847-58.
OBJECTIVE: To develop a usability checklist for public health dashboards., MATERIALS AND METHODS: This study systematically evaluated all publicly available dashboards for sexually transmitted infections on state health department websites in the United States (N = 13). A set of 11 principles derived from the information visualization literature were used to identify usability problems that violate critical usability principles: spatial organization, information coding, consistency, removal of extraneous ink, recognition rather than recall, minimal action, dataset reduction, flexibility to user experience, understandability of contents, scientific integrity, and readability. Three user groups were considered for public health dashboards: public health practitioners, academic researchers, and the general public. Six reviewers with usability knowledge and diverse domain expertise examined the dashboards using a rubric based on the 11 principles. Data analysis included quantitative analysis of experts' usability scores and qualitative synthesis of their textual comments., RESULTS: The dashboards had varying levels of complexity, and the usability scores were dependent on the dashboards' complexity. Overall, understandability of contents, flexibility, and scientific integrity were the areas with the most major usability problems. The usability problems informed a checklist to improve performance in the 11 areas., DISCUSSION: The varying complexity of the dashboards suggests a diversity of target audiences. However, the identified usability problems suggest that dashboards' effectiveness for different groups of users was limited., CONCLUSIONS: The usability of public health data dashboards can be improved to accommodate different user groups. This checklist can guide the development of future public health dashboards to engage diverse audiences.
https://dx.doi.org/10.1093/jamia/ocac140

79. Zeb I, Qureshi NA, Shaheen N, Zafar MI, Ali A, Hamid A, et al. **Spatiotemporal patterns of cutaneous leishmaniasis in the district upper and lower Dir, Khyber Pakhtunkhwa, Pakistan: A GIS-based spatial approaches**. Acta tropica. 2021;217:105861.
While Cutaneous leishmaniasis (CL) is not a life-threatening disease, it leads to devastating effects on local community. CL is widely scattered manifesting a noticeable epidemiological pattern around the globe. The present study was planned to address the role of Geographic Information System (GIS) using CL clinico-epidemiological data to determine the high-risk areas of CL. Recorded data (2014-2018) of 3630 positive individuals was collected from Basic Health Units of the Upper and Lower Dir Districts, Khyber Pakhtunkhwa, Pakistan. Descriptive and statistical analysis was used for clinico-epidemiological characterization. For spatial analysis, ArcGIS V.10.3 was used and the CL average incidence was tagged on the proportional, choropleth, and digital elevation model maps. For focal transmission and high-risk zones, Inverse Density Weight (IDW) spatial interpolation, focal statistics, hot spot, cluster and outlier, and Bayesian geostatistical analysis were used. The trend of CL cases was elevated from 2014 to 2016 except for 2017 and 2018. Individuals of both genders younger than 20 years old were highly susceptible. Single lesions were more prominent (56%) and frequently affected facial parts (51%). The size and pretreatment duration of the CL lesion was significantly associated. Spatially, a choropleth map displayed the maximum CL incidences in Tehsil Balambat, Khal, and Termergara (31%-13%) located within a range of 948-1947m elevation in the central regions with proximal CL transmissions. Hot spot and cluster and outlier analysis affirmed that Tehsil Khal was the high-risk CL foci. The Bayesian geostatistical analysis revealed high temperature, less altitude, and annual precipitation as important risk factors. An increasing trend in CL transmission has become evident, affecting both genders and <20 years old children. GIS resolute the concealed CL

hubs in the least elevated central regions which warrant the control strategies to restrict future epidemics. Copyright © 2021. Published by Elsevier B.V.
https://dx.doi.org/10.1016/j.actatropica.2021.105861

80. Whitehead J, Smith M, Anderson Y, Zhang Y, Wu S, Maharaj S, et al. **Improving spatial data in health geographics: a practical approach for testing data to measure children's physical activity and food environments using Google Street View**. Int J Health Geogr. 2021;20(1):37.
BACKGROUND: Geographic information systems (GIS) are often used to examine the association between both physical activity and nutrition environments, and children's health. It is often assumed that geospatial datasets are accurate and complete. Furthermore, GIS datasets regularly lack metadata on the temporal specificity. Data is usually provided 'as is', and therefore may be unsuitable for retrospective or longitudinal studies of health outcomes. In this paper we outline a practical approach to both fill gaps in geospatial datasets, and to test their temporal validity. This approach is applied to both district council and open-source datasets in the Taranaki region of Aotearoa New Zealand. METHODS: We used the 'streetview' python script to download historic Google Street View (GSV) images taken between 2012 and 2016 across specific locations in the Taranaki region. Images were reviewed and relevant features were incorporated into GIS datasets. RESULTS: A total of 5166 coordinates with environmental features missing from council datasets were identified. The temporal validity of 402 (49%) environmental features was able to be confirmed from council dataset considered to be 'complete'. A total of 664 (55%) food outlets were identified and temporally validated. CONCLUSIONS: Our research indicates that geospatial datasets are not always complete or temporally valid. We have outlined an approach to test the sensitivity and specificity of GIS datasets using GSV images. A substantial number of features were identified, highlighting the limitations of many GIS datasets.
10.1186/s12942-021-00288-8

81. Wells J, Grant R, Chang J, Kayyali R. **Evaluating the usability and acceptability of a geographical information system (GIS) prototype to visualise socio-economic and public health data**. BMC public health. 2021;21(1):2151.
BACKGROUND: Understanding the impact of socio-economic inequality on health outcomes is arguably more relevant than ever before given the global repercussions of Covid-19. With limited resources, innovative methods to track disease, population needs, and current health and social service provision are essential. To best make use of currently available data, there is an increasing reliance on technology. One approach of interest is the implementation and integration of mapping software. This research aimed to determine the usability and acceptability of a methodology for mapping public health data using GIS technology., METHODS: Prototype multi-layered interactive maps were created demonstrating relationships between socio-economic and health data (vaccination and admission rates). A semi-structured interview schedule was developed, including a validated tool known as the System Usability Scale (SUS), which assessed the usability of the mapping model with five stakeholder (SH) groups. Fifteen interviews were conducted across the 5 SH and analysed using content analysis. A Kruskal-Wallis H test was performed to determine any statistically significant difference for the SUS scores across SH. The acceptability of the model was not affected by the individual use of smart technology among SHs., RESULTS: The mean score from the SUS for the prototype mapping models was 83.17 out of 100, indicating good usability. There was no statistically significant difference in the usability of the maps among SH ($p = 0.094$). Three major themes emerged with respective sub-themes from the interviews including: (1) Barriers to current use of data (2) Design strengths and improvements (3) Multiple benefits and usability of the mapping model., CONCLUSION: Irrespective of variations in demographics or use of smart technology amongst interviewees, there was no significant difference in the usability of the model across the stakeholder groups. The average SUS score for a new system is 68. A score of 83.17 was calculated, indicative of a "good" system, as falling within the top 10% of scores. This study has provided a potential digital model for mapping public health data. Furthermore, it demonstrated the need for such a digital solution, as well as its usability and future utilisation avenues among SH. Copyright © 2021. The Author(s).
https://dx.doi.org/10.1186/s12889-021-12072-1

82. Tseng MH, Wu HC. **Accessibility Assessment of Community Care Resources Using Maximum-Equity Optimization of Supply Capacity Allocation**. Int J Environ Res Public Health. 2021;18(3).
Equity in accessible healthcare is crucial for measuring health equity in community care policy. The most important objective of such a policy in Taiwan is empowering people and communities by improving health literacy and increasing access to healthcare resources. Using the nearest-neighbor two-step floating catchment area method, this study

performed an accessibility assessment for community care resources before and after supply capacity optimization. For the target of maximum equity when allocating community care resources, taking maximum values, mean values and minimum values of the distances into consideration, three analytical allocation solutions for supply capability optimization were derived to further compare disparities in geographical accessibility. Three indicators, namely, the Gini coefficient, median minus mean and mean-squared error, were employed to assess the degree of optimization of geographical accessibility scores at the locations of the demand population and to determine the degree of geographic inequities in the allocation of community care resources. Our study proposed a method in which the minimum value of the distance is adopted as the approximate representation of distances between the service point and the locations of demand to determine the minimum value for supply capacity optimization. The study found that the method can effectively assess inequities in care resource allocation among urban and rural communities.
10.3390/ijerph18031153

83. Shannon J, Reese AM, Ghosh D, Widener MJ, Block DR. **More Than Mapping: Improving Methods for Studying the Geographies of Food Access**. American Journal of Public Health. 2021;111(8):1418-22.
The article explores the use of mapping to analyze food environments. Notable is how these tools can offer geospatial analyses of the location of supermarkets, corner stores, restaurants or food pantries throughout the U.S. Other topics discussed include the limits of maps, how in a society that seeks to be egalitarian, food access is imperative, and the importance of tracking the history of food environments.
10.2105/ajph.2021.306339

84. Sarmiento K, Kuna S, Boudreau E, Atwood C, Pineda L, Thompson W, et al. **Vha's telesleep program improves rural veteran access to sleep care through expansion of telehealth networks**. Sleep. 2021;44(SUPPL 2):A317-A8.
Introduction: Rurality is a known contributor to health disparities, including Sleep medicine. Over 1 million (>350,000 rural, >650,000 non-rural) Veterans who received care from VHA in 2020 have obstructive sleep apnea (OSA). VHA's Office of Rural Health (ORH) TeleSleep Program (FY17-20) aimed to increase access to sleep care for rural veterans by establishing telehealth services at 12 hubs and 63 spokes across the country. The TeleSleep program has three components: (1) Telemedicine; (2) Home Sleep Apnea Testing (HSAT); and (3) REVAMP (Remote Veterans Apnea Management Platform), a webapplication for comprehensive sleep apnea care. Method(s): Each of the three TeleSleep components was evaluated independently using specific metrics. We report here on the impact of leveraging telemedicine to improve access to sleep care. Patient care encounters are defined by VA-specific stop codes and are thus identifiable as telehealth or in-person visits. Data used in the evaluation were obtained from the VA Corporate Data Warehouse. Result(s): During FY20, 33,743 rural Veterans had 74,458 sleep encounters within the TeleSleep network. Visits included in-person care, virtual initial and follow up visits, electronic consultations, asynchronous telehealth (remote monitoring of PAP data and HSAT), remote PAP initiation by video or phone, and email exchanges between patients and providers. Between FY17-20, the number of rural Veterans seen for sleep-related disorders at TeleSleep sites tripled (from 10,702 to 33,743), and the number of encounters for sleep-related disorders more than doubled (from 32,894 to 74,458). In FY20, 72% (up from 53% in FY18) of rural Veterans at the TeleSleep hubs or spokes had at least one virtual sleep visit. This was significantly higher than non- TeleSleep VA sites where only 64% of rural Veterans had virtual visits (72% vs. 64%; $p<0.001$). In addition, the proportion of Veterans who had face-to-face only visits (28% at TeleSleep sites vs. 36% at non- TeleSleep sites; $p<0.001$) indicates that the TeleSleep program was highly successful in promoting virtual (instead of face-to-face) visits. Conclusion(s): The ORH TeleSleep Program has improved access to comprehensive sleep care for rural Veterans by increasing the proportion and type of sleep visits conducted virtually vs. in person.
https://dx.doi.org/10.1093/sleep/zsab072.811

85. Saha P, Paul B. **Identification of potential strategic sites for city planning based on water quality through GIS-AHP-integrated model**. Environmental science and pollution research international. 2021;28(18):23073-86.
Freshwater is one of the most important resources for the ecosystem's sustenance and any nation's development. However, clean water bodies are exploited to cater to urban societies' growing demands and economic expansion. This has led to the scarcity of clean water on the planet since the last decade, which is a crucial environmental concern in the present time. Therefore, proper water quality assessment and better management plan integrated with city planning have become an essential need of the hour to combat the clean water stress problem. This study aims to frame a model

to identify the potential sites suitable for water use and document an effective development plan for a highly industrialized, populated, planned, and critically polluted city. The potential strategic sites were identified based on the impact of water quality on factors such as human health and economy, which are directly linked to drinking, irrigation, fisheries, as well as industrial production. The relative importance of each criterion (weightage) was estimated using the analytical hierarchy process (AHP). The physico-chemical parameters of groundwater and surface water of the strategic locations were analyzed to calculate multi-purpose water quality index (WQI) and Ryznar suitability index (RSI). These indices were interpolated through a geospatial tool and reclassified using a scoring system to a uniform scale. These thematic maps were weighted overlaid through the GIS model builder tool in GIS interface to develop suitability maps through developed potential site index (PSI) of the ground as well as surface water. The final suitability maps were used to identify the potential strategic sites for various uses such as drinking, fishery, irrigation, and industries, which can be considered by the planners for improvising the city planning. Various management practices were also drawn through these maps, which will safeguard human health as well as the environment.
https://dx.doi.org/10.1007/s11356-020-12292-9

86. Rosenblum AJ, Wend CM, Akhtar Z, Rosman L, Freeman JD, Barnett DJ. **Use of Big Data in Disaster Recovery: An Integrative Literature Review**. Disaster medicine and public health preparedness. 2021:1-7.
OBJECTIVE: Disasters of all varieties have been steadily increasing in frequency. Simultaneously, "big data" has seen explosive growth as a tool in business and private industries while opportunities for robust implementation in disaster management remain nascent. To more explicitly ascertain the current status of big data as applied to disaster recovery, we conducted an integrative literature review. METHODS: Eleven databases were searched using iteratively developed keywords to target big data in a disaster recovery context. All studies were dual-screened by title and abstract followed by dual full-text review to determine if they met inclusion criteria. Articles were included if they focused on big data in a disaster recovery setting and were published in the English-language peer-reviewed literature. RESULTS: After removing duplicates, 25,417 articles were originally identified. Following dual title/abstract review and full-text review, 18 studies were included in the final analysis. Among those, 44% were United States-based and 39% focused on hurricane recovery. Qualitative themes emerged surrounding geographic information systems (GIS), social media, and mental health. CONCLUSIONS: Big data is an evolving tool for recovery from disasters. More research, particularly in real-time applied disaster recovery settings, is needed to further expand the knowledge base for future applications.
10.1017/dmp.2021.332

87. Romero L, Carneiro PB, Riley C, Clark H, Uy R, Park M, et al. **Building capacity of community health centers to overcome data challenges with the development of an agile COVID-19 public health registry: a multistate quality improvement effort**. Journal of the American Medical Informatics Association : JAMIA. 2021;29(1):80-8.
OBJECTIVE: During the coronavirus disease 2019 (COVID-19) pandemic, federally qualified health centers rapidly mobilized to provide SARS-CoV-2 testing, COVID-19 care, and vaccination to populations at increased risk for COVID-19 morbidity and mortality. We describe the development of a reusable public health data analytics system for reuse of clinical data to evaluate the health burden, disparities, and impact of COVID-19 on populations served by health centers., MATERIALS AND METHODS: The Multistate Data Strategy engaged project partners to assess public health readiness and COVID-19 data challenges. An infrastructure for data capture and sharing procedures between health centers and public health agencies was developed to support existing capabilities and data capacities to respond to the pandemic., RESULTS: Between August 2020 and March 2021, project partners evaluated their data capture and sharing capabilities and reported challenges and preliminary data. Major interoperability challenges included poorly aligned federal, state, and local reporting requirements, lack of unique patient identifiers, lack of access to pharmacy, claims and laboratory data, missing data, and proprietary data standards and extraction methods., DISCUSSION: Efforts to access and align project partners' existing health systems data infrastructure in the context of the pandemic highlighted complex interoperability challenges. These challenges remain significant barriers to real-time data analytics and efforts to improve health outcomes and mitigate inequities through data-driven responses., CONCLUSION: The reusable public health data analytics system created in the Multistate Data Strategy can be adapted and scaled for other health center networks to facilitate data aggregation and dashboards for public health, organizational planning, and quality improvement and can inform local, state, and national COVID-19 response efforts. Copyright Published by Oxford University Press on behalf of the American Medical Informatics Association 2021. This work is written by US Government employees and is in the public domain in the US.

https://dx.doi.org/10.1093/jamia/ocab233

88. Pouey J, Galey C, Chesneau J, Jones G, Franques N, Beaudeau P, et al. **Implementation of a national waterborne disease outbreak surveillance system: Overview and preliminary results, France, 2010 to 2019**. Eurosurveillance. 2021;26(34):2001466.
Background: Waterborne disease outbreaks (WBDO) associated with tap water consumption are probably underestimated in France. Aim(s): In order to improve their detection, Sante publique France launched a surveillance system in 2019, based on the periodical analysis of health insurance data for medicalised acute gastroenteritis (mAGE). Method(s): Spatio-temporal cluster detection methods were applied to mAGE cases to prioritise clusters for further investigation. These investigations determined the plausibility that infection is of waterborne origin and the strength of association. Result(s): Between January 2010 and December 2019, 3,323 priority clusters were detected (53,878 excess mAGE cases). They involved 3,717 drinking water supply zones (WSZ), 15.4% of all French WSZ. One third of these WSZ (33.4%; n = 1,242 WSZ) were linked to repeated clusters. Moreover, our system detected 79% of WBDO voluntarily notified to health authorities. Conclusion(s): Environmental investigations of detected clusters are necessary to determine the plausibility that infection is of waterborne origin. Consequently, they contribute to identifying which WSZ are linked to clusters and for which specific actions are needed to avoid future outbreaks. The surveillance system incorporates three priority elements: linking environmental investigations with water safety plan management, promoting the systematic use of rainfall data to assess waterborne origin, and focusing on repeat clusters. In the absence of an alternative clear hypothesis, the occurrence of a mAGE cluster in a territory completely matching a distribution zone indicates a high plausibility of water origin.Copyright © 2021 European Centre for Disease Prevention and Control (ECDC). All rights reserved.
https://dx.doi.org/10.2807/1560-7917.ES.2021.26.34.2001466

89. Possantti I, Silva T. **Technological Hazard Vulnerability: A GIS-Based Approach for Supporting Environmental Zoning**. Integrated environmental assessment and management. 2021;17(2):445-54.
Technological hazard assessments are extremely rare in Brazil, despite their importance for planning. Aquatic systems are of particular concern, since they are the endpoint of every process occurring in the watershed, including technological disasters. Thus, our goal is to map the technological hazard vulnerability in lagoon systems though a geographic information systems (GIS) model. The technological hazard vulnerability model consists of the spatial overlapping of technological pressure and fragility, having environmental systems as spatial units. The methodology was applied to the lagoon systems of the Rio Grande do Sul State, Southern Brazil, as a case study. The very high vulnerability of the Northern Guaiba Lake is due to the high concentration of technological infrastructures combined with high fragilities of wetland systems. In the Patos Lagoon Estuary, highly vulnerable systems consist mostly in shallow waters. The Mirim Lagoon was less vulnerable compared to other systems, due to a much smaller occurrence of elements of technological pressure. The proposed methodology allowed for the identification of environmental systems particularly vulnerable to technological hazards, where management efforts must be more intense. The results were used for the Ecological-Economic Zoning of the Rio Grande do Sul, as well as to revise the water quality framework of the Patos Lagoon estuary, currently underway. Integr Environ Assess Manag 2021;17:445-454. © 2020 SETAC. Copyright © 2020 SETAC.
https://dx.doi.org/10.1002/ieam.4339

90. Pool J, Akhlaghpour S, Fatehi F. **Health Data Privacy in the COVID-19 Pandemic Context: Discourses on HIPAA**. Studies in health technology and informatics. 2021;279:70-7.
BACKGROUND: Considering the impacts of the COVID-19 pandemic on health service delivery, the US Office for Civil Rights (OCR) updated the policies on health data processing, and Health Insurance Portability and Accountability Act (HIPAA)., OBJECTIVES: In this study, we investigated discourses on HIPAA in relation to COVID-19., METHODS: Through a search of media sources in the Factiva database, relevant texts were identified. We applied a text mining approach to identify concepts and themes in these texts., RESULTS: Our analysis revealed six central themes, namely, Health, HIPAA, Privacy, Security, Patients, and Need, as well as their associated concepts. Among these, Health was the most frequently discussed theme. It comprised concepts such as public, care, emergency, providers, telehealth, entity, use, discretion, OCR, Health and Human Services (HHS), enforcement, business, and services., CONCLUSION: Our discourse analysis of media outlets highlights the role of health data privacy law in the response to global public health emergencies and

demonstrates how discourse analysis and computational methods can inform health data protection policymaking in the digital health era.
https://dx.doi.org/10.3233/SHTI210091

91. Park YS, McMorris BJ, Pruinelli L, Song Y, Kaas MJ, Wyman JF. **Use of Geographic Information Systems to Explore Associations between Neighborhood Attributes and Mental Health Outcomes in Adults: A Systematic Review**. International journal of environmental research and public health. 2021;18(16).
BACKGROUND: Neighborhood attributes are increasingly recognized as factors shaping mental health in adults. Geographic information systems (GIS) offer an innovative approach for quantifying neighborhood attributes and studying their influence on mental health outcomes. Our aim was to describe GIS applications used in neighborhood-related mental health research and how neighborhood attributes are related to depressive symptoms or psychological distress in community-residing adults. METHODS: We conducted a systematic review of studies published in English that included GIS techniques and a validated questionnaire of depressive symptoms or psychological distress. Medline, PsycInfo, Embase, Scopus, CINAHL, GEOBASE, and Compedex were searched to June 2020. Study quality was assessed by a modification of the Joanna Briggs Institute's Checklist for Analytical Cross-sectional Studies. RESULTS: Thirty-two studies met the inclusion criteria. Studies varied in definitions of neighborhood and GIS-derived measurements of neighborhood attributes. Neighborhood attributes were significantly associated with mental health outcomes, although findings were not consistent. Moderating factors (e.g., gender, living conditions) significantly influenced depressive symptoms or psychological distress. CONCLUSION: Neighborhood attributes are important factors influencing mental health in adults. Consensus may be needed on how to standardize the neighborhood unit or GIS-derived measures of neighborhoods in order to explain depression or psychological distress in diverse adult populations.
10.3390/ijerph18168597

92. Olusola JA, Shote AA, Isaifan RJ, Ouigmane A. **The impact of COVID-19 pandemic on nitrogen dioxide levels in Nigeria**. PeerJ. 2021;9:11387.
The Coronavirus disease (COVID-19) has been transmitted worldwide over a very short time after it originated in China in December 2019. In an attempt to control its spread and reduce its health impacts, several countries including those in the African continent imposed restrictive measures that was termed "lockdown". The outcomes of this lockdown have been reported to be beneficial to air quality worldwide. The main objective of this study is to assess the impact of lockdown due to COVID-19 on nitrogen dioxide (NO_2) levels over six major cities in Nigeria. Maps extracted from satellite (Sentinel-5P) were used to indicate the significant reduction in the level of NO_2 in the selected cities in Nigeria during two time-intervals, pre-lockdown (December, 2019) and during lockdown (April, 2020). The results show a significant reduction in NO_2 levels during the lockdown period compared with its levels during the pre-lockdown period in 2019. The reduction in NO_2 concentration levels during lockdown is likely due to less traffic, social distancing and restrictions on business and human activities. There could be an element of uncertainty in the results due to seasonality, as the comparison is done with a different season. However, the magnitude of change due to lockdown is probably much higher than the seasonal variability. Although COVID-19 has negatively impacted the health and economic status of all regions worldwide, it has benefited some aspects of air quality in most countries including Nigeria. This indicates that anthropogenic activities may be managed to reduce air pollution and positively impact the health of human beings.
https://dx.doi.org/10.7717/peerj.11387

93. Northeim K, Marks C, Tiwari C. **Evaluating spatial patterns of seasonal ozone exposure and incidence of respiratory emergency room visits in Dallas-Fort Worth**. PeerJ. 2021;9:e11066.
Background: In urban environments, environmental air pollution poses significant risks to respiratory health. Moreover, the seasonal spatial variability of the air pollutant ozone, and respiratory illness within Dallas-Fort Worth (DFW) is not well understood. We examine the relationships between spatial patterns of long-term ozone exposure and respiratory illness to better understand impacts on health outcomes. We propose that this study will establish an enhanced understanding of the spatio-temporal characteristics of ozone concentrations and respiratory emergency room visits (ERV) incidence. Method(s): Air pollution data (ozone) and ERV incidence data from DFW was used to evaluate the relationships between exposures and outcomes using three steps: (1) develop a geostatistical model to produce quarterly maps of ozone exposure for the DFW area; (2) use spatial analysis techniques to identify clusters of zip codes

with high or low values of ozone exposure and respiratory ERV incidence; and (3) use concentration-response curves to evaluate the relationships between respiratory ERV incidence and ozone exposure. Result(s): Respiratory ERV incidence was highest in quarters 1 and 4, while ozone exposure was highest in quarters 2 and 3. Extensive statistically significant spatial clusters of ozone regions were identified. Although the maps revealed that there was no regional association between the spatial patterns of high respiratory ERV incidence and ozone exposure, the concentration-response analysis suggests that lower levels of ozone exposure may still contribute to adverse respiratory outcomes.
https://dx.doi.org/10.7717/peerj.11066

94. Nayak PP, Pai JB, Singla N, Somayaji KS, Kalra D. **Geographic Information Systems in Spatial Epidemiology: Unveiling New Horizons in Dental Public Health**. Journal of International Society of Preventive & Community Dentistry. 2021;11(2):125-31.
OBJECTIVES: Research on the role of environment and place in various aspects of dental public health using geographic information systems (GIS) is escalating rapidly. Yet, the understanding of GIS and the analytical tools that it offers are still vaguely understood. This narrative review therefore draws from the utilization of GIS in the dental public health research. MATERIALS AND METHODS: Electronic databases such as Google Scholar, PUBMED, and Scopus were searched using terms "spatial epidemiology," "GIS," "geographic information systems," "health geography," "environment public health tracking," "spatial distribution," "disease mapping," "geographic correlation studies," "cartography," "big data," and "disease clustering" through December 2019. RESULTS: This review builds upon the prospects of GIS application in various aspects of dental public health. Studies were classified as: (1) GIS for mapping of disease, population at risk, and risk factors; (2) GIS in geographic correlation studies; (3) GIS for gauging healthcare accessibility and spatial distribution of healthcare providers. We also identified the commonly used GIS analytical techniques in oral epidemiology. CONCLUSIONS: We anticipate that this review will spur advancement in the utilization of spatial analytical techniques and GIS in the dental public health research.
10.4103/jispcd.JISPCD_413_20

95. Monteith S, Glenn T, Geddes J, Severus E, Whybrow PC, Bauer M. **Internet of things issues related to psychiatry**. International Journal of Bipolar Disorders. 2021;9(1):11.
Background: Internet of Things (IoT) devices for remote monitoring, diagnosis, and treatment are widely viewed as an important future direction for medicine, including for bipolar disorder and other mental illness. The number of smart, connected devices is expanding rapidly. IoT devices are being introduced in all aspects of everyday life, including devices in the home and wearables on the body. IoT devices are increasingly used in psychiatric research, and in the future may help to detect emotional reactions, mood states, stress, and cognitive abilities. This narrative review discusses some of the important fundamental issues related to the rapid growth of IoT devices. Main body: Articles were searched between December 2019 and February 2020. Topics discussed include background on the growth of IoT, the security, safety and privacy issues related to IoT devices, and the new roles in the IoT economy for manufacturers, patients, and healthcare organizations. Conclusion(s): The use of IoT devices will increase throughout psychiatry. The scale, complexity and passive nature of data collection with IoT devices presents unique challenges related to security, privacy and personal safety. While the IoT offers many potential benefits, there are risks associated with IoT devices, and from the connectivity between patients, healthcare providers, and device makers. Security, privacy and personal safety issues related to IoT devices are changing the roles of manufacturers, patients, physicians and healthcare IT organizations. Effective and safe use of IoT devices in psychiatry requires an understanding of these changes.
https://dx.doi.org/10.1186/s40345-020-00216-y

96. Middleton J, Zafar H, Reddy A, Martin C, Thompson R, Swift A, et al. **Effect of UK COVID-19 public health measures on activity and quality of life in patients with pulmonary arterial hypertension**. Heart. 2021;107(SUPPL 1):A91.
Background Limitation of activity and restriction of movement have been widely, and effectively, enforced to reduce COVID- 19 transmission. Physical activity is however a critical measure in the prevention of cardiovascular disease. Pulmonary arterial hypertension (PAH) is a devastating, disease driven by small vessel vascular remodeling, leading to right heart failure. Exercise capacity relates to clinical outcomes and exercise training improves key indicators of

cardiopulmonary function. Here, we describe the temporal effects of UK government restriction measures on daily activity, heart rate and quality-of-life (QoL) in patients with PAH. Methods From November 2019 to March 2020 patients were enrolled into the arrhythmia sub-study of The UK National Cohort Study of Idiopathic and Heritable PAH (REC:13/EE/ 0203) and implanted with insertable cardiac monitors. Daily heart rate, heart rate variability and activity were transmitted remotely. Standard questionnaires were administered remotely to assess QoL (EmPHasis-10), anxiety (GAD-7) and depression (PHQ-9). Results Median age of the 26 patients implanted with insertable cardiac monitors was 49 years, 23(88%) were female and 5(19%) had heritable PAH with mutations in BMPR2. At enrolment 10(38.5%) patients were low risk (<5% 1-year mortality), 10(38.5%) were intermediate risk (5-10%) and 6 (23%) were high risk (>10%). The mean duration from insertion to census date was 21.1weeks+/-5.7. No complications were reported. Completeness of remote monitoring data was 100%. Following lockdown, mean activity was reduced (3.16vrs 2.68hours, -0.48 hours, 95%CI -0.27-0.69, 16%, p<0.0001). During the period April 14th to 23rd QoL was reduced (26(18-38)vrs 32 (17-47), p<0.01) and anxiety (1(0- 9)vrs 10 (5-18), p<0.001) and depression scores increased (3 (1-16)vrs 11 (3-17), p<0.001) compared to pre-lockdown levels. The observed increase in depression scores persisted to the census date (3(1-16)vrs 11(8-17), p<0.01). No change in day or night heart rate, or heart rate variability, was observed and no patients developed COVID-19. Conclusion In this cohort of patients with idiopathic and heritable PAH, UK protective health measures were effective in preventing COVID-19 in patients thought to be vulnerable. However, these protective measures resulted in reduced daily activity and QoL and were associated increased anxiety and depression indicators. Patients may decondition through periods of reduced activity. This may have implications for riskassessment and endpoint adjudication in clinical studies, both of which use measures of exercise capacity.
https://dx.doi.org/10.1136/heartjnl-2021-BCS.118

97. Maqsood F, Al-Matrafi M, Al-Muaither N. **Ocular parameters evaluation in relation to the refractive error using optical coherence topography**. Journal of Clinical and Diagnostic Research. 2021;15(3):NC01-NC4.
Introduction: The increasing prevalence of myopia has become a major public health impact due to its potentially blinding ocular complications. This study was done to evaluate the choroidal and retinal thickness, depth of the anterior chamber and the curvature of the cornea using 3D Optical Coherence Topography (OCT) and Optical Coherence Biometry instrument (Zeiss IOLMaster 700) among Saudi female adults with emmetropia, low and moderate myopia. Aim(s): To evaluate the choroidal thickness, foveal retinal thickness, depth of anterior chamber, Axial Length (AL) and curvature of the cornea between myopic and emmetropic individuals. Material(s) and Method(s): This cross-sectional study was done in the female section of Department of Optometry, College of Applied Medical Science, King Saud University (KSU), Riyadh, in Saudi Arabia. Hundred and four eyes of healthy females between the ages of 19-26 years who fulfilled the inclusion criteria were selected. There was no gender preference; only female subjects were included because this study was done in the female college. The subjects were categorised into emmetropic groups (Spherical Equivalent (SE) <= -0.25 D), mild myopic groups (SE between -0.50 to -3.00 D) and moderate myopic groups (SE between -3.00 to -6.00 D). The foveal retinal and subfoveal choroidal thickness was measured using 3D OCT, however AL, Anterior Chamber Depth (ACD) and corneal radius were measured using IOL master. Result(s): The foveal retinal thickness of moderate myopia (205.55+/-15.35 mum) was found the same as in emmetropia (204.12+/-15.44 mum) and mild group (204.64+/-14.29 mum) with p>0.05. The significant difference was not found in the subfoveal choroidal thickness between these three groups. The mean AL of moderate myopia (25.03+/-0.75 mm) was significantly higher than mild myopia (23.99+/-0.74 mm) and emmetropia group (23.15+/-0.98 mm). There was highly significant difference in the ACD between the emmetropic and myopic groups. However, no significant difference was observed in the mean of corneal radius (K-reading) among the three groups (p>0.05). The corneal radius in total myopic eyes had a weak negative correlation with the AL. Conclusion(s): This study demonstrated that the foveal retinal and subfoveal choroidal thickness did not differ significantly in emmetropic and myopic groups. Also, positive correlation was noted between the ACD and AL. Pearson's correlation coefficient (r) in ACD and AL for emmetropic group was found 0.28 and 0.48 for the moderate myopic group.
https://dx.doi.org/10.7860/JCDR/2021/46099.14592

98. Macharia PM, Joseph NK, Sartorius B, Snow RW, Okiro EA. **Subnational estimates of factors associated with under-five mortality in Kenya: a spatio-temporal analysis, 1993-2014**. BMJ global health. 2021;6(4).
BACKGROUND: To improve child survival, it is necessary to describe and understand the spatial and temporal variation of factors associated with child survival beyond national aggregates, anchored at decentralised health planning units.

Therefore, we aimed to provide subnational estimates of factors associated with child survival while elucidating areas of progress, stagnation and decline in Kenya., METHODS: Twenty household surveys and three population censuses conducted since 1989 were assembled and spatially aligned to 47 subnational Kenyan county boundaries. Bayesian spatio-temporal Gaussian process regression models accounting for inadequate sample size and spatio-temporal relatedness were fitted for 43 factors at county level between 1993 and 2014., RESULTS: Nationally, the coverage and prevalence were highly variable with 38 factors recording an improvement. The absolute percentage change (1993-2014) was heterogeneous ranging between 1% and 898%. At the county level, the estimates varied across space and over time with a majority showing improvements after 2008 which was preceded by a period of deterioration (late-1990 to early-2000). Counties in Northern Kenya were consistently observed to have lower coverage of interventions and remained disadvantaged in 2014 while areas around Central Kenya had and historically have had higher coverage across all intervention domains. Most factors in Western and South-East Kenya recorded moderate intervention coverage although having a high infection prevalence of both HIV and malaria., CONCLUSION: The heterogeneous estimates necessitates prioritisation of the marginalised counties to achieve health equity and improve child survival uniformly across the country. Efforts are required to narrow the gap between counties across all the drivers of child survival. The generated estimates will facilitate improved benchmarking and establish a baseline for monitoring child development goals at subnational level.
https://dx.doi.org/10.1136/bmjgh-2020-004544

99. Li M, Liu Z, Zhang M, Chen Y. **A workflow for spatio-seasonal hydro-chemical analysis using multivariate statistical techniques**. Water research. 2021;188:116550.
Multivariate statistical techniques are powerful in data interpretation and pattern recognition, which play a vital role in pollutant source identification for water environment management. Despite of their wide application in hydro-chemical analysis, absence of a comprehensive workflow hinders the practices and further studies. The present study constructed a workflow on the application of multivariate statistical techniques in spatio-seasonal hydro-chemical analysis, which provided a basic guidance for practices and a systematic support to future exploration. Selection of the methods and work paths for spatio-seasonal analysis largely depends on the structure of data set and the requirements of specific tasks. Trial and adjustment could be repeatedly performed to optimize the analysis strategy and identify more underlying patterns. Given a multiscale dataset concerning complex spatio-seasonal variations, temporal or spatial grouping using appropriate methods to reasonably divide the complicated data set contributes to data interpretation and pattern recognition. The upper Yangtze River basin (UYRB, China) was employed for case analysis to demonstrate how the workflow guides an efficient and effective data exploration. Efforts could be made in future works to continually improve the workflow to involve more complicated analysis and techniques and the integrated application in various fields.
https://dx.doi.org/10.1016/j.watres.2020.116550

100. Lee K-H, Bae M-S. **Integration of air quality model with GIS for the monitoring of PM2.5 from local primary emission at a rural site**. Environmental monitoring and assessment. 2021;193(10):682.
Local primary emissions of air pollutants are responsible for public health, decreasing productivity, and cultural activities in local residential areas. In this study, an integrated air quality observation and modeling system with a geographical information system (GIS) was developed to characterize the air pollution caused by local primary emission sources. This integrated system could provide air quality monitoring, data analysis, and visualization results that reflect air pollutant concentration data in a study area containing a local rural village (LRV) and an asphalt manufacturing facility (AMF). Additionally, the model was used to estimate the contributions of air quality from an emission source at the receptor and determine the control factor for the emission rate or meteorological changes. From the forward and backward modeling results, we found that the concentrations of particulate matter smaller than 2.5 mum (PM2.5) concentrations in the village were affected by the unique meteorological and emission conditions. The PM2.5 concentration was significantly increased for the cases with a slow wind speed of 1 m/s or high wind speed of 3 m/s, with an emission rate of 10 g/s. The contribution of AMF emissions was explained by contribution factor analysis. During the study period of December 2014-December 2015, the incoming contribution of PM2.5 at the LRV measurement station was approximately 47.6%. These results suggest that the proposed method can be useful for understanding adverse air

quality conditions and estimating the emissions of air pollutants from primary sources for local environmental and public health authorities. Copyright © 2021. The Author(s), under exclusive licence to Springer Nature Switzerland AG.
https://dx.doi.org/10.1007/s10661-021-09461-9

101. Lagoun AM, Bouzid-Lagha S, Bendjaballah-Lalaoui N, Saibi H. **Geographic information system-based approach and statistical modeling for assessing nitrate distribution in the Mitidja aquifer, Northern Algeria**. Environmental monitoring and assessment. 2021;193(10):631.
The Mitidja alluvial aquifer in northern Algeria is an important drinking, industrial, and agricultural water source. Unfortunately, nitrate contamination has led to a decrease in water quality in several areas that benefit from this source. This study employed geographic information system and statistical modeling methods to evaluate the origin, evolution, and spatiotemporal distribution of groundwater nitrate in the aquifer and investigate the influence of different hydrogeological parameters on its extent. Control points were established across various regions of the Mitidja groundwater aquifer. A total of 1185 nitrate concentrations were measured at 316 sampling points between June 1985 and May 2015. The results showed variable rates, with the 50 mg/L nitrate consumption limit exceeded in 423 samples at 84 observation points. Statistical modeling showed that nitrate concentration was related to groundwater characteristics (aquifer nature, water table depth, and thickness of saturated zone) and human activities (land use, agricultural practices, and population density). Analysis of the nitrate distribution showed that the eastern and western watersheds experienced the greatest contamination. The significant nitrate concentrations in the eastern area were correlated with urban contamination, including uncontrolled urbanization, high population density, and industrial activity, while the primary origin of nitrate in the western area was correlated with agricultural activity, particularly fertilizers. The findings of this study can aid local government and water agencies in the development and implementation of regulations to help mitigate increases in nitrate concentrations. Copyright © 2021. The Author(s), under exclusive licence to Springer Nature Switzerland AG.
https://dx.doi.org/10.1007/s10661-021-09427-x

102. Kulikowski C, Maojo VM. **COVID-19 pandemic and artificial intelligence: challenges of ethical bias and trustworthy reliable reproducibility?** BMJ health & care informatics. 2021;28(1).

https://dx.doi.org/10.1136/bmjhci-2021-100438

103. Ibrahim N, Gibson J, Ali S, Dobbs T, Whitaker IS. **Is poor quality non-melanoma skin cancer data affecting high quality research and patient care?** Journal of plastic, reconstructive & aesthetic surgery : JPRAS. 2021;74(6):1355-401.

https://dx.doi.org/10.1016/j.bjps.2020.12.036

104. Haji M, Karuppannan S, Qin D, Shube H, Kawo NS. **Potential Human Health Risks Due to Groundwater Fluoride Contamination: A Case Study Using Multi-techniques Approaches (GWQI, FPI, GIS, HHRA) in Bilate River Basin of Southern Main Ethiopian Rift, Ethiopia**. Archives of environmental contamination and toxicology. 2021;80(1):277-93.
The main focus of the present research was to examine the appropriateness of groundwater resources for drinking purposes in the Bilate River Basin of Southern Main Ethiopian Rift, Ethiopia. The groundwater quality index (GWQI), fluoride pollution index (FPI), and human health risk were used to examine the human health risk factors associated with the intake of high fluoride groundwater. For this purpose, 29 groundwater samples were collected from the existing wells and were analyzed for various physicochemical parameters. The dominant cation was Na+, followed by Ca2+, Mg2+, and K+. The dominant anion was HCO3-, followed by Cl-, SO42-, and F-. The Gibbs plot shows that rock-water interactions are the dominant factor controlling the groundwater chemistry. By using the GWQI, the quality of groundwater samples was 31% excellent, 21% good, 31% poor, and 17% very poor. The fluoride concentration in groundwater ranges from 0.2 to 5.60 mg/L (mean, 2.10 mg/L). 59% (i.e., 17 wells) of the groundwater samples were not suitable for drinking, because they surpassed the drinking water quality limit of 1.5 mg/L. The remaining 41% (i.e., 12 wells) of the samples were suitable for drinking. The FPI indicates that 51.72% of the wells were highly polluted by fluoride. The noncarcinogenic health risk varies from 0.75 to 8.44 for children (83%), 0.34-3.84 for women (62%), and 0.27-3.01 for men (52%), which indicates that children are at higher health risk than women and men due to the physiological condition and the rates of ingestion.

https://dx.doi.org/10.1007/s00244-020-00802-2

105. Gupta D, Ranjan RK, Parthasarathy P, Ansari A. **Spatial and seasonal variability in the water chemistry of Kabar Tal wetland (Ramsar site), Bihar, India: multivariate statistical techniques and GIS approach**. Water science and technology : a journal of the International Association on Water Pollution Research. 2021;83(9):2100-17.
This study was performed to evaluate the spatial and temporal distribution of major ions in water samples of a newly designated Ramsar site, namely Kabar Tal (KT) wetland of Bihar. Samples were collected during summer, monsoon, and winter seasons. The analytical and GIS results show that concentration of electrical conductivity, chloride, and nitrate are higher in summer than monsoon and winter. However, the concentration of major cations such as sodium, potassium, calcium, and magnesium are higher in winter than monsoon and summer. In addition, major anions like sulphate and phosphate concentration is higher during monsoon than summer and winter. Multivariate statistical tool (discriminant analysis) results suggest that temperature, pH, electrical conductivity, sulphate, and potassium are the major parameters distinguishing the water quality in different seasons. The study confirms that seasonal variations are playing a major role in the hydrochemistry of KT wetland. Overall, this work outlines the approach towards proper conservation and utilization of wetlands and to assess the quality of surface water for determining its suitability for agricultural purposes. Overall, this work highlights the approach towards estimating the seasonal dynamics of chemical species in KT wetland and its suitability for irrigation purposes.
https://dx.doi.org/10.2166/wst.2021.115

106. Forsius M, Kujala H, Minunno F, Holmberg M, Leikola N, Mikkonen N, et al. **Developing a spatially explicit modelling and evaluation framework for integrated carbon sequestration and biodiversity conservation: Application in southern Finland**. Science of the Total Environment. 2021;775:145847.
The challenges posed by climate change and biodiversity loss are deeply interconnected. Successful co-managing of these tangled drivers requires innovative methods that can prioritize and target management actions against multiple criteria, while also enabling cost-effective land use planning and impact scenario assessment. This paper synthesises the development and application of an integrated multidisciplinary modelling and evaluation framework for carbon and biodiversity in forest systems. By analysing and spatio-temporally modelling carbon processes and biodiversity elements, we determine an optimal solution for their co-management in the study landscape. We also describe how advanced Earth Observation measurements can be used to enhance mapping and monitoring of biodiversity and ecosystem processes. The scenarios used for the dynamic models were based on official Finnish policy goals for forest management and climate change mitigation. The development and testing of the system were executed in a large region in southern Finland (Kokemaenjoki basin, 27,024 km2) containing highly instrumented LTER (Long-Term Ecosystem Research) stations; these LTER data sources were complemented by fieldwork, remote sensing and national data bases. In the study area, estimated total net emissions were currently 4.2 TgCO2eq a-1, but modelling of forestry measures and anthropogenic emission reductions demonstrated that it would be possible to achieve the stated policy goal of carbon neutrality by low forest harvest intensity. We show how this policy-relevant information can be further utilized for optimal allocation of set-aside forest areas for nature conservation, which would significantly contribute to preserving both biodiversity and carbon values in the region. Biodiversity gain in the area could be increased without a loss of carbon-related benefits.
https://dx.doi.org/10.1016/j.scitotenv.2021.145847

107. Fernandes ACP, Terencio DPS, Pacheco FAL, Fernandes LFS. **A combined GIS-MCDA approach to prioritize stream water quality interventions, based on the contamination risk and intervention complexity**. The Science of the total environment. 2021;798:149322.
Water management decisions are complex ever since they are dependent on adopted politics, social objectives, environmental impacts, and economic determinants. To adequately address hydric resources issues, it is crucial to rely on scientific data and models guiding decision-makers. The present study brings a new methodology, consisting of a combined GIS-MCDA, to prioritize catchments that require environmental interventions to improve surface water quality. A Portuguese catchment, Ave River Basin, was selected to test this methodology due to the low water quality. First, it was calculated the contamination risk of each catchment, based on a GIS-MCDA using point source pressures, landscape metrics, and diffuse emissions as criteria. This analysis was compared to local data of ecological and chemical status through ANOVA and the Tukey test. The results showed the efficiency of the method since the contamination risk

was lower for catchments under a good status and higher in catchments with a lower classification. In a second task, it was calculated the intervention complexity using a different GIS-MCDA. For this approach, it was chosen five criteria that condition environmental interventions, population density, slope, percentage of burned areas, Strahler order, and the number of effluent discharge sites. Both multicriteria methods were combined in a graphical analysis to rank the catchments intervention priority, subdividing the prioritization into four categories from 1st to 4th, giving a higher preference for catchments with high contamination risk and low intervention complexity. As a result, catchments with a good status were dominantly placed under low intervention priority, and catchments with a lower ecological status were classified as a high priority, 1st and 2nd. In total, 248 catchments were spatially ranked, which is an essential finding for decision-makers, that are willing to safeguard the catchment water quality.
https://dx.doi.org/10.1016/j.scitotenv.2021.149322

108. Ensley R, Hansen RD, Morales-Aguilar C, Thompson J. **Geomorphology of the Mirador-Calakmul Karst Basin: A GIS-based approach to hydrogeologic mapping**. PloS one. 2021;16(8):e0255496.
This paper classifies the karst landscapes of the Peten Plateau and defines the Mirador-Calakmul Karst Basin by illustrating the distribution of its karst hydrologic features. Archaeological and spatial research of the Mirador-Calakmul area of Guatemala and Mexico has shown it to be a karst basin with geopolitical implications. Current research characterizes the karst landscapes of the Peten Plateau, maps the distribution of karst hydrologic features, and delineates the basin in geomorphological terms. To further this aim, multiple forms of remote sensing data including orthophotographs, a satellite Digital Elevation Model, satellite multispectral images, and Light Detection and Ranging (LiDAR) data have been integrated to interpret the karst features in the study area. Outcrop study and thin section analysis of the upper Buena Vista Formation document that the dominant lithologies are a shallow water algal boundstone interbedded with terrestrial caliche. Karst landforms have been mapped over the Peten Plateau and we identify five karst landscapes, the largest of which is a fluviokarst landscape dominated by karst valleys. We further map karst hydrologic features including seasonal swamps, dolines, intermittent lakes, intermittent streams, solution-enhanced fractures, and springs all of which are characteristic of drainage basins. Boundaries of the karst basin are mapped from multiple lines of evidence including distribution of the karst valleys, a line of springs along the western boundary of the fluviokarst landscape, and a surface drainage analysis. We capture and classify hydrologic data points and develop a regional groundwater map that indicates subsurface flow from east to west within the basin. A drainage map illustrates the extensive system of karst valleys, boundaries, and inferred groundwater flow paths of the Mirador-Calakmul Karst Basin. It was within this geomorphological setting that the ancient Maya developed an extensive civilization during the Middle and Late Preclassic periods (1000 BCE-150 CE).
https://dx.doi.org/10.1371/journal.pone.0255496

109. Eltarabily MG, Moghazy HEM. **GIS-based evaluation and statistical determination of groundwater geochemistry for potential irrigation use in El Moghra, Egypt**. Environmental monitoring and assessment. 2021;193(5):306.
The El Moghra area is located in northwestern Egypt in the Western Desert. It is classified as the first priority of the national project to reclaim 1.50 million feddan of Egypt's desert lands. Groundwater quality assessment of the El Moghra aquifer is essential because irrigation water requirements in the El Moghra area depend solely on groundwater. A geochemistry analysis was conducted for 230,000 feddans from forty-six groundwater samples collected during the drilling process of deep wells in year 2018 and 2019. Our study's main objective is to determine whether the groundwater in the El Moghra aquifer is suitable for irrigation use. ArcGIS was used to prepare the geospatial distribution maps of major elements. Hydrochemical characteristics and groundwater types were identified from descriptive analyses of groundwater samples. Multivariate statistical analysis was run using SPSS; correlation coefficients were first determined; then, a correlation matrix was generated. Principal component analysis was performed and a covariance matrix with varimax rotation was produced. Results revealed the alkalinity and the high salinity of groundwater in the project study area. Most of the samples had a total hardness greater than 300 mg/l. Sodium chloride (Na-Cl) is the dominant type for groundwater samples. The mechanism controlling groundwater chemistry depends on rock weathering. Principal component analysis results showed that two eigenvectors among ten have a 72.86% contribution to the cumulative variance. The higher TDS values (14,008 mg/l) confirm the ions release when the upward groundwater flow from the lower Nubian Sandstone aquifer system to the upper quaternary aquifer occurs.

Additionally, the geospatial maps of ion distribution showed that the frequent release of minerals happens in the northwestern part of the project study area: the eastern Qattara Depression. A perfect correlation between sodium and chloride distributions was obtained, and it is identical to the electrical conductivity distribution as well. Our study recommends very salt-tolerant crops as canola, barley, quinoa, and jojoba to be planted in the project area. Drought-tolerant crops as Barbary fig and Jatropha are also recommended. Applying irrigation water frequently with short intervals between irrigations to avoid soil drying and surface clusters' formation, as well as enhance leeching of salts away from the root systems, is essential.
https://dx.doi.org/10.1007/s10661-021-09058-2

110. Elmeknassi M, El Mandour A, Elgettafi M, Himi M, Tijani R, El Khantouri FA, et al. **A GIS-based approach for geospatial modeling of groundwater vulnerability and pollution risk mapping in Bou-Areg and Gareb aquifers, northeastern Morocco**. Environmental science and pollution research international. 2021;28(37):51612-31.
Groundwater resources are the main supply of freshwater for human activities. Nevertheless, during the last 50 years, groundwater has become very susceptible to chemical pollution due to human activities. The groundwater vulnerability assessment constitutes a worldwide recognized tool for water management and protection. In this study, the GIS-based DRASTIC and pollution risk models have been used to assess the intrinsic vulnerability and risk to pollution of the Gareb and Bou-Areg aquifers, the main irrigated areas in the northeast of Morocco, by analyzing available hydrogeological attributes. The seven hydrogeologic factors used to assess vulnerability were depth to aquifer, net recharge, aquifer media, soil media, topography, impact of the vadose zone, and hydraulic conductivity, while an eighth parameter has been added to assess the pollution risk which is the land use. The resultant vulnerability map reveals that about 0.06% of the study area is in low vulnerability zones, 83.68% is moderately vulnerable, and 16.26% is highly vulnerable to groundwater pollution. The results also reveal that groundwater is highly vulnerable in the Gareb aquifer and the coastal zone, where the water table is very low, the slope is gentle, and the geological formations are permeable. In addition, moderate to low vulnerability is found towards the west of the study area where the groundwater is located in deep aquifers. The groundwater pollution risk map is obtained by overlaying the land use with the DRASTIC vulnerability. The central and western parts of Bou-Areg as well as the south of Gareb are dominated by high and very high pollution risk classes, and present 43.07% of the study area, which is strongly influenced by urban areas, agricultural activities, and shallow groundwater systems. 30.11% of the surface is moderately vulnerable, mainly in areas where human activity is not widely observed, while the very low and low pollution risk classes represent a total of 26.82% of the total area. The mapping models were validated using nitrate concentration and electrical conductivity data in groundwater as an indicator of pollution. A positive correlation was observed when validating these models. The resultant groundwater vulnerability and pollution risk maps might provide an early warning to policy maker and manager to manage and avoid further stress on this invaluable resource.
https://dx.doi.org/10.1007/s11356-021-14336-0

111. Chen J, Sharifi R, Khan MSS, Islam F, Bhat JA, Kui L, et al. **Wheat Microbiome: Structure, Dynamics, and Role in Improving Performance Under Stress Environments**. Frontiers in Microbiology. 2021;12:821546.
Wheat is an important cereal crop species consumed globally. The growing global population demands a rapid and sustainable growth of agricultural systems. The development of genetically efficient wheat varieties has solved the global demand for wheat to a greater extent. The use of chemical substances for pathogen control and chemical fertilizers for enhanced agronomic traits also proved advantageous but at the cost of environmental health. An efficient alternative environment-friendly strategy would be the use of beneficial microorganisms growing on plants, which have the potential of controlling plant pathogens as well as enhancing the host plant's water and mineral availability and absorption along with conferring tolerance to different stresses. Therefore, a thorough understanding of plant-microbe interaction, identification of beneficial microbes and their roles, and finally harnessing their beneficial functions to enhance sustainable agriculture without altering the environmental quality is appealing. The wheat microbiome shows prominent variations with the developmental stage, tissue type, environmental conditions, genotype, and age of the plant. A diverse array of bacterial and fungal classes, genera, and species was found to be associated with stems, leaves, roots, seeds, spikes, and rhizospheres, etc., which play a beneficial role in wheat. Harnessing the beneficial aspect of these microbes is a promising method for enhancing the performance of wheat under different environmental stresses.

This review focuses on the microbiomes associated with wheat, their spatio-temporal dynamics, and their involvement in mitigating biotic and abiotic stresses.Copyright © 2022 Chen, Sharifi, Khan, Islam, Bhat, Kui and Majeed.
https://dx.doi.org/10.3389/fmicb.2021.821546

112. Chen D, Wang J, Ruan W, Ni Q, Helal S. **Enabling cost-effective population health monitoring by exploiting spatiotemporal correlation**. ACM Transactions on Computing for Healthcare. 2021;2(2):2637-8051.
Because of its important role in health policy-shaping, population health monitoring (PHM) is considered a fundamental block for public health services. However, traditional public health data collection approaches, such as clinic-visit-based data integration or health surveys, could be very costly and time-consuming. To address this challenge, this article proposes a cost-effective approach called Compressive Population Health (CPH), where a subset of a given area is selected in terms of regions within the area for data collection in the traditional way, while leveraging inherent spatial correlations of neighboring regions to perform data inference for the rest of the area. By alternating selected regions longitudinally, this approach can validate and correct previously assessed spatial correlations. To verify whether the idea of CPH is feasible, we conduct an in-depth study based on spatiotemporal morbidity rates of chronic diseases in more than 500 regions around London for over 10 years. We introduce our CPH approach and present three extensive analytical studies. The first confirms that significant spatiotemporal correlations do exist. In the second study, by deploying multiple state-of-The-Art data recovery algorithms, we verify that these spatiotemporal correlations can be leveraged to do data inference accurately using only a small number of samples. Finally, we compare different methods for region selection for traditional data collection and show how such methods can further reduce the overall cost while maintaining high PHM quality.Copyright © 2021 ACM.
https://dx.doi.org/10.1145/3428665

113. Brown JA, Ferdinands AR, Prowse R, Reynard D, Raine KD, Nykiforuk CIJ. **Seeing the food swamp for the weeds: Moving beyond food retail mix in evaluating young people's food environments**. SSM - Population Health. 2021;14:100803.
Nutritional health of children and youth is an increasing cause for concern in Canada. Through food and beverage messaging in multiple environments, young people develop eating behaviours with ramifications throughout their life course. Unhealthy food retailers near schools, recreation facilities, and childcare centres-key activity settings for healthy eating promotion-present repeated, compounding exposures to commercial geomarketing. Geomarketing impacts nutritional health by promoting highly processed, calorie-dense, and nutrient-poor foods and beverages across urban landscapes. While food retail mix (as a ratio of healthy to unhealthy food retailers) can be used to assess food environments at multiple scales, such measures may misrepresent young people's unique experience of these geographic phenomena. Moving beyond uniform conceptualization of food environments, new research methods and tools are needed for children and youth. We investigated young people's food environments in the major Canadian cities of Calgary and Edmonton. Using government-initiated nutrition guidelines, we categorized 55.8% of all food retailers in Calgary, and 59.9% in Edmonton as 'unhealthy'. A Bernoulli trial at the 0.05 alpha level indicated few differences in prevalence proximal to activity settings versus elsewhere in both cities, demonstrating the limited applicability of food retail mix for characterizing young people's food environments. To model unhealthy food retailers geomarketing to children and youth, we considered their proximity to multiple activity settings, using overlapping radial buffers at the 250 m, 500 m, 1000 m, and 1500 m scales. Examining young people's food environments relative to the spaces where they learn and play, we determined that as many as 895 out of 2663 unhealthy food retailers fell within 1500 m of 21+ activity settings. By conceptualizing, measuring, and problematizing these "super-proximal" unhealthy food retailers, urban planners and public health researchers can use these techniques to pinpoint unhealthy food retailers, or "weeds in the food swamp," as a critical site for healthy eating promotion in municipalities.Copyright © 2021.
https://dx.doi.org/10.1016/j.ssmph.2021.100803

114. Broday GA, Kluthcovsky ACGC. **INFANT MORTALITY AND FAMILY HEALTH STRATEGY IN THE 3RD HEALTH REGIONAL OF PARANA, FROM 2005 TO 2016**. Revista paulista de pediatria : orgao oficial da Sociedade de Pediatria de Sao Paulo. 2021;40:e2020122.
OBJECTIVE: To analyze the temporal trend in infant mortality and in populational coverage by the Family Health Strategy and associated factors with infant mortality in the municipalities of the 3rd Health Regional of Parana, Southern Brazil., METHODS: Ecological time series study, with data from the Mortality Information System (Sistema de Informacao Sobre

Mortalidade - SIM), the Live Birth Information System (Sistema de Informacao Sobre Nascidos Vivos - SINASC) and the Support Room for Strategic Management (Sala de Apoio a Gestao Estrategica - SAGE), from 2005 to 2016. Trends were calculated using polynomial regression. The associated factors with infant mortality were maternal, perinatal and obstetric variables. The significance level adopted was 5%., RESULTS: Between 2005 and 2016, there were 115,796 births and 1,575 deaths of children under 1 year of age. Considering the municipalities together, the populational coverage by the Family Health Strategy went from 43.8% in 2005 to 66.4% in 2016 and the infant mortality from 17.1/1,000 live births in 2005 to 10.7/1,000 live births in 2016. The trend over time of populational coverage by the Family Health Strategy was crescent and of infant mortality was decrescent, for most municipalities. The factors associated with greater chances of death in children under 1 year of age were preterm gestational age (Odds Ratio - OR=15.05; 95% confidence interval - 95CI% 13.54-16.72), low birth weight (OR=15.14; 95%CI 13.61-16.84), multiple gestation (OR=4.51; 95%CI 3.74-5.45) and mother with up to 7 years of study (OR=1.93; 95%CI 1.74-2.14)., CONCLUSIONS: Crescent trend in coverage by the Family Health Strategy was accompanied by a decrescent trend in infant mortality. The results can be a source of information for the strengthening of mother-child health actions, considering local and regional specificities.
https://dx.doi.org/10.1590/1984-0462/2022/40/2020122

115. Bourouhou I, Salmoun F. **Sea water quality monitoring using remote sensing techniques: a case study in Tangier-Ksar Sghir coastline**. Environmental monitoring and assessment. 2021;193(9):557.
Water quality is an extremely important factor as it affects the ecological balance of ecosystems and the development of the social and economic wellbeing of the countries bordering it. Remote sensing multiconcept helps to understand the natural environment, managing water resources and assessing water pollution on local and regional levels. Landsat 8 data were used to monitor coastal water quality in the region of Tangier-Ksar Sghir. The main purpose of the current study is to establish a mathematical relationship between the amount of light emitted from the water bodies and the measured water parameters. The results permit to create a spatial distribution maps for the water quality parameters. The present work study three water parameters: total suspended solids (TSS), dissolved oxygen (DO), and total dissolved sediments (TDS). Thirty-four sampling points were used to represent water parameters measurements along the coastline. The 75% of the in situ measurements were used to build the statistical models by using the spectral characteristics obtained from the sensors, while the remaining 25% were used for testing the accuracy of the developed equations. For the correlation analysis and the regression development, the Statistical Package of the Social Sciences (SPSS) software was used. The final results of the statistical analysis showed a high correlation between the calculated data and the observed ones with $R2 > 0.713$ and p value < 0.001. The obtained values showed a high accuracy as well (RMSE ranging between 0.23 and 0.69 and SEE ranging between 0.01 and 0.47). SNAP software and Qgis were used to do the image processing and to create the spatial distribution maps for the water parameters in the coastline of Tangier-Ksar Sghir region.
https://dx.doi.org/10.1007/s10661-021-09242-4

116. Bhamra MK, Naqvi W. **A study protocol for checking efficacy of microsoft kinect azure for evaluation of spatial parameters of gait in normal healthy population**. Indian Journal of Forensic Medicine and Toxicology. 2021;15(1):1728-31.
Introduction: In healthy population, spatial parameters of gait such as stride length and step length are frequently linked with gait cycle but can be obstructive, time taking and difficult to measure. This study is to check theefficacy of kinect azure for evaluating of spatial parameters of gait in normal healthy population. Kinect is accurate, unobstructive, low cost clinical gait analysis systems have many uses like diagnosis, monitoring, management and rehabilitation. Method(s): The research has been designed as an observational study.The total of 132 participants will be taken from AVBRH, sawangi Meghe for study as per exclusion and inclusion criteria.With intervention the span of the study will be 6 months. It holds single period, concurrent validity evaluation comparing spatial gait parameters derived from the Kinect system. Discussion(s): This study protocol aims to assess the efficacy of Microsoft kinect azure for evaluation of spatial parameters of gait.The study's expected outcome will concentrate on the evaluation of the usability of kinect to assess spatial gait on healthy individuals.
https://dx.doi.org/10.37506/ijfmt.v15i1.13659

117. Bartlett L, Avery L, Ponnappan P, Chelangat J, Cheruiyot J, Matthews R, et al. **Insights into the design, development and implementation of a novel digital health tool for skilled birth attendants to support quality maternity care in Kenya**. Family medicine and community health. 2021;9(3).

https://dx.doi.org/10.1136/fmch-2020-000845

118. Badlowski GA, Adolf JE, Fouad G. **Spatial analysis of water quality parameters in Hilo Bay, Hawai'i, using a combination of interpolated surfaces and hot spot analysis**. Environmental monitoring and assessment. 2021;193(3):118.
Hilo Bay estuary, located on the northeastern side of Hawai'i Island, experiences variability in water quality parameters due to its numerous water inputs. This estuary experiences influxes of water from three sources: groundwater to the east, marine water from the north, and surface water from the Wailuku River to the west. High rainfall and river flow impacts Hilo Bay's water quality including salinity, turbidity, and chlorophyll a concentration. Here, maps of Hilo Bay water quality were examined to assess spatial patterns of these important parameters. Exploring the patterns of these water quality parameters by creating inverse distance weighted (IDW) interpolation surfaces of survey points and clusters based on hot spot analyses during low- and high-flow conditions showed statistically significant differences in spatial water quality in Hilo Bay. Water quality maps after a storm show (1) an overall decrease in salinity, (2) a river plume from the Wailuku River associated with a turbidity hot spot, and (3) a chlorophyll a hot spot offset from the river plume in the center of the bay. Using spatial analysis to analyze water quality throughout the entirety of Hilo Bay before and after storm events can lead to a better understanding of how this ecosystem is affected during these types of events, and furthermore, adopting this method of sampling and analysis allows for a greater representation of water quality all over the bay and can improve the monitoring of water quality in this important ecosystem.
https://dx.doi.org/10.1007/s10661-021-08894-6

119. Badker R, Miller K, Pardee C, Oppenheim B, Stephenson N, Ash B, et al. **Challenges in reported COVID-19 data: Best practices and recommendations for future epidemics**. BMJ Global Health. 2021;6(5):e005542.
The proliferation of composite data sources tracking the COVID-19 pandemic emphasises the need for such databases during large-scale infectious disease events as well as the potential pitfalls due to the challenges of combining disparate data sources. Multiple organisations have attempted to standardise the compilation of disparate data from multiple sources during the COVID-19 pandemic. However, each composite data source can use a different approach to compile data and address data issues with varying results. We discuss some best practices for researchers endeavouring to create such compilations while discussing three key categories of challenges: (1) data dissemination, which includes discrepant estimates and varying data structures due to multiple agencies and reporting sources generating public health statistics on the same event; (2) data elements, such as date formats and location names, lack standardisation, and differing spatial and temporal resolutions often create challenges when combining sources; and (3) epidemiological factors, including missing data, reporting lags, retrospective data corrections and changes to case definitions that cannot easily be addressed by the data compiler but must be kept in mind when reviewing the data. Efforts to reform the global health data ecosystem should bear such challenges in mind. Standards and best practices should be developed and incorporated to yield more robust, transparent and interoperable data. Since no standards exist yet, we have highlighted key challenges in creating a comprehensive spatiotemporal view of outbreaks from multiple, often discrepant, reporting sources and provided guidelines to address them. In general, we caution against an over-reliance on fully automated systems for integrating surveillance data and strongly advise that epidemiological experts remain engaged in the process of data assessment, integration, validation and interpretation to identify, diagnose and resolve data challenges.Copyright © Author(s) (or their employer(s)) 2021. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.
https://dx.doi.org/10.1136/bmjgh-2021-005542

120. Azareh A, Sardooi ER, Gholami H, Mosavi A, Shahdadi A, Barkhori S. **Detection and prediction of lake degradation using landscape metrics and remote sensing dataset**. Environmental science and pollution research international. 2021;28(21):27283-98.
Monitoring changes in natural ecosystems is considered essential to natural resource management. Despite the global importance of the lakes' quality monitoring, there is currently a research gap in the simultaneous predictive modeling of

lakes' land-use changes and ecosystem measurements. In the present study for projecting the water bodies of lakes and their surrounding ecosystems, the land-use changes and the landscape analysis of different periods, i.e., 1987, 2002, 2018, and 2030, are studied using remote sensing data and various metrics. The trend of land-use and landscape changes is projected for 2030. The results indicate significant degradation of rangelands and forests due to the conversion to agriculture and construction and the declining trend of lakes' water body and their transformation to salt lake and salt lands. The increase of agricultural lands and the overuse of groundwater wells upstream of the lakes could be one of the reasons for this decline. Decreasing the lakes' water body and subsequently increasing salt lands are considered a severe threat to human health and the ecosystem services of the lakes. Besides, the dust generated by salt lands could also decrease crop yield in the study area.
https://dx.doi.org/10.1007/s11356-021-12522-8

121. Awad SF, Musuka G, Mukandavire Z, Froass D, Mackinnon NJ, Cuadros DF. **Implementation of a vaccination program based on epidemic geospatial attributes: Covid-19 pandemic in ohio as a case study and proof of concept**. Vaccines. 2021;9(11):1242.
Geospatial vaccine uptake is a critical factor in designing strategies that maximize the population-level impact of a vaccination program. This study uses an innovative spatiotemporal model to assess the impact of vaccination distribution strategies based on disease geospatial attributes and population-level risk assessment. For proof of concept, we adapted a spatially explicit COVID-19 model to investigate a hypothetical geospatial targeting of COVID-19 vaccine rollout in Ohio, United States, at the early phase of COVID-19 pandemic. The population-level deterministic compartmental model, incorporating spatial-geographic components at the county level, was formulated using a set of differential equations stratifying the population according to vaccination status and disease epidemiological characteristics. Three different hypothetical scenarios focusing on geographical sub-population targeting (areas with high versus low infection intensity) were investigated. Our results suggest that a vaccine program that distributes vaccines equally across the entire state effectively averts infections and hospitalizations (2954 and 165 cases, respectively). However, in a context with equitable vaccine allocation, the number of COVID-19 cases in high infection intensity areas will remain high; the cumulative number of cases remained >30,000 cases. A vaccine program that initially targets high infection intensity areas has the most significant impact in reducing new COVID-19 cases and infection-related hospitalizations (3756 and 213 infections, respectively). Our approach demonstrates the importance of factoring geospatial attributes to the design and implementation of vaccination programs in a context with limited resources during the early stage of the vaccine rollout.
https://dx.doi.org/10.3390/vaccines9111242

122. Aravinthasamy P, Karunanidhi D, Subramani T, Roy PD. **Demarcation of groundwater quality domains using GIS for best agricultural practices in the drought-prone Shanmuganadhi River basin of South India**. Environmental science and pollution research international. 2021;28(15):18423-35.
A study was conducted to evaluate the suitability of groundwater in the drought-prone Shanmuganadhi River basin of south India for best agricultural practices since the surface water that exists in this basin is not sufficient to meet out the demand. As the quality of groundwater is not uniform in the hard rock aquifers of this basin, the work was carried out to demarcate the suitable groundwater quality zones for the agricultural activities. Sixty-one groundwater samples were collected and analyzed for various parameters such as electrical conductivity (EC), pH, TDS, major cations (Ca2+, Mg2+, Na+, and K+) and anions (Cl-, SO42-, HCO3-, PO43-, NO3-, and F-). To demarcate the feasible zones for agricultural practices, irrigation water quality parameters like EC, sodium adsorption ratio (SAR), percent sodium (Na %), residual sodium carbonate (RSC), magnesium hazard ratio (MHR), Kelly's ratio (KR), and permeability index (PI) were computed. Furthermore, the irrigation water quality representation diagrams like USSL, Wilcox, and Doneen were prepared, and their outputs were spatially plotted using the Geographical Information System (GIS) to identify the suitability domains of groundwater for irrigational practices. Interpretation of irrigation water quality parameters and diagrams indicate that 2% of groundwater samples represented "low" salinity, 26% of samples represented "medium" salinity, 66% of samples represented "high" salinity, and 6% of samples represented "very high" salinity. Similarly, about 59% of samples represented the low alkaline/sodium category and 41% of them represented the medium alkaline category. The USSL output shows that about 2% of samples of the basin signified "low salinity with low alkalinity" category (C1S1), 28% of samples signified the "medium salinity with low alkalinity" category (C2S1), 33% of samples signified "high salinity with

low alkalinity" category (C3S1), 28% of samples signified the "high salinity with medium alkalinity" category (C3S2), and 10% of samples signified the "very high salinity with medium alkalinity" category (C4S2). Groundwater is suitable for irrigation in 277.52 km2 area of the basin. It is moderately suitable in an area of 318.46 km2 and poorly suitable over 38.64 km2. This study recommends that groundwater with moderate suitability could only be used for irrigating permeable soils and for cultivating salt-tolerant crops. The addition of gypsum to soil might be helpful to increase the infiltration capacity and osmotic activity. However, poorly suitable area should be avoided for agricultural practices.
https://dx.doi.org/10.1007/s11356-020-08518-5

123. Araiza-Aguilar JA, Cram-Heydrich S, Ruiz-Rivera N, Oropeza-Orozco O, Fernandez-Lomelin MDP, Rojas-Valencia MN. **GIS-based approach to zoning the risk associated with municipal solid waste management: application to regional scale**. Environmental monitoring and assessment. 2021;193(2):69.
The objective of this paper is to offer an approach to assess the risk associated with Municipal Solid Wastes, in a geospatial context. Initially, a risk index including hazard, vulnerability and other important variables was built. The built model is based on multi-criteria evaluation techniques and geographic information systems. Subsequently, the constructed index was used to model possible damage in various municipalities of the state of Chiapas, Mexico. The results indicate that the highest levels of risk are found in places with unfavorable conditions, such as high rates of waste generation, low waste collection coverage, steep slopes, etc. that cover 6.22% of the study area. The areas with high risk level are mainly found in the southeast of the municipalities of Villa Corzo and Villaflores, and cover 27.06% of the study area. The places of low and very low risk levels are concentrated in the center and northeast of the study area, in the municipalities of Suchiapa, Chiapa de Corzo and Acala, and cover 38.6% of the area. At the municipal level, Berriozabal, Villaflores and Villa Corzo have the highest levels of risk in most of their territory; the high levels of risk presented in Berriozabal are due to the limited territorial area that it occupies in the study area. In Villaflores and Villa Corzo, the high levels of risk are due to the high population dispersion. A large part of Tuxtla Gutierrez territory presents low and medium risk levels, especially within the population settlement. The peripheral areas show the highest levels of risk, because the waste collection service is not provided very often. Finally, the Cohen's kappa statistic used to validate the precision of the model gave a value of 0.34, which means that the spatial model can be considered acceptable despite its low value. Although this work is only a general approach to spatial risk modeling at a regional scale, it provides interesting information. Moreover, it adds to the few efforts that exist in the literature to model the risk associated with wastes.
https://dx.doi.org/10.1007/s10661-021-08864-y

124. Albiero G, Santucci L, Carol E. **Assessment of Acid Sulfate Drainage in an Environmental Liability Associated with an Ancient Sulfuric Acid Industry in a Sector of the Rio de la Plata Coastal Plain: Impacts On Soil And Water Quality**. Water, Air, and Soil Pollution. 2021;232(4):150.
Environmental liabilities have become one of the most important problems at environmental level, especially those located in urban areas. Within the area of the Rio de la Plata coastal plain, industrial waste abandoned by an ancient sulfuric acid industry in a sector of the petrochemical center constitutes an environmental liability composed mainly of fragments of native sulfur. The aim of this work is to evaluate, from laboratory tests, the generation of sulfate acid drainage in environmental liabilities associated with the ancient sulfuric acid industry in order to identify the waste spatial distribution and to determine the impacts that they impart on the quality of the soil and groundwater. The results obtained show that the native sulfur scattered in the environmental liability associated with the ancient sulfuric acid industry constitutes a potential source of sulfated acid drainage that locally affects the soil, groundwater, and underground structures of the industrial center, and also small adjacent ecosystems. The interaction between native sulfur and the rainwater causes the oxidation of the native sulfur releasing protons and sulfates, which reach the groundwater through the infiltration water process, generating the acidification of the environment. The results provide useful draft for the management of environmental liabilities, and also the monitoring data obtained could assist in prioritization of remediation options, which constitute a problem of relevance and whose regulations for management and mitigation are still a controversial issue.
https://dx.doi.org/10.1007/s11270-021-05107-1

125. Zhang Y, Tayarani M, Al'Aref SJ, Beecy AN, Liu Y, Sholle E, et al. **Using electronic health records for population health sciences: A case study to evaluate the associations between changes in left ventricular ejection fraction and the built environment**. JAMIA Open. 2020;3(3):386-94.
Objective: Electronic health record (EHR) data linked with address-based metrics using geographic information systems (GIS) are emerging data sources in population health studies. This study examined this approach through a case study on the associations between changes in ejection fraction (EF) and the built environment among heart failure (HF) patients. Material(s) and Method(s): We identified 1287 HF patients with at least 2 left ventricular EF measurements that are minimally 1 year apart. EHR data were obtained at an academic medical center in New York for patients who visited between 2012 and 2017. Longitudinal clinical information was linked with address-based built environment metrics related to transportation, air quality, land use, and accessibility by GIS. The primary outcome is the increase in the severity of EF categories. Statistical analyses were performed using mixed-effects models, including a subgroup analysis of patients who initially had normal EF measurements. Result(s): Previously reported effects from the built environment among HF patients were identified. Increased daily nitrogen dioxide concentration was associated with the outcome while controlling for known HF risk factors including sex, comorbidities, and medication usage. In the subgroup analysis, the outcome was significantly associated with decreased distance to subway stops and increased distance to parks. Conclusion(s): Population health studies using EHR data may drive efficient hypothesis generation and enable novel information technology-based interventions. The availability of more precise outcome measurements and home locations, and frequent collection of individual-level social determinants of health may further drive the use of EHR data in population health studies.
https://dx.doi.org/10.1093/JAMIAOPEN/OOAA038

126. Yalvac S. **Validating InSAR-SBAS results by means of different GNSS analysis techniques in medium- and high-grade deformation areas**. Environmental monitoring and assessment. 2020;192(2):120.
This study aimed to validate the interferometric synthetic aperture radar (InSAR) method by using relative and absolute Global Navigation Satellite System (GNSS) techniques. In this context, two land subsidence areas, one high (Mexico City) and one medium (Aguascalientes), were monitored between 2014 and 2018 by using Sentinel 1A satellite data. The monitoring was carried out with the Small Baseline Subset (SBAS) technique using 46 images for Mexico City and 18 images for Aguascalientes. Concordantly, the GNSS Continuously Operating Reference Station (CORS) data in the regions were analyzed with relative and Precise Point Positioning (PPP) GNSS analysis techniques. The time series obtained from three different analyses were compared and the results were evaluated in light of statistical criteria. According to the results, it is determined that the InSAR-SBAS technique can vary up to +/- 20 mm from the displacement values obtained from GNSS due to various noise sources. Such deviations were limited to a few samples, and in general the differentiations were reasonable in the range of 7-8 mm. The difference between the deformation velocity estimation results obtained from the three different methods varied between 3 and 10 mm/year. In this context, these findings suggest that the InSAR-SBAS technique is an effective method for monitoring land deformation with the accuracy of sub-centimeter decided. In addition, PPP which has become an increasingly popular technique showed fast and reliable results in the range of 5-10 mm for InSAR verification. Moreover, with this study, most current results for Mexico City, which is the world's fastest subsiding metropole, were achieved. In the central region of the city, the detected 300 mm/year of subsidence rate was updated as 370 mm/year. In addition, Aguascalientes was monitored by using the Sentinel 1A satellite mission for the first time in this study. The 60 mm/year subsidence rate obtained for Aguascalientes in previous studies was updated and it was estimated that there are zones where this rate reaches up to - 115 mm/year levels. In this regard, it was concluded that the deformation rate has increased for both regions since the previous monitoring studies.
https://dx.doi.org/10.1007/s10661-019-8009-8

127. Xiong Y, Ran Y, Zhao S, Zhao H, Tian Q. **Remotely assessing and monitoring coastal and inland water quality in China: Progress, challenges and outlook**. Critical Reviews in Environmental Science and Technology. 2020;50(12):1266-302.
China faces increasingly serious water scarcity due to the uneven distribution of available water resources, rapid economic development, and water pollution. The current war on water pollution by the Chinese government requires nationwide water quality information at high spatiotemporal resolution that can be obtained by only remote sensing (RS) methods. However, it is challenging to remotely retrieve such information from turbid Case-2 waters. This paper

reviews four aspects of the major achievements in remotely sensed coastal and inland water quality in China. Specifically, achievements in atmospheric correction prior to water quality retrieval, progress in water-related sensor design, developments (improvements) to existing Case-2 water algorithms, and advances in oil spill and harmful algal bloom monitoring. Major challenges are identified, including: 1) a large mismatch exists between the water quality information required and RS datasets due to a lack of professional inland water sensors; 2) planned monitoring and field experiments for studying the optical properties of inland waters are scarce; and 3) RS of urban black odorous waters and international rivers is of great urgency. This review may provide scientific guidelines for obtaining information about coastal and inland waters and assist water resource managers and aquatic ecologists in controlling water pollution.
https://dx.doi.org/10.1080/10643389.2019.1656511

128. Wirth FN, Johns M, Meurers T, Prasser F. **Citizen-Centered Mobile Health Apps Collecting Individual-Level Spatial Data for Infectious Disease Management: Scoping Review**. JMIR mHealth and uHealth. 2020;8(11):e22594.
BACKGROUND: The novel coronavirus SARS-CoV-2 rapidly spread around the world, causing the disease COVID-19. To contain the virus, much hope is placed on participatory surveillance using mobile apps, such as automated digital contact tracing, but broad adoption is an important prerequisite for associated interventions to be effective. Data protection aspects are a critical factor for adoption, and privacy risks of solutions developed often need to be balanced against their functionalities. This is reflected by an intensive discussion in the public and the scientific community about privacy-preserving approaches., OBJECTIVE: Our aim is to inform the current discussions and to support the development of solutions providing an optimal balance between privacy protection and pandemic control. To this end, we present a systematic analysis of existing literature on citizen-centered surveillance solutions collecting individual-level spatial data. Our main hypothesis is that there are dependencies between the following dimensions: the use cases supported, the technology used to collect spatial data, the specific diseases focused on, and data protection measures implemented., METHODS: We searched PubMed and IEEE Xplore with a search string combining terms from the area of infectious disease management with terms describing spatial surveillance technologies to identify studies published between 2010 and 2020. After a two-step eligibility assessment process, 27 articles were selected for the final analysis. We collected data on the four dimensions described as well as metadata, which we then analyzed by calculating univariate and bivariate frequency distributions., RESULTS: We identified four different use cases, which focused on individual surveillance and public health (most common: digital contact tracing). We found that the solutions described were highly specialized, with 89% (24/27) of the articles covering one use case only. Moreover, we identified eight different technologies used for collecting spatial data (most common: GPS receivers) and five different diseases covered (most common: COVID-19). Finally, we also identified six different data protection measures (most common: pseudonymization). As hypothesized, we identified relationships between the dimensions. We found that for highly infectious diseases such as COVID-19 the most common use case was contact tracing, typically based on Bluetooth technology. For managing vector-borne diseases, use cases require absolute positions, which are typically measured using GPS. Absolute spatial locations are also important for further use cases relevant to the management of other infectious diseases., CONCLUSIONS: We see a large potential for future solutions supporting multiple use cases by combining different technologies (eg, Bluetooth and GPS). For this to be successful, however, adequate privacy-protection measures must be implemented. Technologies currently used in this context can probably not offer enough protection. We, therefore, recommend that future solutions should consider the use of modern privacy-enhancing techniques (eg, from the area of secure multiparty computing and differential privacy).
https://dx.doi.org/10.2196/22594

129. Wei X, Chang NB, Bai K, Gao W. **Satellite remote sensing of aerosol optical depth: advances, challenges, and perspectives**. Critical Reviews in Environmental Science and Technology. 2020;50(16):1640-725.
Aerosol optical depth (AOD) is widely recognized as a critical indicator in understanding atmospheric physics and regional air quality because of its capability for quantifying aerosol loading in the atmosphere. Retrieving AOD from space-borne sensors' observations has become the primary technique for monitoring aerosol loading on a large scale. There is currently a renewed interest in designing new satellite sensors and developing more advanced retrieval algorithms to measure AOD from space in order to better quantify concentrations of particulate matters (PMs) for

advanced air quality management, environmental health assessment, and climate change studies. However, retrieving high-resolution AOD at varying scales is still a challenging task due to the low signal-to-noise ratio in sensing, algorithmic synthesis constraints, downscaling issues, and data gaps resulting from adverse impacts such as cloud contamination. Current state-of-the-art technologies still do not permit delicate urban-scale environmental health studies based on appropriate AOD-PMs relationships. This review paper provides a holistic view of the major advances in AOD measurements, elucidates the limitations of current AOD products, presents the challenges with respect to the derivation of high-resolution AOD, and highlights perspectives regarding the possible improvements of satellite-based AOD estimation. (Figure presented.).Copyright © 2019, © 2019 Taylor & Francis Group, LLC.
https://dx.doi.org/10.1080/10643389.2019.1665944

130. Wang S, Ding S, Xiong L. **A New System for Surveillance and Digital Contact Tracing for COVID-19: Spatiotemporal Reporting Over Network and GPS**. JMIR mHealth and uHealth. 2020;8(6):e19457.
The current pandemic of the coronavirus disease (COVID-19) has highlighted the importance of rapid control of the transmission of infectious diseases. This is particularly important for COVID-19, where many individuals are asymptomatic or have only mild symptoms but can still spread the disease. Current systems for controlling transmission rely on patients to report their symptoms to medical professionals and be able to recall and trace all their contacts from the previous few days. This is unrealistic in the modern world. However, existing smartphone-based GPS and social media technology may provide a suitable alternative. We, therefore, developed a mini-program within the app WeChat. This analyzes data from all users and traces close contacts of all patients. This permits early tracing and quarantine of potential sources of infection. Data from the mini-program can also be merged with other data to predict epidemic trends, calculate individual and population risks, and provide recommendations for individual and population protection action. It may also improve our understanding of how the disease spreads. However, there are a number of unresolved questions about the use of smartphone data for health surveillance, including how to protect individual privacy and provide safeguards against data breaches. Copyright ©Shaoxiong Wang, Shuizi Ding, Li Xiong. Originally published in JMIR mHealth and uHealth (http://mhealth.jmir.org), 10.06.2020.
https://dx.doi.org/10.2196/19457

131. Wang F. **Why Public Health Needs GIS: A Methodological Overview**. Ann GIS. 2020;26(1):1-12.
The short paper provides an overview on how geographic issues have become increasingly relevant to public health research and policy, particularly through the lens of geographic information systems (GIS). It covers six themes with an emphasis on methodological issues. (1) Our health-related behavior varies across geographic settings, so should public health policy. (2) Facilities (supply) and patients (demand) in a health care market interact with each other across geopolitical borders, and measures of health care accessibility need to capture that. (3) Our health outcome is the result of joint effects of individual attributes and neighborhood characteristics, and an adequate definition of neighborhood is critical for assessing neighborhood effect. (4) Disease rates in areas of small population are unreliable, and one effective way to mitigate the problem is to construct a larger, internally-homogenous and comparable area unit. (5) Defining a scientific geographic unit for health care market is critical for researchers, practitioners, and policy makers to evaluate health care delivery, and GIS enables us to define the unit (e.g., primary care service areas, hospital service areas, and cancer service areas) automatically, efficiently and optimally. (6) Aside from various optimization objectives around "efficiency", it is as important to plan the location and allocation of health care resources toward maximum equality in health care access. Case studies are cited to illustrate each theme.
10.1080/19475683.2019.1702099

132. Wang F. **Why Public Health Needs GIS: A Methodological Overview**. Annals of GIS. 2020;26(1):1-12.
The short paper provides an overview on how geographic issues have become increasingly relevant to public health research and policy, particularly through the lens of geographic information systems (GIS). It covers six themes with an emphasis on methodological issues. (1) Our health-related behavior varies across geographic settings, so should public health policy. (2) Facilities (supply) and patients (demand) in a health care market interact with each other across geopolitical borders, and measures of health care accessibility need to capture that. (3) Our health outcome is the result of joint effects of individual attributes and neighborhood characteristics, and an adequate definition of neighborhood is critical for assessing neighborhood effect. (4) Disease rates in areas of small population are unreliable, and one effective way to mitigate the problem is to construct a larger, internally-homogenous and comparable area unit. (5) Defining a

scientific geographic unit for health care market is critical for researchers, practitioners, and policy makers to evaluate health care delivery, and GIS enables us to define the unit (e.g., primary care service areas, hospital service areas, and cancer service areas) automatically, efficiently and optimally. (6) Aside from various optimization objectives around "efficiency", it is as important to plan the location and allocation of health care resources toward maximum equality in health care access. Case studies are cited to illustrate each theme.
https://dx.doi.org/10.1080/19475683.2019.1702099

133. Valiente R, Escobar F, Pearce J, Bilal U, Franco M, Sureda X. **Estimating and mapping cigarette butt littering in urban environments: A GIS approach**. Environmental research. 2020;183:109142.
BACKGROUND: Cigarette butts are some of the most common form of litter in the World, causing severe environmental damage. Analysing spatial distribution of cigarette butts in the urban environment may lead to useful insights for further interventions to reduce this form of litter. In this study, we present a GIS-based methodology to estimate the density of cigarette butts across a large urban area., METHODS: We collected information about discarded cigarette butts in outdoor public spaces by systematic social observation in a diverse sample of areas in Madrid, Spain. We used these data to estimate the density of cigarette butts in public spaces around the entire city by performing GIS analyses based on Kernel Density Estimations. Last, we validated these measures using on-field observations in a set of locations across the city., RESULTS: Hospitality venues and public transportation stops were the places with the highest concentrations of cigarette butts, followed by the entrances to educational venues and playgrounds. Central districts showed the highest amount of cigarette butts in contrast to peripheral ones. We found that our measure had good validity, with a correlation coefficient of 0.784., DISCUSSION: This is the first study estimating and mapping cigarette butt litter in a large urban area. We identified a set of outdoor public places with high concentrations of cigarette butts and found geographical unevenness in the distribution of this pervasive form of litter across the study area. Our findings demonstrate the ubiquitous nature of cigarette butts in the urban environment and the need for interventions to reduce its impact on both people's health and the environment.
https://dx.doi.org/10.1016/j.envres.2020.109142

134. Valderrama-Landeros L, Blanco Y Correa M, Flores-Verdugo F, Alvarez-Sanchez LF, Flores-de-Santiago F. **Spatiotemporal shoreline dynamics of Marismas Nacionales, Pacific coast of Mexico, based on a remote sensing and GIS mapping approach**. Environmental monitoring and assessment. 2020;192(2):123.
Within the last few decades, tropical coastal systems such as beaches, dunes, and mangrove forests have experienced high annual rates of loss worldwide due to natural and anthropogenic impacts. Historical remote sensing data have been used to map and monitor these fragile systems, as well as to track specific events through time. The purpose of this study was to examine coastal trends along Marismas Nacionales in Mexico, which is the largest wetland complex of the western coast of the Pacific Ocean. The opening of the Cuautla Canal in 1976 and the construction of several hydroelectric power dams have severely impacted this wetland system. Shoreline variability was estimated based on representative remote sensing images over half a century (1970 to 2019). Results indicate that, after 49 years, 805 ha of beach deposits have been lost in the Cuautla Canal and at the beach ridge region that should otherwise be an accretional coastal zone. Conversely, the southern section of the study site shows 406 ha of constant accretion during the same period due to the presence of the unobstructed San Pedro River. Our study highlights the adverse effects of engineering projects, such as inlets and hydroelectric dams throughout tropical coastal systems that have strongly depended on freshwater input from upstream rivers.
https://dx.doi.org/10.1007/s10661-020-8094-8

135. Vaiphei SP, Kurakalva RM, Sahadevan DK. **Water quality index and GIS-based technique for assessment of groundwater quality in Wanaparthy watershed, Telangana, India**. Environmental science and pollution research international. 2020;27(36):45041-62.
A comprehensive study of 58 groundwater samples collected in the virgin area of Wanaparthy watershed (1600 km2), Telangana, India, to assess the hydrochemistry, quality, water types and potability using hydrogeochemical characterization, WQI and GIS technique. Major ions concentration of Na+, K+, Ca2+, Mg2+, Cl-, F-, NO3- and SO42- in groundwater were analysed using ion chromatography (IC). Physicochemical values of the potential of hydrogen (pH), total dissolved solids (TDS) and electrical conductivity (EC) were determined using Hanna portable meters, while total hardness (TH), alkalinity and bicarbonates are estimated by titrimetric methods. Results obtained enlighten the major

anions and cations, which are found in order of Cl- > HCO3- > SO42- > NO3- > F- and Na+ > Ca+2 > Mg+2 > K+ respectively. Among various ions measured, fluoride (18.97%), chloride (3.44%), nitrate (8.62%), sulphate (5.17%), sodium (34.48%) and calcium (1.72%) were found to above acceptable limit values of Bureau of Indian Standards (BIS) for drinking purposes. According to Piper trilinear diagram, two dominant hydrochemical facies, Na-Cl-SO4 and Ca-Na-HCO3 types, were identified. Gibbs diagram imparted the dominancy of samples in the territory are rock-water reaction and evaporation dominance. WQI shows 67.79% of samples pertain to the excellent to good water types reveal fit for drinking. Drainage pattern enumerated the concentration of the parameters measured are exceeding towards the downstream region, which might be due to the chemical reaction of rock-water interaction (infiltration and recharge). As the groundwater is the major source of drinking in the study area, a proper management plan has to implement before its quality deteriorated.
https://dx.doi.org/10.1007/s11356-020-10345-7

136. Thompson CA, Tsou MH. **Improving researcher accessibility topublicly available data through creative integration,geospatial visualization, and open data portals**. Cancer Epidemiology Biomarkers and Prevention. 2020;29(9 SUPPL).
The increased accessibility of population-level data made available by the government and public health andconsumer agencies provides a unique opportunity for integrative data analysis, spatial visualization with muchhigher resolution to identify clusters of disease, and their correlation with geospatial, socioeconomic, anddemographic predictors. However, interactive mapping and spatial analysis tools are underutilized by healthresearchers and decision-makers as a result of scarce training materials, few examples demonstrating theirsuccessful use, and poor mechanisms for sharing results generated by geovisualization. Further, in the wake ofmassive amounts of new data and analytical tool availability, consumers of cancer population health data, such asacademic researchers and public health practitioners, are facing an ongoing transformation of practice resulting inthe need for effective collaboration and sharing of resources within and across disciplinary and geographicboundaries. In this talk we will summarize three of our ongoing projects that leverage web-based technologies withthe aim to reduce barriers to data sharing, promote simultaneous analysis of multiple datasets, and enablegeovisualization of cancer outcomes and their interrelationships with social and spatial factors. The DisentanglingDisparities Data Warehouse, or D3W, is a population-based data resource that includes geotagged CaliforniaCancer Registry data linked to census, American Community Survey, and other curated sources of neighborhood-level contextual and environmental data. The D3W allows ecologic and/or multilevel statistical analysis and supports Previoussophisticated analysis of the spatial dynamics of cancer in California. The HealthWebMapper is a highly interactivedata visualization tool with a simple two-tier web geographic information systems (GIS) framework. This dynamicweb GIS/mapping tool was created with open-source JavaScript library, Leaflet, and free web authoring tools(bootstrap, jquery, and Google Chart) to provide user-friendly maps and data-mining functions, including multipleclassification methods, correlation analysis, data export, and side-by-side displays. HealthWebMapper is an opensource application and available via a public Github repository, and it can be easily installed on any website withoutspecialized GIS servers or databases. Finally, to promote ease of access to the D3W and HealthWebMapper as wellas other research data resources, we are developing the Health Data Open Analytic Portal, with support from thenewly established NIH-funded HealthLINK Center for Population Health and Health Disparities Research at SanDiego State University. The key functions of the open data portal are to archive, manage, download, and integratedisease, environmental, socioeconomic, and health behavior data. The data portal will enable the sharing, archiving,and learning of research procedures and health data resources. The searchable and downloadable data portal willalso provide comprehensive research investigator profiles and online training materials to facilitate transdisciplinaryresearch collaborations in cancer population health and beyond.
https://dx.doi.org/10.1158/1538-7755.MODPOP19-IA08

137. Taheri K, Missimer TM, Amini V, Bahrami J, Omidipour R. **A GIS-expert-based approach for groundwater quality monitoring network design in an alluvial aquifer: a case study and a practical guide**. Environmental monitoring and assessment. 2020;192(11):684.
Groundwater quality monitoring is a critical part of water management in all groundwater basins. In order to be effective and to meet the required needs, groundwater quality monitoring networks (GQMNs) must be designed to be able to operate long-term and economically without minimal disruption. The analytical hierarchical process (AHP), a multi-criteria decision-making program, was used to design a GQMN for an alluvial aquifer located in the Islam Abad

plain west of Kermanshah province, Iran. This semi-arid area is subject to groundwater depletion and water quality changes. The model used 8 primary criteria sub-divided with 5 sub-criteria based on a combination of empirical data and expert opinion. The primary criteria included density of wells, well discharge, well depth, water quality (conductivity), flow direction, annual groundwater extraction, water level declines, and accessibility. The model showed that 59 of 254 production wells in the basin could provide optimal monitoring locations. When a second screening of the wells was used to determine constraints (physical conditions of the wells and pumps, owner permission of use, type of the pump, etc.), the number of wells was reduced to 13 wells. An initial round of water sampling and chemical analysis demonstrated that the design of the GQMN met the goals of the water management agency of the region.
https://dx.doi.org/10.1007/s10661-020-08646-y

138. Taher A, Bunker E, Chartier LB, Ostrow O, Ovens H, Davis B, et al. **Application of the Informatics Stack framework to describe a population-level emergency department return visit continuous quality improvement program**. International journal of medical informatics. 2020;133:103937.
INTRODUCTION: Population health programs are increasingly reliant on Health Information Technology (HIT). Program HIT architecture description is a necessary step prior to evaluation. Several sociotechnical frameworks have been used previously with HIT programs. The Informatics Stack is a novel framework that provides a thorough description of HIT program architecture. The Emergency Department Return Visit Quality Program (EDRVQP) is a population-level continuous quality improvement (QI) program connecting EDs across Ontario. The objectives of the study were to utilize the Informatics Stack to provide a description of the EDRVQP HIT architecture and to delineate population health program factors that are enablers or barriers., MATERIALS AND METHODS: The Informatics Stack was used to describe the HIT architecture. A qualitative study was completed with semi-structured interviews of key informants across stakeholder organizations. Emergency departments were selected randomly. Purposive sampling identified key informants. Interviews were conducted until saturation. An inductive qualitative analysis using grounded theory was completed. A literature review of peer-reviewed background literature, and stakeholder organization reports was also conducted., RESULTS: 23 business actors from 15 organizations were interviewed. The EDRVQP architecture description is presented across the Informatics Stack levels. The levels from most comprehensive to most basic are world, organization, perspectives/roles, goals/functions, workflow/behaviour/adoption, information systems, modules, data/information/knowledge/wisdom/algorithms, and technology. Enabling factors were the high rate of electronic health record adoption, legislative mandate for data collection, use of functional data standards, implementation flexibility, leveraging validated algorithms, and leveraging existing local health networks. Barriers were privacy legislation and a high turn-around time., DISCUSSION: The Informatics Stack provides a robust approach to thoroughly describe the HIT architecture of population health programs prior to program replication. The EDRVQP is a population health program that illustrates the pragmatic use of continuous QI methodology across a population (provincial) level.

https://dx.doi.org/10.1016/j.ijmedinf.2019.07.016

139. Rottmann E, Bankert J, Berger A, Kirchner L, Dewalle J, Meissner M, et al. **Epidemiology and Geographic Evaluation of ANCA-associated Vasculitis (AAV) at a Rural Academic Health Center Utilizing an Electronic Health Record (EHR)**. Arthritis and Rheumatology. 2020;72(SUPPL 10):2067-70.
Background/Purpose: ANCA-associated vasculitis has a reported prevalence ranging from 3.2 to 9.1 cases per 100,000 individuals, but little is known of geographic variations. The aim of this study is to observe the prevalence of AAV in a rural based health system using updated ACR/EULAR Diagnostic and Classification Criteria for Primary Systemic Vasculitis (DCVAS). The study also provides geographic mapping of cases to investigate potential environmental factors.
Method(s): We reviewed patients with potential AAV through use of EHR from 1/1/2003-6/30/2018 with ICD 9/10 codes consistent with AAV, granulomatosis with polyangiitis (GPA), microscopic polyangiitis (MPA), or eosinophilic granulomatosis with polyangiitis (EGPA). We conducted a manual chart review of cases that satisfy ACR/EULAR DCVAS. Each case was independently confirmed by a rheumatologist, pulmonologist and nephrologist. The denominator for a 5-year point prevalence estimate was calculated by identifying patients > 18 years old with a PCP encounter between 1/1/2003-6/30/2018 who had at least one outpatient encounter between 1/1/2014-12/31/2018. The numerator was calculated by identifying AAV cases within the denominator population. The prevalence estimate was calculated using a simple binomial proportion and the simple asymptotic continuity corrected 95% confidence interval. Prevalence estimates for GPA, MPA, and EGPA were calculated using similar methods as for overall AAV prevalence. Because of the

rarity, the 95% confidence interval for the EGPA is reported using a Clopper-Pearson exact method. Statistical analysis was completed using SAS 9.4. All confirmed cases of AAV were plotted along a map to evaluate geographic distribution. Result(s): Out of 2983 cases screened by ICD codes, 108 cases satisfi ed DCVAS. For prevalence criteria, there were 54 confirmed cases out of a denominator population of 458,588. The prevalence estimate for AAV is 11.6/100,000 (95% CI: 8.4, 14.8). The total population mean age was 50.7, 55.0% were female and 93.9% were Caucasian. Among the 54 AAV patients, the mean age was 60.8, 50.0% were female, and 96.3% were Caucasian. There were 38 patients with GPA, 13 with MPA, and 3 with EGPA. Prevalence estimates and demographic characteristics are shown in Figure 1 and Figure 2. The prevalence estimates for AAV and GPA is observed to be above the reported national average range. Our geographic mapping shows correlation of cases in counties deemed as Coal Region, following along a major interstate, a regional river, and primary medical service area (Figure 3). Conclusion(s): Our prevalence estimates for AAV and GPA is observed to be higher than average, but MPA and EGPA has insufficient U.S. epidemiology to compare. Our health system captures a large region of predominantly Caucasian patients in a rural population so it is of interest to compare to national averages. Mapping suggests a correlation of AAV cases in Coal Region counties and along a major river, suggesting a possible environmental factor. We hope to explore potential environmental-gene interactions and compare epidemiology with an urban system in the future.
https://dx.doi.org/10.1002/art.41538

140. Rodriguez-Camargo LA, Sierra-Parada RJ, Blanco-Becerra LC. **Spatial analysis of PM2.5 concentrations in Bogota according to the World Health Organization air quality guidelines for cardiopulmonary diseases, 2014-2015**. [Analisis espacial de las concentraciones de PM2,5 en Bogota segun los valores de las guias de la calidad del aire de la Organizacion Mundial de la Salud para enfermedades cardiopulmonares, 2014-2015]. 2020;40(1):137-52.
Introduction: The World Health Organization (WHO) points out that 3 million deaths per year caused by cardiopulmonary diseases are related to exposure to air pollution. Objective: To estimate areas of concentration of PM2.5 in Bogota according to the WHO Air Quality Guidelines (AQG) for cardiopulmonary diseases during the period 2014-2015. Materials and methods: We conducted an ecological study with geostatistical techniques. We calculated the PM2.5 averages for six hour-periods distributed throughout the day in four time slots, which were classified according to daily and annual WHO AQG. Results: The locality of Kennedy presented the highest concentrations of PM2.5 in all time slots. The values registered in this area classified within the daily and annual AQG showed that the locality would present an increase of 1.2% and 9% in cardiopulmonary mortality in the short and long term, respectively. Conclusion: The time slots from 0:00 to 6:00 h y from 12:00 to 18:00 h met the annual AQG value of 10 mug/m3 in a part of the eastern zone of the city; in the rest of the city, in these same time slots, intermediate objectives 2 and 3 were met, which means increases by 9% and 3% in the cardiopulmonary mortality according to the AQG, respectively.
https://dx.doi.org/10.7705/biomedica.4719

141. Renardy M, Kirschner DE. **A Framework for Network-Based Epidemiological Modeling of Tuberculosis Dynamics Using Synthetic Datasets**. Bulletin of mathematical biology. 2020;82(6):78.
We present a framework for discrete network-based modeling of TB epidemiology in US counties using publicly available synthetic datasets. We explore the dynamics of this modeling framework by simulating the hypothetical spread of disease over 2 years resulting from a single active infection in Washtenaw County, MI. We find that for sufficiently large transmission rates that active transmission outweighs reactivation, disease prevalence is sensitive to the contact weight assigned to transmissions between casual contacts (that is, contacts that do not share a household, workplace, school, or group quarter). Workplace and casual contacts contribute most to active disease transmission, while household, school, and group quarter contacts contribute relatively little. Stochastic features of the model result in significant uncertainty in the predicted number of infections over time, leading to challenges in model calibration and interpretation of model-based predictions. Finally, predicted infections were more localized by household location than would be expected if they were randomly distributed. This modeling framework can be refined in later work to study specific county and multi-county TB epidemics in the USA.
https://dx.doi.org/10.1007/s11538-020-00752-9

142. Ramalho A, Lobo M, Duarte L, Souza J, Santos P, Freitas A. **Landscapes on Prevention Quality Indicators: A Spatial Analysis of Diabetes Preventable Hospitalizations in Portugal (2016-2017)**. International journal of environmental research and public health. 2020;17(22).

Preventable hospitalizations due to complications of diabetes mellitus (DM), represented by the related prevention quality indicators (PQI), are ambulatory care-sensitive conditions that can be prevented and controlled through effective primary health care (PHC) treatment. It is important to reduce mortality and promote the quality of life to diabetic patients in regions with higher hospitalization rates. The study aims to analyze the results of the DM age-sex-adjusted PQI, by groups of health centers (ACES), distributed in the Portuguese territory. The most representative PQI at a national level were identified, and the trends were mapped and analyzed. Also, it presents the ACES with the highest age-adjusted rates of avoidable hospitalizations for DM. The absolute number of preventable hospitalizations for all DM complications in Portugal has decreased by 20%, thus passing from the rate of 79 in 2016 to 65.2/100,000 inhabitants in 2017. Despite the improvement in results for PQI 03, 20 of 48 ACES that were above the national 2017 median rate in 2016, achieved better results the following year, and for the overall preventable diabetes hospitalizations (PQI 93) only 11 out 39, revealing the need for further studies and PHC actions to improve the diabetic quality of life.
https://dx.doi.org/10.3390/ijerph17228387

143. Rakibul A, Md. Shaharier A, Torit C, Md. Mahbub H. **Applications of GIS and geospatial analyses in COVID-19 research: A systematic review**. F1000Research. 2020;9:1379.
Background: Geographic information science (GIS) has established itself as a distinct domain and incredibly useful whenever the research is related to geography, space, and other spatio-temporal dimensions. However, the scientific landscape on the integration of GIS in COVID-related studies is largely unknown. In this systematic review, we assessed the current evidence on the implementation of GIS and other geospatial tools in the COVID-19 pandemic. Methods: We systematically retrieved and reviewed 79 research articles that either directly used GIS or other geospatial tools as part of their analysis. We grouped the identified papers under six broader thematic groups based on the objectives and research questions of the study- environmental, socio-economic, and cultural, public health, spatial transmission, computer-aided modeling, and data mining. Results: The interdisciplinary nature of how geographic and spatial analysis was used in COVID-19 research was notable among the reviewed papers. Although GIS has substantial potential in planning to slow down the spread, surveillance, contact tracing, and identify the trends and hotspots of breakdowns, it was not employed as much as it could have been. This review not only provided an overarching view on how GIS has been used in COVID-19 research so far but also concluded that this geospatial analysis and technologies could be used in future public health emergencies along with statistical and other socio-economic modeling techniques. Our systematic review also provides how both scientific communities and policymakers could leverage GIS to extract useful information to make an informed decision in the future. Conclusions: Despite the limited applications of GIS in identifying the nature and spatio-temporal pattern of this raging pandemic, there are opportunities to utilize these techniques in handling the pandemic. The use of spatial analysis and GIS could significantly improve how we understand the pandemic as well as address the underserviced demographic groups and communities.
10.12688/f1000research.27544.2

144. Pratama MA, Immanuel YD, Marthanty DR. **A Multivariate and Spatiotemporal Analysis of Water Quality in Code River, Indonesia**. TheScientificWorldJournal. 2020;2020:8897029.
The efficacy of a water quality management strategy highly depends on the analysis of water quality data, which must be intensively analyzed from both spatial and temporal perspectives. This study aims to analyze spatial and temporal trends in water quality in Code River in Indonesia and correlate these with land use and land cover changes over a particular period. Water quality data consisting of 15 parameters and Landsat image data taken from 2011 to 2017 were collected and analyzed. We found that the concentrations of total dissolved solid, nitrite, nitrate, and zinc had increasing trends from upstream to downstream over time, whereas concentrations of parameter biological oxygen demand, cuprum, and fecal coliform consistently undermined water quality standards. This study also found that the proportion of natural vegetation land cover had a positive correlation with the quality of Code River's water, whereas agricultural land and built-up areas were the most sensitive to water pollution in the river. Moreover, the principal component analysis of water quality data suggested that organic matter, metals, and domestic wastewater were the most important factors for explaining the total variability of water quality in Code River. This study demonstrates the application of a GIS-based multivariate analysis to the interpretation of water quality monitoring data, which could aid watershed stakeholders in developing data-driven intervention strategies for improving the water quality in rivers and streams.

https://dx.doi.org/10.1155/2020/8897029

145. Nicodemo C, Barzin S, Cavalli N, Lasserson D, Moscone F, Redding S, et al. **Measuring geographical disparities in England at the time of COVID-19: results using a composite indicator of population vulnerability**. BMJ open. 2020;10(9):e039749.
OBJECTIVES: The growth of COVID-19 infections in England raises questions about system vulnerability. Several factors that vary across geographies, such as age, existing disease prevalence, medical resource availability and deprivation, can trigger adverse effects on the National Health System during a pandemic. In this paper, we present data on these factors and combine them to create an index to show which areas are more exposed. This technique can help policy makers to moderate the impact of similar pandemics., DESIGN: We combine several sources of data, which describe specific risk factors linked with the outbreak of a respiratory pathogen, that could leave local areas vulnerable to the harmful consequences of large-scale outbreaks of contagious diseases. We combine these measures to generate an index of community-level vulnerability., SETTING: 91 Clinical Commissioning Groups (CCGs) in England., MAIN OUTCOME MEASURES: We merge 15 measures spatially to generate an index of community-level vulnerability. These measures cover prevalence rates of high-risk diseases; proxies for the at-risk population density; availability of staff and quality of healthcare facilities., RESULTS: We find that 80% of CCGs that score in the highest quartile of vulnerability are located in the North of England (24 out of 30). Here, vulnerability stems from a faster rate of population ageing and from the widespread presence of underlying at-risk diseases. These same areas, especially the North-East Coast areas of Lancashire, also appear vulnerable to adverse shocks to healthcare supply due to tighter labour markets for healthcare personnel. Importantly, our index correlates with a measure of social deprivation, indicating that these communities suffer from long-standing lack of economic opportunities and are characterised by low public and private resource endowments., CONCLUSIONS: Evidence-based policy is crucial to mitigate the health impact of pandemics such as COVID-19. While current attention focuses on curbing rates of contagion, we introduce a vulnerability index combining data that can help policy makers identify the most vulnerable communities. We find that this index is positively correlated with COVID-19 deaths and it can thus be used to guide targeted capacity building. These results suggest that a stronger focus on deprived and vulnerable communities is needed to tackle future threats from emerging and re-emerging infectious disease. Copyright © Author(s) (or their employer(s)) 2020. Re-use permitted under CC BY. Published by BMJ.
https://dx.doi.org/10.1136/bmjopen-2020-039749

146. Newhouse N, Farmer A, Whelan ME. **COVID-19: Needs-led implementation and the immediate potential of remote monitoring**. BJGP Open. 2020;4(2):1093.

https://dx.doi.org/10.3399/BJGPOPEN20X101093

147. Nadler P, Wang S, Arcucci R, Yang X, Guo Y. **An epidemiological modelling approach for COVID-19 via data assimilation**. European journal of epidemiology. 2020;35(8):749-61.
The global pandemic of the 2019-nCov requires the evaluation of policy interventions to mitigate future social and economic costs of quarantine measures worldwide. We propose an epidemiological model for forecasting and policy evaluation which incorporates new data in real-time through variational data assimilation. We analyze and discuss infection rates in the UK, US and Italy. We furthermore develop a custom compartmental SIR model fit to variables related to the available data of the pandemic, named SITR model, which allows for more granular inference on infection numbers. We compare and discuss model results which conducts updates as new observations become available. A hybrid data assimilation approach is applied to make results robust to initial conditions and measurement errors in the data. We use the model to conduct inference on infection numbers as well as parameters such as the disease transmissibility rate or the rate of recovery. The parameterisation of the model is parsimonious and extendable, allowing for the incorporation of additional data and parameters of interest. This allows for scalability and the extension of the model to other locations or the adaption of novel data sources.
https://dx.doi.org/10.1007/s10654-020-00676-7

148. Motlagh ZK, Lotfi A, Pourmanafi S, Ahmadizadeh S, Soffianian A. **Spatial modeling of land-use change in a rapidly urbanizing landscape in central Iran: integration of remote sensing, CA-Markov, and landscape metrics**. Environmental monitoring and assessment. 2020;192(11):695.

In the present paper, land use/land cover (LULC) change was predicted in the Greater Isfahan area (GIA), central Iran. The GIA has been growing rapidly in recent years, and attempts to simulate its spatial expansion would be essential to make appropriate decisions in LULC management plans and achieve sustainable development. Several modeling tools were employed to outline sustainable scenarios for future dynamics of LULCs in the region. Specifically, we explored past LULC changes in the study area from 1996 to 2018 and predicted its future changes for 2030 and 2050. For this purpose, we performed object-oriented and decision tree techniques on Landsat and Sentinel-2 satellite images. The CA-Markov hybrid model was utilized to analyze past trends and predict future LULC changes. LULC changes were quantitatively measured using landscape metrics. According to the results, the majority of changes were related to increasing residential areas and decreasing irrigated lands. The results indicated that residential lands would grow from 27,886.87 ha to 67,093.62 ha over1996-2050 while irrigated lands decrease from 99,799.4 ha to 50,082.16 ha during the same period of time. The confusion matrix of the 2018 LULC map was built using a total of 525 ground truth points and yielded a Kappa coefficient and overall accuracy of 78% and 82%, respectively. Moreover, the confusion matrix constructed base on the Sentinel-2 map, as a reference, to judge the predicted 2018 LULC map with a Kappa coefficient of 88%. The results of this study provide useful insights for sustainable land management. The results of this research also proved the promising capability of remote sensing algorithms, CA-Markov model and landscape metrics future LULC planning in the study area.
https://dx.doi.org/10.1007/s10661-020-08647-x

149. Middleton JT, Konganige S, Dahaghin P, Zafar H, Reddy A, Martin C, et al. **Effect of COVID-19 Public Health Measures on Activity and Quality of Life in Patients with Pulmonary Arterial Hypertension**. Circulation. 2020;142(SUPPL 3).
Background: Limitation of physical activity has been widely enforced to reduce COVID-19 transmission, however it is a critical measure in the prevention of cardiovascular disease. In patients with pulmonary arterial hypertension (PAH), exercise capacity relates to clinical outcomes and exercise training improves cardiopulmonary function. Here, we describe the temporal effects of UK government restriction measures on daily activity and quality of life (QoL) in patients with PAH. Method(s): Patients Enrolled in The United Kingdom National Cohort Study of Idiopathic and Heritable PAH Study were implanted with insertable cardiac monitors (LinQ, Medtronic) in the clinic setting. Data were transmitted and reviewed in accordance with established clinical protocols. Standard questionnaires were administered remotely to assess QoL (EmPHasis-10), anxiety (GAD-7) and depression (PHQ-9). Result(s): Median age of the 26 patients was 49 years, 23 (88%) were female and 5 (19%) had heritable PAH with mutations in BMPR2. At enrolment 10 (38.5%) patients were low risk (<5% 1-year mortality), 10 (38.5%) were intermediate risk (5-10%) and 6 (23%) were high risk (>10%). The mean duration from insertion to census date was 21.1 weeks (SD 5.7). No complications were reported. Completeness of remote monitoring data was 100%.Following lockdown, mean activity was reduced compared to pre-lockdown levels (3.16 vrs 2.68 hours/day -0.48 hours, 95%CI -0.27- -0.69, 16%, p<0.0001). This reduction was present each week following lockdown. Although not statistically significant the greatest reduction in activity was observed in patients in the low-risk group. Following lockdown QoL was reduced (26 (18-38) vrs 32 (17-47), p<0.01) and anxiety (1 (0-9) vrs 10 (5-18), p<0.001) and depression scores increased (3 (1-16) vrs 11 (3-17), p<0.001) compared to pre-lockdown levels. No change in day or night heart rate, or heart rate variability was observed and no patients developed COVID-19. Conclusion(s): In this cohort of patients with PAH, protective health measures were effective in preventing COVID-19 in patients thought to be highly vulnerable. However, these measures resulted in reduced daily activity and QoL and were associated increased anxiety and depression indicators.
https://dx.doi.org/10.1161/circ.142.suppl_3.15636

150. Marara T, Palamuleni LG. **A spatiotemporal analysis of water quality characteristics in the Klip river catchment, South Africa**. Environmental monitoring and assessment. 2020;192(9):578.
Understanding the spatial and temporal patterns of water quality is central to its management as it provides information essential to the restoration as well as protection of water resources. The main objectives of this study were (i) to analyze the spatial and temporal trends of water quality and (ii) to identify the critical sources of pollution in the Klip River catchment (KRC). Water samples were collected at 12 sampling points along the Klip River, monthly from February 2016 to January 2017 and analyzed using inductively coupled plasma mass spectrometry (ICP-MS) and spectrophotometry for heavy metals and nutrients, respectively. Multivariate statistical techniques (cluster analysis and discriminant analysis) were used to delineate homogeneous water quality zones and seasons, and principal component analysis was used to

identify pollution sources. Comprehensive pollution index (CPI) was also computed to classify the overall pollution of the river. The spatial grouping yielded two homogenous water quality zones namely upstream and downstream. Temporal grouping yielded two clusters, which were attributed to the effects of the El Nino (2015/16 season) and La Nina phenomena (2016/17 season). The CPI revealed that the KRC was critically polluted in the upstream for domestic (162.16-323.28) and aquatic uses (617.70-837.09) in both the 2015/2016 and 2016/2017 seasons. It can be concluded that pollutants, which influence water quality in the KRC in one season and/or location, may not necessarily be the same in the other season or location. Therefore, there is need to develop a water quality management plan in the KRC that targets the most impaired uses, pollutants of priority, and the critically polluted areas.
https://dx.doi.org/10.1007/s10661-020-08441-9

151. Ma J, Xu J, Qu Y. **Evaluation on the surface PM2.5 concentration over China mainland from NASA's MERRA-2**. Atmospheric Environment. 2020;237:117666.
One of the important products of MERRA-2 (Modern-Era Retrospective Analysis for Research and Applications) developed by NASA (National Aeronautics and Space Administration) is the long-term global records of surface PM2.5 mass concentration since 1980s, providing the ability of studying the interactions between air pollution, weather and climate changes. In this study, the PM2.5 mass concentrations of MERRA-2 are firstly validated across China mainland by independent surface measurements collected by Ministry of Ecology and Environment of People's Republic of China from 2014 to 2018. The results show that MERRA-2 well captures the spatial distribution and seasonal variation of PM2.5 mass concentration in China mainland. The spatial and temporal evolution of large scale persistent PM2.5 pollution event is also generally reflected by MERRA-2 by case study based on the target object match method. However significant underestimation of the PM2.5 mass concentration in MEERA-2 is revealed across China mainland, especially in BTH region by 34.6 mug m-3, followed by 19.8 mug m-3 in YRD and 9.1 mug m-3 in PRD region. Such underestimation is most substantial in winter and autumn seasons. In addition, the discrepancy between MERRA-2 and observations increases significantly with the enhanced PM2.5 level, for example, ranging from 29.9 mug m-3 in clean days, while 66.1 mug m-3 in polluted days in BTH region. We highlight the downward trends of PM2.5 from 2014 to 2018 in China mainland estimated by MERRA-2 which is basically consistent in the observations, but with ~50% underestimation, indicating the potential applications of MERRA-2 for the future aerosol climatological studies. We suggest that the underestimations of both magnitude and variability of PM2.5 in MERRA-2 probably result from the uncertainty of the magnitude of emission inventory used in GOES model (lower intensity and weaker variations), and the absence of nitrate in PM2.5 constitution. A parameterized method for nitrate is proposed and evaluated by the sensitive study to improve MERRA-2 PM2.5 underestimation by 19.2-23.6% in BTH region. However, the more comprehensive validations are still required in future studies, especially by the aerosol composition measurements.
https://dx.doi.org/10.1016/j.atmosenv.2020.117666

152. Lu B, Zhang X, Wen J. **Real World Effectiveness of Information and Communication Technologies in Disaster Relief: A Systematic Review**. Iranian journal of public health. 2020;49(10):1813-26.
BACKGROUND: The application of information and communication technologies (ICTs) in disaster relief is increasingly widespread, but it is still unclear whether ICT can reduce casualties and economic losses in disaster response phase. METHODS: We searched studies in the databases of Scopus, EI, MEDLINE and EMBASE from Jan 1, 1990, to Mar 22, 2019. Excel 2016 and VOSviewer (version 1.6.11) were used to analyze the extracted data and visualize the network diagram. RESULTS: We included 169 eligible articles. The number of ICTs-related disaster-relief articles published annually shows an overall trend of growth since 1990. The United States has the greatest influence in this field. The 169 articles reported twenty-four technologies and the top three reported most frequently were remote sensing, social media, and geographic information system (GIS). The main roles of ICTs in natural disaster rescue included information dissemination, post-disaster image collection and damage assessment. However, of the 169 articles, only five reported that ICTs reduced casualties or economic losses in disaster response phase, two concluded that rescue robot was ineffective in mudslide rescue, and the remaining 162 (95.86%) did not evaluate the effect of ICTs on the rescue. CONCLUSION: ICTs have the potential to reduce casualties and economic losses, but some technologies are not applicable to all rescue scenarios. In addition, most studies did not pay attention to the effect of technology on the rescue.
10.18502/ijph.v49i10.4678

153. Lekinwala NL, Bharadwaj A, Sunder Raman R, Bhushan M, Bali K, Dey S. **Weight-of-evidence approach to identify regionally representative sites for air-quality monitoring network: Satellite data-based analysis**. MethodsX. 2020;7:100949.
The methodology discussed in Lekinwala et al., 2020, hereinafter referred to as the 'parent article', is used to setup a nation-wide network for background PM2.5 measurement at strategic locations, optimally placing sites to obtain maximum regionally representative PM2.5 concentrations with minimum number of sites. Traditionally, in-situ PM2.5 measurements are obtained for several potential sites and compared to identify the most regionally representative sites [4], Wongphatarakul et al., 1998) at the location. The 'parent article' proposes the use of satellite-derived proxy for aerosol (Aerosol Optical Depth, AOD) data in the absence of in-situ PM2.5 measurements. This article focuses on the details about satellite-data processing which forms part of the methodology discussed in the 'parent article'. Following are some relevant aspects: * High resolution AOD is retrieved from Moderate Resolution Imaging Spectroradiometer (MODIS) instruments aboard NASA's Aqua and Terra satellite using Multi-Angle Implementation of Atmospheric Correction (MAIAC) algorithm. The data is stored as grids of size 1200 x 1200 and a total of seven such grids cover the Indian land mass. These grids were merged, regridded and multiplied by conversion factors from GEOS-Chem Chemical Transport Model to obtain PM2.5 values. Standard set of tools like CDO and NCL are used to manipulate the satellite-data (*.nc files). * The PM2.5 values are subjected to various statistical analysis using metrics like coefficient of divergence (CoD), Pearson correlation coefficient (PCC) and mutual information (MI). * Computations for CoD, MI are performed using Python codes developed in-house while a function in NumPy module of Python was used for PCC calculations.
https://dx.doi.org/10.1016/j.mex.2020.100949

154. Jha MK, Shekhar A, Jenifer MA. **Assessing groundwater quality for drinking water supply using hybrid fuzzy-GIS-based water quality index**. Water research. 2020;179:115867.
Groundwater is a vital source of freshwater in both urban and rural regions of the world. However, its injudicious abstraction and rapidly increasing contamination are posing a severe threat for sustainable water supply worldwide. Geographical Information System (GIS)-based groundwater quality evaluation using Groundwater Quality Index (GQI) has been proved to be a cost-effective tool for assessing groundwater quality and its variability at a larger scale. However, the conventional GQI approach is unable to deal with uncertainties involved in the assessment of environmental problems. To overcome this limitation, a novel hybrid framework integrating Fuzzy Logic with the GIS-based GQI is proposed in this study for assessing groundwater quality and its spatial variability. The proposed hybrid framework is demonstrated through a case study in a hard-rock terrain of Southern India using ten prominent groundwater-quality parameters measured during pre-monsoon and post-monsoon seasons. Two conventional GIS-based GQI models GQI-10 (using all the ten groundwater-quality parameters) and GQI-7 (using seven 'concerned/critical' groundwater-quality parameters) as well as hybrid Fuzzy-GIS-based GQI (FGQI) models (using seven critical parameters) were developed for the two seasons and the results were compared. The Trapezoidal membership functions classified the model input parameters into 'desirable', 'acceptable' and 'unacceptable' classes based on the experts' knowledge and water quality standards for drinking purposes. The concentrations of Ca2+, Mg2+, and SO42- in groundwater were found within the WHO desirable limits for drinking water throughout the year, while the concentrations of seven parameters (TDS, NO3--N, Na+, Cl-, K+, F- and Hardness) exceed their permissible limits during pre-monsoon and post-monsoon seasons. A comparative evaluation of GQI models revealed that the FGQI model predicts groundwater quality better than the conventional GQI-10 and GQI-7 models. GQI modeling results suggest that the groundwater of most of eastern and southern parts (~60% in pre-monsoon season; ~90% in post-monsoon season) of the study area is unsuitable for drinking. Further, the groundwater quality deteriorates during post-monsoon seasons compared to pre-monsoon seasons, which indicates an increased influx of contaminants from different industries, mining areas, waste disposal sites and agricultural fields during monsoon seasons. This finding calls for the strict enforcement of regulations for proper handling of effluents from various contamination sources in the study area. It is concluded that the fuzzy logic-based decision-making approach (FGQI) is more reliable and pragmatic for groundwater-quality assessment and analysis at a larger scale. It can serve as a useful tool for the water planners and decision makers in efficiently monitoring and managing groundwater quality at watershed or basin scales.
https://dx.doi.org/10.1016/j.watres.2020.115867

155. Ishaq S, Sadiq R, Farooq S, Chhipi-Shrestha G, Hewage K. **Investigating the public health risks of low impact developments at residential, neighbourhood, and municipal levels**. The Science of the total environment. 2020;744:140778.
Low Impact Developments (LIDs) employ a series of vegetative techniques to retain rainfall close to the site of origin. Although LIDs offer sustainable runoff management, these infrastructures can be considered a risk to public health due to the presence of pathogens in the runoff and human exposure to contaminated water held in and transported by LIDs. The objective of this study is to examine the disease burden of Gastrointestinal illness (GI) from exposure to LIDs at the residential, neighbourhood, and municipal levels. The authors conducted a meta-analysis of literature on three water features: (1) harvested rainwater obtained from LIDs, (2) surface water, and (3) floodwater. A set of 32 studies were systematically selected to collect values of risks of infection and expressed as the disease burden, i.e. disability adjusted life years (DALYs). The results showed that the percentage of GI illness exceeding the health guidelines were high for harvested rainwater, i.e. 22% of annual disease burden exceeded the WHO guidelines (0.001 DALYs/1000 persons), and 2% exceeded the US EPA guidelines (5.75 DALYs/1000 bathers). Among the six exposures for harvested rainwater, exposure to spray irrigation, exceeded US EPA guidelines whereas; five exposures, i.e. flushing, hosing, daily shower, spray irrigation, and children playing, surpassed the WHO guidelines. Considering LID treatment, the values of annual disease burden from all the selected barriers were below US EPA guidelines however, these values exceeded the WHO guidelines for three barriers i.e. water plaza, grass swale, and open storage ponds. These findings provide a broader perspective of the disease burden associated with LIDs and emphasise to consider the type of exposures and required treatment barriers for developing LID infrastructures in urban areas.
10.1016/j.scitotenv.2020.140778

156. Habli I, Alexander R, Hawkins R, Sujan M, McDermid J, Picardi C, et al. **Enhancing COVID-19 decision making by creating an assurance case for epidemiological models**. BMJ health & care informatics. 2020;27(3).

https://dx.doi.org/10.1136/bmjhci-2020-100165

157. Goyal V, Brooks IHM, Wallace R, Dermish AI, Kumar B, Schutt-Aine A, et al. **Medication abortion use among low-income and rural Texans before and during state-imposed restrictions and after FDA-updated labeling**. American journal of obstetrics and gynecology. 2020;223(2):236.e1-.e8.
BACKGROUND: In 2013, the Texas legislature passed House Bill 2, restricting use of medication abortion to comply with Food and Drug Administration labeling from 2000. The Food and Drug Administration updated its labeling for medication abortion in 2016, alleviating some of the burdens imposed by House Bill 2., OBJECTIVE: Our objective was to identify the impact of House Bill 2 on medication abortion use by patient travel distance to an open clinic and income status., MATERIALS AND METHODS: In this retrospective study, we collected patient zip code, county of residence, type of abortion, family size, and income data on all patients who received an abortion (medication or aspiration) from 7 Texas abortion clinics in 3 time periods: pre-House Bill 2 (July 1, 2012-June 30, 2013), during House Bill 2 (April 1, 2015-March 30, 2016), and post-Food and Drug Administration labeling update (April 1, 2016-March 30, 2017). Patient driving distance to the clinic where care was obtained was categorized as 1-24, 25-49, 50-99, or 100+ miles. Patient county of residence was categorized by availability of a clinic during House Bill 2 (open clinic), county with a House Bill 2-related clinic closure (closed clinic), or no clinic any time period. Patient income was categorized as <=110% federal poverty level (low-income) and >110% federal poverty level. Change in medication abortion use in the 3 time periods by patient driving distance, residence in a county with an open clinic, and income status were evaluated using chi2 tests and logistic regression. We used geospatial mapping to depict the spatial distribution of patients who obtained a medication abortion in each time period., RESULTS: Among 70,578 abortion procedures, medication abortion comprised 26%, 7%, and 29% of cases pre-House Bill 2, during House Bill 2, and post-Food and Drug Administration labeling update, respectively. During House Bill 2, patients traveling 100+ miles compared to 1- 24 miles were less likely to use medication abortion (odds ratio, 0.21; 95% confidence interval, 0.15, 0.30), as were low-income compared to higher-income patients (odds ratio, 0.76; 95% confidence interval, 0.68, 0.85), and low-income, distant patients (adjusted odds ratio, 0.14; 95% confidence interval, 0.08, 0.25). Similarly, post-Food and Drug Administration labeling update, rebound in medication abortion use was less pronounced for patients traveling 100+ miles compared to 1-24 miles (odds ratio, 0.82; 95% confidence interval, 0.74, 0.91), low-income compared to higher-income patients (odds ratio, 0.77; 95% confidence interval, 0.72, 0.81), and low-income, distant patients (adjusted odds ratio, 0.80; 95% confidence interval,

0.68, 0.94). Post-Food and Drug Administration labeling update, patients residing in counties with House Bill 2-related clinic closures were less likely to receive medication abortion as driving distance increased (52% traveling 25-49 miles, 41% traveling 50-99 miles, and 26% traveling 100+ miles, P < .05). Geospatial mapping demonstrated that patients traveled from all over the state to receive medication abortion pre-House Bill 2 and post-Food and Drug Administration labeling update, whereas during House Bill 2, only those living in or near a county with an open clinic obtained medication abortion., CONCLUSION: Texas state law drastically restricted access to medication abortion and had a disproportionate impact on low-income patients and those living farther from an open clinic. After the Food and Drug Administration labeling update, medication abortion use rebounded, but disparities in use remained.
https://dx.doi.org/10.1016/j.ajog.2020.02.028

158. Garies S, Cummings M, Quan H, McBrien K, Drummond N, Manca D, et al. **Methods to improve the quality of smoking records in a primary care EMR database: exploring multiple imputation and pattern-matching algorithms**. BMC medical informatics and decision making. 2020;20(1):56.
BACKGROUND: Primary care electronic medical record (EMR) data are emerging as a useful source for secondary uses, such as disease surveillance, health outcomes research, and practice improvement. These data capture clinical details about patients' health status, as well as behavioural risk factors, such as smoking. While the importance of documenting smoking status in a healthcare setting is recognized, the quality of smoking data captured in EMRs is variable. This study was designed to test methods aimed at improving the quality of patient smoking information in a primary care EMR database., METHODS: EMR data from community primary care settings extracted by two regional practice-based research networks in Alberta, Canada were used. Patients with at least one encounter in the previous 2 years (2016-2018) and having hypertension according to a validated definition were included (n = 48,377). Multiple imputation was tested under two different assumptions for missing data (smoking status is missing at random and missing not-at-random). A third method tested a novel pattern matching algorithm developed to augment smoking information in the primary care EMR database. External validity was examined by comparing the proportions of smoking categories generated in each method with a general population survey., RESULTS: Among those with hypertension, 40.8% (n = 19,743) had either no smoking information recorded or it was not interpretable and considered missing. Those with missing smoking data differed statistically by demographics, clinical features, and type of EMR system used in the clinic. Both multiple imputation methods produced fully complete smoking status information, with the proportion of current smokers estimated at 25.3% (data missing at random) and 12.5% (data missing not-at-random). The pattern-matching algorithm classified 18.2% of patients as current smokers, similar to the population-based survey (18.9%), but still resulted in missing smoking information for 23.6% of patients. The algorithm was estimated to be 93.8% accurate overall, but varied by smoking status category., CONCLUSION: Multiple imputation and algorithmic pattern-matching can be used to improve EMR data post-extraction but the recommended method depends on the purpose of secondary use (e.g. practice improvement or epidemiological analyses).
https://dx.doi.org/10.1186/s12911-020-1068-5

159. Gao S, Wang Z, Wu Q, Zeng J. **Multivariate statistical evaluation of dissolved heavy metals and a water quality assessment in the Lake AHA watershed, Southwest China**. PeerJ. 2020;8:e9660.
Heavy metals are of public concern in aquatic ecosystems due to their growing release from industries and mining activities. This study investigated the sources, temporal-spatial distributions and water quality of dissolved heavy metals (Mn, Co, Al, Ni, Ba, V, Sb, Fe, Sr) in the Lake Aha watershed, an area under the influence of sewage and acid mining drainage. These heavy metals displayed significant spatial and temporal variabilities. The water quality index results (WQI values ranged from 3.21 to 15.64) and health risk assessment (all hazard indexes are below 1) indicated that dissolved heavy metals in this study pose a low risk for human health. Correlation analysis and principal component analysis indicated that Fe and Sr mainly presented a natural geological feature in the study area, and Mn, Co, Al and Ni were influenced by the acid coal mine drainage, whereas Ba, V and Sb were under the impact of local industrial or medical activities. This study provides new insights into the risk assessment of heavy metals in small watersheds.
https://dx.doi.org/10.7717/peerj.9660

160. Fang Y, Zheng T, Zheng X, Peng H, Wang H, Xin J, et al. **Assessment of the hydrodynamics role for groundwater quality using an integration of GIS, water quality index and multivariate statistical techniques**. Journal of environmental management. 2020;273:111185.
To explore the impact of groundwater hydrodynamics on water quality, a cost-effective geospatial model was developed using geographic information system (GIS) technology and the Dupuit assumption. Meanwhile, the groundwater quality in the Dagu River Basin was evaluated based on the water quality index (WQI) and multivariate statistical analyses. In April (dry season) and September (rainy season) 2017, the groundwater level was automatically monitored from 115 wells, and the water quality including 21 hydrochemical parameters was sampled from 37 wells. Results reveal that the WQI values varied from 35.01 to 64.74, with mean values of 51.89 and 47.87 in the rainy and dry seasons. Approximately 80% of the samples exhibited moderate water quality, with no significant difference between the rainy and dry seasons. Nitrate pollution and the integrated water quality in the central and northern regions were generally worse than that in the southern region. The Darcy velocity in the central and northern regions was relatively high with a maximum rate of 0.56 m/d, compared with the southern region. This correlation illustrates the effect of groundwater hydrodynamics on quality. The sowing of greater chemical fertilizers combined with faster groundwater movement is likely responsible for the large-scale nitrate pollution in the central and northern regions. Results also proved the accuracy of the geospatial model with a valid uncertainty. The geospatial model provides a valuable alternative for the spatial analysis of the effect of groundwater hydrodynamics on water quality.
https://dx.doi.org/10.1016/j.jenvman.2020.111185

161. Endo PT, Silva I, Lima L, Bezerra L, Gomes R, Ribeiro-Dantas M, et al. **#StayHome: Monitoring and benchmarking social isolation trends in Caruaru and the Regiao Metropolitana do Recife during the COVID-19 pandemic**. Revista da Sociedade Brasileira de Medicina Tropical. 2020;53:e20200271.
This technical report presents information related to the Social Isolation Index (SII) of the city of Caruaru, Pernambuco, Brazil. The data was provided by In Loco, a technology startup that has collected the movement of around 60 million Brazilians through cell phone location.
https://dx.doi.org/10.1590/0037-8682-0271-2020

162. Ekong I, Chukwu E, Chukwu M. **COVID-19 Mobile Positioning Data Contact Tracing and Patient Privacy Regulations: Exploratory Search of Global Response Strategies and the Use of Digital Tools in Nigeria**. JMIR mHealth and uHealth. 2020;8(4):e19139.
BACKGROUND: The coronavirus disease (COVID-19) pandemic is the biggest global economic and health challenge of the century. Its effect and impact are still evolving, with deaths estimated to reach 40 million if unchecked. One effective and complementary strategy to slow the spread and reduce the impact is to trace the primary and secondary contacts of confirmed COVID-19 cases using contact tracing technology., OBJECTIVE: The objective of this paper is to survey strategies for digital contact tracing for the COVID-19 pandemic and to present how using mobile positioning data conforms with Nigeria's data privacy regulations., METHODS: We conducted an exploratory review of current measures for COVID-19 contact tracing implemented around the world. We then analyzed how countries are using mobile positioning data technology to reduce the spread of COVID-19. We made recommendations on how Nigeria can adopt this approach while adhering to the guidelines provided by the National Data Protection Regulation (NDPR)., RESULTS: Despite the potential of digital contact tracing, it always conflicts with patient data privacy regulations. We found that Nigeria's response complies with the NDPR, and that it is possible to leverage call detail records to complement current strategies within the NDPR., CONCLUSIONS: Our study shows that mobile position data contact tracing is important for epidemic control as long as it conforms to relevant data privacy regulations. Implementation guidelines will limit data misuse.
https://dx.doi.org/10.2196/19139

163. De Filippis G, Piscitelli P, Castorini IF, Raho AM, Idolo A, Ungaro N, et al. **Water quality assessment: A quali-quantitative method for evaluation of environmental pressures potentially impacting on groundwater, developed under the M.I.N.O.Re. project**. International Journal of Environmental Research and Public Health. 2020;17(6):1835.

Background: At global level, the vulnerability of aquifers is deteriorating at an alarming rate due to environmental pollution and intensive human activities. In this context, Local Health Authority ASL Lecce has launched the M.I.N.O.Re. (Not Compulsory Water Monitoring Activities at Regional level) project, in order to assess the vulnerability of the aquifer in Salento area (Puglia Region) by performing several non-compulsory analyses on groundwater samples. This first paper describes the quali-quantitative approach adopted under the M.I.N.O.Re. project for the assessment of environmental pressures suffered by groundwater and determines the number of wells to be monitored in specific sampling areas on the basis of the local potential contamination and vulnerability of the aquifer. Method(s): We created a map of the entire Lecce province, interpolating it with a grid that led to the subdivision of the study area in 32 quadrangular blocks measuring 10 km x 10 km. Based on current hydrogeological knowledge and institutional data, we used GIS techniques to represent on these 32 blocks the 12 different layers corresponding to the main anthropic or environmental type of pressures potentially impacting on the aquifer. To each kind of pressure, a score from 0 to 1 was attributed on the basis of the potential impact on groundwater. A total score was assigned to each of the 32 blocks. A higher number of wells was selected to be monitored in those blocks presenting higher risk scores for possible groundwater contamination due to anthropic/environmental pressures. Result(s): The range of total scores varied from 2.4 to 42.5. On the basis of total scores, the 10 km x 10 km blocks were divided into four classes of environmental pressure (1st class: from 0,1 to 10,00; 2nd class: from 10,01 to 20,00; 3rd class: from 20,1 to 30,00; 4th class: from 30,01 to 42,50). There were 11 areas in the 1st class, 9 areas in the 2nd class, 8 areas in the 3rd class and 4 areas in the 4th class. We assigned 1 monitoring well in 1st class areas, 2 monitoring wells in 2nd class areas, 3 monitoring wells in 3rd class areas and 4 monitoring wells in 4th class areas. Conclusion(s): The methodology developed under the M.I.N.O.Re. project could represent a useful model to be used in other areas to assess the environmental pressures suffered by aquifers and the quality of the groundwater.
https://dx.doi.org/10.3390/ijerph17061835

164. Crilly P, Kayyali R. **A systematic review of randomized controlled trials of telehealth and digital technology use by community pharmacists to improve public health**. Pharmacy. 2020;8(3):137.
Community pharmacists (CPs) continue to have an important role in improving public health, however, advances in telehealth and digital technology mean that the methods by which they support their customers and patients are changing. The primary aim of this study was to identify which telehealth and digital technology tools are used by CPs for public health purposes and determine if these have a positive impact on public health outcomes. A systematic review was carried out using databases including PubMed and ScienceDirect, covering a time period from April 2005 until April 2020. The search criteria were the following: randomized controlled trials, published in English, investigating the delivery of public health services by community pharmacists using a telehealth or digital tool. Thirteen studies were included out of 719 initially identified. Nine studies detailed the use of telephone prompts or calls, one study detailed the use of a mobile health application, two studies detailed the use of a remote monitoring device, and one study detailed the use of photo-aging software. Public health topics that were addressed included vaccination uptake (n = 2), smoking cessation (n = 1), hypertension management (n = 2), and medication adherence and counseling (n = 8). More studies are needed to demonstrate whether or not the use of novel technology by CPs can improve public health.
https://dx.doi.org/10.3390/PHARMACY8030137

165. Corey L, Vezina A, Gala RB. **Using technology to improve women's health care**. Ochsner Journal. 2020;20(4):422-5.
Background: Technology is being integrated into all aspects of health care. While many applications offer novel experiences, the evidence supporting translation to improved education or care is evolving. Method(s): We review ways that technology is affecting a variety of fields pertinent to women's health, including patient commu-nication, physician education, and health care performance. Result(s): In the Ochsner Health Department of Obstetrics and Gynecology, we have developed a platform known as Connected Maternity Online Monitoring-Connected MOM-to encourage remote monitoring during the prenatal course. We are also assess-ing improvements in quality and safety through a centralized fetal heart rate monitoring bunker known as TeleStork. Conclusion(s): Through systematic integration of technology into the delivery of women's health care at Ochsner, we hope to demonstrate sustainable improvements in physician skills, patient access, and quality and safety.
https://dx.doi.org/10.31486/toj.19.0113

166. Comero S, Dalla Costa S, Cusinato A, Korytar P, Kephalopoulos S, Bopp S, et al. **A conceptual data quality framework for IPCHEM - The European Commission Information Platform for chemical monitoring**. TrAC - Trends in Analytical Chemistry. 2020;127:115879.
EU bodies, Member State authorities and research organisations make significant efforts to monitor numerous chemicals in various matrices (water, soil, sediment, biota, indoor and outdoor air, feed, food, products, etc.) based on requirements of EU legal acts, national and international initiatives and for scientific purposes. However, to access this information today policy makers and scientists are obliged to search and retrieve data from many different sources, using different interfaces with different levels of accessibility. As a consequence, they cannot easily compare data or promptly recognize missing information in terms of spatial coverage and temporal trends. Often, the data sources, as well as their lineage are not fully traceable, and the licence conditions for data access and use often are not specified and/or provided to the end users. The European Commission designed, developed and promoted IPCHEM, the Information Platform for Chemical Monitoring with the aim to offer a unique access point for discovering and accessing chemical monitoring datasets created and/or managed by European Commission bodies, research centres, Member States, international and national organisations. IPCHEM does not aim at providing a central database, but a web based distributed infrastructure granting remote access to data originating from various data sources. This approach allows integrating chemical monitoring data from various heterogeneous sources, of different level of spatial and temporal detail. However, in order to be used for different purposes including a regulatory context, these data need to be of known and defined quality. Quality in this context goes far beyond the mere analytical data quality and requires a novel definition and standardised assessment of data quality criteria in terms of spatial, temporal, methodological and metrological traceability. This paper describes the definition of a specific methodology and its current and future implementation in the IPCHEM architecture for the quality assurance and quality control (QA/QC) of data integrated into IPCHEM. A QA/QC statement scheme is defined in order to set a quality score, based on quality scoring groups, for each dataset.
https://dx.doi.org/10.1016/j.trac.2020.115879

167. Champagne C, Alfred JP, Deslouches YG, Ploetz M, Rajkumar AS, Meyer P, et al. **Improving access to care and community health in Haiti with optimized community health worker placement**. American Journal of Tropical Medicine and Hygiene. 2020;103(5 SUPPL):159.
Due to social and political vulnerabilities, as well as the number of natural disasters that Haiti had to face, the current health system cannot guarantee health service access and quality to the majority of the population. The deployment of polyvalent community health workers (CHWs), covering population in urban, rural and difficult-to-reach areas is a constitutive part of the person-centred primary care reinforcement initiated by the ministry of health and will accelerate efforts to reach universal health coverage. For its implementation, two essential elements need to be revisited: the organisation of the community health system as well as the package of services delivered. A methodology based on mathematical tools was developed to support the development of guidelines and inform the geographical deployment of Community Health Workers (CHWs) in Haiti. Fine-graded estimates of population and travel times were combined with integer programming optimisation methods to derive placement scenarios that account for population density, road networks and topography. In order to give guidance on important operational limitations, parameters included constraints on walking time and number of people allocated to each CHW, as well as proximity to existing health facilities. Several national-scale scenarios adapted to the Haitian context were compared, in order to inform the number and distribution of CHWs required to bridge the gap in access to health services. The results of the analysis advised the development of the National Strategic Community Health Plan by providing guidance on the expected number each CHW could serve and their catchment area. The planning tool developed to help target limited resources and optimize Haiti's revised community health system may prove useful in programming and costing community health plans in additional contexts.

168. Chabok M, Asakereh A, Bahrami H, Jaafarzadeh NO. **Selection of MSW landfill site by fuzzy-AHP approach combined with GIS: case study in Ahvaz, Iran**. Environmental monitoring and assessment. 2020;192(7):433.
The study was aimed to use fuzzy multi-criteria decision making integrated with GIS to select the optimum location for municipal solid waste (MSW) landfill sites that comply with standard landfill guidelines and environmental and socio-economic criteria. Fuzzy logic and, in particular, fuzzy sets were applied to create the criteria layers in GIS and to weigh

and integrate these layers in GIS. Analytical Hierarchy Process (AHP) was also used to determine the land suitability for landfill. The method was used as a case study to determine the location of landfills in the suburbs of Ahvaz, Iran. According to the results, transportation networks and residential and commercial areas were the most influential factors on the placement of landfills, with a final weight of 0.163 and 0.131, respectively. Areas near roads and transportation networks but far from the sensitive environmental zones were most suitable for landfill. Finally, 11 sites that met the defined requirements were selected as suitable locations for MSW landfill. This technique and its results can provide a proper guideline to help decision makers choose the optimal landfill site in the future. Depending on their importance in each region, the methodology can incorporate other factors and criteria.
https://dx.doi.org/10.1007/s10661-020-08395-y

169. Buckee CO, Balsari S, Chan J, Crosas M, Dominici F, Gasser U, et al. **Aggregated mobility data could help fight COVID-19**. Science (New York, NY). 2020;368(6487):145-6.

https://dx.doi.org/10.1126/science.abb8021

170. Brunetti ND, Molinari G, Acquistapace F, Zimotti T, Parati G, Indolfi C, et al. **2019 Italian Society of Cardiology Census on telemedicine in cardiovascular disease: A report from the working group on telecardiology and informatics**. Open Heart. 2020;7(1):e001157.
Background: The aim of this study was to assess by a census supported by the Italian Society of Cardiology (Societa Italiana di Cardiologia, SIC) the present implementation of telemedicine in the field of cardiovascular disease in Italy. Method(s): A dedicated questionnaire was sent by email to all the members of the SIC: data on telemedicine providers, service provided, reimbursement, funding and organisational solutions were collected and analysed. Result(s): Reported telemedicine activities were mostly stable and public hospital based, focused on acute cardiovascular disease and prehospital triage of suspected acute myocardial infarction (prehospital ECG, always interpreted by a cardiologist and not automatically reported by computerised algorithms). Private companies delivering telemedicine services in cardiology (ECGs, ambulatory ECG monitoring) were also present. In 16% of cases, ECGs were also delivered through pharmacies or general practitioners. ICD/CRT-D remote control was performed in 42% of cases, heart failure patient remote monitoring in 37% (21% vital parameters monitoring, 32% nurse telephone monitoring). Telemedicine service was public in 74% of cases, paid by the patient in 26%. About half of telemedicine service received no funding, 17% received State and/or European Union funding. Conclusion(s): Several telemedicine activities have been reported for the management of acute and chronic cardiovascular disease in Italy. The whole continuum of cardiovascular disease is covered by telemedicine solutions. A periodic census may be useful to assess the implementation of guidelines recommendations on telemedicine.
https://dx.doi.org/10.1136/openhrt-2019-001157

171. Bell N, Wilkerson R, Mayfield-Smith K, Lopez-De Fede A. **Association of Patient-Centered Medical Home designation and quality indicators within HRSA-funded community health center delivery sites**. BMC health services research. 2020;20(1):980.
BACKGROUND: Patient-Centered Medical Home (PCMH) adoption is an important strategy to help improve primary care quality within Health Resources and Service Administration (HRSA) community health centers (CHC), but evidence of its effect thus far remains mixed. A limitation of previous evaluations has been the inability to account for the proportion of CHC delivery sites that are designated medical homes., METHODS: Retrospective cross-sectional study using HRSA Uniform Data System (UDS) and certification files from the National Committee for Quality Assurance (NCQA) and the Joint Commission (JC). Datasets were linked through geocoding and an approximate string-matching algorithm. Predicted probability scores were regressed onto 11 clinical performance measures using 10% increments in site-level designation using beta logistic regression., RESULTS: The geocoding and approximate string-matching algorithm identified 2615 of the 6851 (41.8%) delivery sites included in the analyses as having been designated through the NCQA and/or JC. In total, 74.7% (n = 777) of the 1039 CHCs that met the inclusion criteria for the analysis managed at least one NCQA- and/or JC-designated site. A proportional increase in site-level designation showed a positive association with adherence scores for the majority of all indicators, but primarily among CHCs that designated at least 50% of its delivery sites. Once this threshold was achieved, there was a stepwise percentage point increase in adherence scores, ranging from 1.9 to 11.8% improvement, depending on the measure., CONCLUSION: Geocoding and approximate string-

matching techniques offer a more reliable and nuanced approach for monitoring the association between site-level PCMH designation and clinical performance within HRSA's CHC delivery sites. Our findings suggest that transformation does in fact matter, but that it may not appear until half of the delivery sites become designated. There also appears to be a continued stepwise increase in adherence scores once this threshold is achieved.
https://dx.doi.org/10.1186/s12913-020-05826-x

172. Behera M, Sena DR, Mandal U, Kashyap PS, Dash SS. **Integrated GIS-based RUSLE approach for quantification of potential soil erosion under future climate change scenarios**. Environmental monitoring and assessment. 2020;192(11):733.
Human-induced agricultural and developmental activities cause substantial alteration to the natural geography of a landscape; thereby accelerates the geologic soil erosion process. This necessitates quantification of catchment-scale soil erosion under both retrospective and future scenarios for efficient conservation of soil resources. Here, we present a revised universal soil loss equation (RUSLE) based soil erosion estimation framework at an unprecedentedly high spatial resolution (30 x 30 m) to quantify the average annual soil loss and sediment yield from an agriculture-dominated river basin. The input parameters were derived by using the observed rainfall data, soil characteristics (soil texture, hydraulic conductivity, organic matter content), and topographic characteristics (slope length and percent slope) derived from digital elevation model (DEM) and satellite imageries. The developed approach was evaluated in the Brahmani River basin (BRB) of eastern India, wherein the different RUSLE inputs, viz., rainfall erosivity (R factor), soil erodibility (K factor), topographic (LS factor), crop cover (C factor), and management practice (P factor) factors have the magnitude of 1937 to 4867 MJ mm ha-1 h-1 year-1, 0.023 to 0.039 t h ha MJ-1 ha-1 mm-1, 0.03 to 74, 0.16 to 1, and 0 to 1, respectively. The estimated average annual soil loss over the BRB ranged from 0 to 319.55 t ha-1 year-1, and subsequent erosion categorization revealed that 54.2% of basin area comes under extreme soil erosion zones in the baseline period. Similarly, the sediment yield estimates varied in the range of 0.96 to 133.31 t ha-1 year-1, and 35.81% area were identified as high soil erosion potential zones. The extent of erosion under climate change scenario was assessed using the outputs of HadGEM2-ES climate model for the future time scales of 2030, 2050, 2070, and 2080 under the four representative concentration pathways (RCPs) 2.6, 4.5, 6.0, and 8.5. The severity of soil erosion under climate change is expected to have a mixed impact in the range of -25 to 25% than the baseline scenario. The outcomes of this study will serve as a valuable tool for decision-makers while implementing management policies over the BRB, and can be well extended to any global catchment-scale applications.
https://dx.doi.org/10.1007/s10661-020-08688-2

173. Anderez DO, Kanjo E, Pogrebna G, Kaiwartya O, Johnson SD, Hunt JA. **A COVID-19-Based Modified Epidemiological Model and Technological Approaches to Help Vulnerable Individuals Emerge from the Lockdown in the UK**. Sensors (Basel, Switzerland). 2020;20(17).
COVID-19 has shown a relatively low case fatality rate in young healthy individuals, with the majority of this group being asymptomatic or having mild symptoms. However, the severity of the disease among the elderly as well as in individuals with underlying health conditions has caused significant mortality rates worldwide. Understanding this variance amongst different sectors of society and modelling this will enable the different levels of risk to be determined to enable strategies to be applied to different groups. Long-established compartmental epidemiological models like SIR and SEIR do not account for the variability encountered in the severity of the SARS-CoV-2 disease across different population groups. The objective of this study is to investigate how a reduction in the exposure of vulnerable individuals to COVID-19 can minimise the number of deaths caused by the disease, using the UK as a case study. To overcome the limitation of long-established compartmental epidemiological models, it is proposed that a modified model, namely SEIR-v, through which the population is separated into two groups regarding their vulnerability to SARS-CoV-2 is applied. This enables the analysis of the spread of the epidemic when different contention measures are applied to different groups in society regarding their vulnerability to the disease. A Monte Carlo simulation (100,000 runs) along the proposed SEIR-v model is used to study the number of deaths which could be avoided as a function of the decrease in the exposure of vulnerable individuals to the disease. The results indicate a large number of deaths could be avoided by a slight realistic decrease in the exposure of vulnerable groups to the disease. The mean values across the simulations indicate 3681 and 7460 lives could be saved when such exposure is reduced by 10% and 20% respectively. From the encouraging results of the modelling a number of mechanisms are proposed to limit the exposure of vulnerable individuals to the disease. One option could be the provision of a wristband to vulnerable people and those without a smartphone and contact-tracing

app, filling the gap created by systems relying on smartphone apps only. By combining very dense contact tracing data from smartphone apps and wristband signals with information about infection status and symptoms, vulnerable people can be protected and kept safer.
https://dx.doi.org/10.3390/s20174967

174. Amano H, Iwasaki Y. **Land Cover Classification by Integrating NDVI Time Series and GIS Data to Evaluate Water Circulation in Aso Caldera, Japan**. International journal of environmental research and public health. 2020;17(18).
Grasslands in Aso caldera, Japan, are a type of land cover that is integral for biodiversity, tourist attractions, agriculture, and groundwater recharge. However, the area of grasslands has been decreasing in recent years as a result of natural disasters and changes in social conditions surrounding agriculture. The question of whether the decrease in spring water discharge in Aso caldera is related to the decrease in grasslands remains unanswered. To clarify this relationship, a water circulation model that considers land covers with different hydrological features is needed. In this study, by integrating Normalized Difference Vegetation Index (NDVI) time series and Geographic Information System (GIS) data, we generated land cover maps from the past (in 1981 and 1991) to the present (in 2015 and 2016), before and after the 2016 Kumamoto earthquake, and then for the future (in the 2040s); these maps formed the dataset for building a water circulation model. The results show that the area of grasslands, which are reported to have a higher groundwater recharge rate than that of forests, in 2016 had decreased to 68% of the area in 1981 as a result of afforestation and transformation into forests, as well as landslides induced by the earthquake. The area of grasslands is predicted to further drop to 60% by the 2040s. On the other hand, the area of forests (conifers and hardwoods) in 2016 had increased by 119% relative to that in 1981 because of the transformation of grasslands into forests, although these areas decreased as a result of landslides due to the 2016 Kumamoto earthquake. Quantification of groundwater recharge from grasslands and forests using the land cover maps generated for 1981, 1996, 2015, and 2016 shows that the annual increase in precipitation in these years significantly affected groundwater recharge; these effects were greater than those associated with the type of land cover. Thus, the groundwater recharge increased, despite the decrease in grasslands. However, when constant precipitation was assumed, the groundwater recharge presented a decreasing trend, indicating the importance of maintaining and conserving grasslands from the viewpoint of groundwater conservation.
https://dx.doi.org/10.3390/ijerph17186605

175. Alarcao ACJ, Dell' Agnolo CM, Vissoci JR, Carvalho ECA, Staton CA, de Andrade L, et al. **Suicide mortality among youth in southern Brazil: A spatiotemporal evaluation of socioeconomic vulnerability**. Brazilian Journal of Psychiatry. 2020;42(1):46-53.
Objective: To conduct a geospatial analysis of suicide deaths among young people in the state of Parana, southern Brazil, and evaluate their association with socioeconomic and spatial determinants. Method(s): Data were obtained from the Mortality Information System and the Brazilian Institute of Geography and Statistics. Data on suicide mortality rates (SMR) were extracted for three age groups (15-19, 20-24, and 25-29 years) from two 5-year periods (1998-2002 and 2008-2012). Geospatial data were analyzed through exploratory spatial data analysis. We applied Bayesian networks algorithms to explore the network structure of the socioeconomic predictors of SMR. Result(s): We observed spatial dependency in SMR in both periods, revealing geospatial clusters of high SMR. Our results show that socioeconomic deprivation at the municipality level was an important determinant of suicide in the youth population in Parana, and significantly influenced the formation of high-risk SMR clusters. Conclusion(s): While youth suicide is multifactorial, there are predictable geospatial and socio-demographic factors associated with high SMR among municipalities in Parana. Suicide among youth aged 15-29 occurs in geographic clusters which are associated with socioeconomic deprivation. Rural settings with poor infrastructure and development also correlate with increased SMR clusters.
https://dx.doi.org/10.1590/1516-4446-2018-0352

176. **A Multistage, Geocoding Approach for the Development of a Database of Private Wells in Gaston County, North Carolina**. Journal of Environmental Health. 2020;83(4):8-15.
The article discusses research which focused on the utilization of geocoding techniques in the development of a geographic information systems (GIS) database of private wells located in Gaston County, North Carolina. Topics explored include the combination of reference data sets to ensure successful geocoding match rates, the link between

positional accuracy and geocoding data quality, and the possible use of this GIS database in the evaluation of drinking water quality.

177. Zanotti C, Rotiroti M, Fumagalli L, Stefania GA, Canonaco F, Stefenelli G, et al. **Groundwater and surface water quality characterization through positive matrix factorization combined with GIS approach**. Water research. 2019;159:122-34.
This study aims at testing the effectiveness of Positive Matrix Factorization in characterizing groundwater and surface water quality, in terms of identifying main hydrochemical features and processes (natural and anthropogenic) that govern them. This method is applied in a hydro-system featured by a strong interrelation between groundwater and surface water and highly impacted by agricultural activities. Therefore, a holistic approach considering groundwater together with the surface water bodies, consisting in lake, several rivers and springs, was used. Multivariate statistical analysis, in particular Factor Analysis, has been proved to be effective in elaborating and interpreting water quality data highlighting the information carried within them, but it presents some limitations: it does not consider data uncertainty and it groups variables which are correlated positively and negatively. Moreover, in some cases the resulting factors are not clearly interpretable, describing each one various overlapping features/processes. Here, Positive Matrix Factorization is applied to groundwater and surface water quality data, and the results are compared to those obtained through a Factor Analysis in terms of both factor profiles and their spatial distribution through a GIS approach. Results of isotopes analysis are used to validate PMF output and support interpretation. Positive Matrix Factorization allows to consider data uncertainty and the solution respects two positivity constraints, based on the concept of chemical mass balance, which leads to a more environmentally interpretable solution. Results show that Positive Matrix Factorization identifies five different factors reflecting main features and natural and anthropogenic processes affecting the study area: 1) surface water used for irrigation, 2) groundwater subjected to reducing processes at advanced stages, 3) groundwater subjected to reducing processes at early stages, 4) groundwater residence time and 5) the effects of the agricultural land use on both groundwater and surface water. Positive Matrix Factorization leads to a more detailed understanding of the studied system as compared to Factor Analysis which identifies only three factors with overlapping information. Based on the results of this study, Positive Matrix Factorization could be a useful technique to perform groundwater and surface water quality characterization and to reach a deeper understanding of the phenomena that govern water chemistry.
https://dx.doi.org/10.1016/j.watres.2019.04.058

178. Yang Y, Zhao Y, Zhang L, Lu Y. **Evaluating the methods and influencing factors of satellite-derived estimates of NOX emissions at regional scale: A case study for Yangtze River Delta, China**. Atmospheric Environment. 2019;219:117051.
The top-down estimation of NOX emissions and their influencing factors were evaluated based on the "synthetic" and real satellite observation methods at different spatial scales in eastern China. Using the "synthetic" NO2 vertical column densities (VCD) simulated from a hypothetical "true" emission inventory, the top-down estimates of NOX emissions for the Yangtze River Delta (YRD) region at 9 km resolution and the Southern Jiangsu City Cluster (SJC) at 3 km resolution were obtained using various inverse modeling approaches and the a priori emissions for January and July 2012. The normalized mean biases (NMBs) between the top-down and the hypothetical "true" emissions for all the cases were smaller than 6%, which indicates that both linear and nonlinear approaches could effectively constrain the total amount of emissions, with limited influence from spatial resolution, a priori emissions, and seasons. Larger differences for most cases were found for the normalized mean errors (NMEs), implying that the inverse modeling approach and other influencing factors played a more important role on the spatial distribution of the top-down estimates. Two NO2 VCD products from real satellite observation (Dutch OMI NO2 data product v2 (DOMINO v2) and Peking University OMI NO2 data product v2 (POMINO v2)) were then applied to emissions constraints. The NMEs between the top-down estimates derived from the two products were calculated at 182% and 99% for January and July, respectively, indicating the great importance of satellite observation in constraining emissions. With the nonlinear inverse modeling approach, the top-down estimates of NOX emissions based on POMINO v2 were 25%-60% smaller than the national bottom-up inventory for the four seasons in the YRD, which indicates overestimation by the bottom-up method due to the insufficient consideration of recent air pollution control policy. At the 9 km resolution, the simulated NO2 concentrations with air quality modeling based on the top-down estimates were much closer to available ground observation than the bottom-

up ones for all seasons, which suggests improved emissions estimation from the inverse model at regional scales.Copyright © 2019 Elsevier Ltd.
https://dx.doi.org/10.1016/j.atmosenv.2019.117051

179. Szczesniak RD, Brokamp C, Ryan P, Ni Y, Andrinopoulou E, Keogh RH, et al. **Characterizing socioeconomic deprivation, climate and high traffic pollution improves prediction of lung-function trajectories**. Pediatric Pulmonology. 2019;54(Supplement 2):233-4.
Introduction: Environmental exposures and community characteristics (geomarkers) have been shown to influence pulmonary outcomes and interventions in cystic fibrosis (CF) patients, but the ability of comprehensive and precise geomarkers estimated at the local (ie, geocoded) level to predict FEV1 decline has not been studied. Method(s): Residential addresses were obtained and geocoded for a longitudinal cohort study of 212 CF patients aged 6-20 years who received care at Cincinnati Children's Hospital CF Center (2012-2017). Community and environmental geomarkers derived at the residential addresses for study participants included daily temperature, relative humidity, an index of community deprivation derived from US Census data, greenspace (defined by remote sensing data), and estimated concentrations of air pollution including fine particulate matter (PM2.5) and traffic-related air pollution (TRAP) derived from validated models. We applied a novel longitudinal model to predict FEV1 (the outcome) using the geomarkers and considered routinely collected clinical/demographic characteristics (genotype, birth year, sex, Medicaid insurance use, CF-related diabetes, infections with Pseudomonas and MRSA) as covariates. Time was modeled as age at clinical encounter (in years). Parameter estimates are reported with mean, SE and p-value (P). We selected a final prediction model using backward elimination (P<0.10). Improvement in model fit and prediction by including geomarkers were evaluated with the likelihood ratio test (LRT) and decrease in root mean-square error (RMSE), respectively. Result(s): The final prediction model, which retained a subset of geomarkers and clinical/demographic variables (sex, Medicaid insurance use and birth year), estimated population-level rate of decline as -1.39 (0.43)% predicted (pred)/year (P<0.0001). Higher temperature (Kelvin) corresponded to lower overall FEV1 (-0.6% pred drop for every 10-unit increase on Kelvin scale, P<0.0001). Individuals with increased community deprivation and TRAP exposure experienced more rapid decline (-1.45 [0.85]% pred/year, P=0.09, and -1.41 [0.80]% pred/year, P=0.07). Including these geomarkers yielded significantly better fit and improved prediction of FEV1 , compared to a model with only clinical/demographic characteristics (likelihood ratio test statistic: 40.7, P<0.0001; RMSE decreased by 4.2% predicted). Conclusion(s): Including geomarkers more accurately predicts pulmonary decline in CF, elucidates potential impacts of climatology, traffic pollution and socioeconomic status and has applications for clinicians in assessing prognosis and personalizing environmental health interventions.
https://dx.doi.org/10.1002/ppul.22495

180. Price H, Adams E, Quilliam RS. **The difference a day can make: The temporal dynamics of drinking water access and quality in urban slums**. Science of the Total Environment. 2019;671:818-26.
In urban slums - home to approximately 1 billion people worldwide - access to clean drinking water is woefully inadequate despite the United Nations' declaration that access to safe water is a fundamental human right. Households in slums are frequently forced to rely on multiple drinking water sources to meet their needs. Numerous factors influence choice of water source, including water quality, availability, reliability, and affordability. These factors are not temporally static, but instead vary over multiple timescales (from sub-daily changes to annual changes and beyond) in response to changes in the water source itself and changes in the household's ability to use that source. For example, the cost of water can may change over time in response to water availability (e.g. rainy season versus dry season) and a slum household's ability to pay for water may change over time in response to changes in household income. However, existing national and global monitoring of safe water access, including Sustainable Development Goal 6, overlook these temporal dynamics of water access, quality and health risk in slums. This paper proposes a research agenda for exploring temporal changes in drinking water access and quality in urban slums and their potential influence on health risk. It argues that in the design of research studies, policy interventions, and drinking water monitoring aimed at improving access and health in urban slums, temporal dynamics should be considered over at least three interlinked time scales: short-term (from sub-daily to week-to-week), medium-term (from month-to-month to season-to-season) and long-term (from year-to-year). The paper concludes with recommendations for future research on temporal dynamics of drinking water and health in slums.Copyright © 2019 Elsevier B.V.
https://dx.doi.org/10.1016/j.scitotenv.2019.03.355

181. Ouedraogo B, Gaudart J, Dufour J-C. **How does the cellular phone help in epidemiological surveillance? A review of the scientific literature**. Informatics for health & social care. 2019;44(1):12-30.
BACKGROUND: In the field of epidemiological surveillance, no systematic literature review appears to exist of implemented projects using cellular phone technology., METHOD: We performed a systematic literature review using the Pubmed and Scopus databases to retrieve articles published up to December 2015. We analyzed information reported in these publications according to the mobile health (mHealth) evidence reporting and assessment (mERA) checklist, and complemented this work with specific items related to epidemiology, in order to clarify the types of results reported and summarized in this context., RESULTS: Thirty-three articles were selected and reviewed. Each article was related to a different project. Two mERA items were systematically and fully reported, while two others were never reported. Three projects were deployed in very specific zones. Most of the projects were implemented in Africa. Infectious diseases were the elements most monitored. Most projects were based on daily data collection and SMS transmission. Economic assessment was limited to SMS, mobile phone, and implementation costs., DISCUSSION-CONCLUSION: Although suitable for epidemiologic surveillance, the mERA checklist needs further interpretation. The technical and transmission modes of cellular phone use varied greatly from one study to another. No evaluation of the interoperability capabilities of cellular phones with other applications or sub-systems was possible.
https://dx.doi.org/10.1080/17538157.2017.1354000

182. Ottaviano M, Beltran-Jaunsaras ME, Terius-Padron JG, Garcia-Betances RI, Gonzalez-Martinez S, Cea G, et al. **Empowering Citizens through Perceptual Sensing of Urban Environmental and Health Data Following a Participative Citizen Science Approach**. Sensors (Basel, Switzerland). 2019;19(13).
The growth of the urban population together with a high concentration of air pollution have important health impacts on citizens who are exposed to them, causing serious risks of the development and evolution of different chronic diseases. This paper presents the design and development of a novel participatory citizen science-based application and data ecosystem model. These developments are imperative and scientifically designed to gather and process perceptual sensing of urban, environmental, and health data. This data acquisition approach allows citizens to gather and generate environment- and health-related data through mobile devices. The sum of all citizens' data will continuously enrich and increase the volumes of data coming from the city sensors and sources across geographical locations. These scientifically generated data, coupled with data from the city sensors and sources, will enable specialized predictive analytic solutions to empower citizens with urban, environmental, and health recommendations, while enabling new data-driven policies. Although it is difficult for citizens to relate their personal behaviour to large-scale problems such as climate change, pollution, or public health, the developed ecosystem provides the necessary tools to enable a greener and healthier lifestyle, improve quality of life, and contribute towards a more sustainable local environment.
https://dx.doi.org/10.3390/s19132940

183. Ocampo CB, Mina NJ, Echavarria MI, Acuna M, Caballero A, Navarro A, et al. **VECTOS: An Integrated System for Monitoring Risk Factors Associated With Urban Arbovirus Transmission**. Global health, science and practice. 2019;7(1):128-37.
In Colombia, as in many Latin American countries, decision making and development of effective strategies for vector control of urban diseases such as dengue, Zika, and chikungunya is challenging for local health authorities. The heterogeneity of transmission in urban areas requires an efficient risk-based allocation of resources to control measures. With the objective of strengthening the capacity of local surveillance systems to identify variables that favor urban arboviral transmission, a multidisciplinary research team collaborated with the local Secretary of Health officials of 3 municipalities in Colombia (Giron, Yopal, and Buga), in the design of an integrated information system called VECTOS from 2015 to 2018. Information and communication technologies were used to develop 2 mobile applications to capture entomological and social information, as well as a web-based system for the collection, geo-referencing, and integrated information analysis using free geospatial software. This system facilitates the capture and analysis of epidemiological information from the Colombian national surveillance system (SIVIGILA), periodic entomological surveys-mosquito larvae and pupae in premises and peridomestic breeding sites-and surveys of knowledge, attitudes, and practices (KAP) in a spatial and temporal context at the neighborhood level. The data collected in VECTOS are mapped and visualized in graphical reports. The system enables real-time monitoring of weekly epidemiological indicators, entomological indices, and social surveys. Additionally, the system enables risk stratification of neighborhoods, using selected epidemiological,

entomological, demographic, and environmental variables. This article describes the VECTOS system and the lessons learned during its development and use. The joint analysis of epidemiological and entomological data within a geographic information system in VECTOS gives better insight to the routinely collected data and identifies the heterogeneity of risk factors between neighborhoods. We expect the system to continue to strengthen vector control programs in evidence-based decision making and in the design and enhanced follow-up of vector control strategies. Copyright © Ocampo et al.
https://dx.doi.org/10.9745/GHSP-D-18-00300

184. Moore K, Merritt A, Bobo B, Graham A, Kuhn A. **Using geographic information systems (GIS) to analyze statewide regional data-a feasibility project from the Kentucky stroke encounter quality improvement project (SEQIP)**. Circulation: Cardiovascular Quality and Outcomes. 2019;12(SUPPL 1).
Background: The Stroke Encounter Quality Improvement Project (SEQIP) is a collaboration between certified stroke centers, the AHA/ASA and the Kentucky Department for Public Health (KDPH) to implement statewide QI initiatives to improve the care of stroke patients. From 2009 to 2018, 23 hospital in Kentucky participating in SEQIP have entered 76,222 stroke patient records into Get With The Guidelines (GWTG) / Patient Management ToolTM (PMT). Purpose(s): Geographic information systems (GIS) tools can expand our understanding of care and outcomes based on patient location. The purpose of this project was to demonstrate the methods of linking a disease management registry with GIS mapping and analysis program,) to understand challenges when performing this link, and to derive meaningful insight on stroke care and outcomes by zip code. Method(s): Stroke data from GWTG and PMT was compiled and downloaded by KDPH. The information was converted to a database file for use in ArcGIS. After excluding those who had missing or incomplete zip codes, records were Geocoded annually from 2009 to 2018. The data were then matched to one of 945 zip codes in Kentucky. Data were summarized by zip code, calendar year by the number of ischemic strokes; number IV alteplase administration; rate ischemic stroke receiving IV alteplase; number and rate of ischemic stroke patients arriving to hospital by EMS, privately owned vehicle or transfer; and median time from last known well to hospital arrival; and medical history of hypertension. Additional data including hospitals, certified stroke centers, drive time analysis, etc. were added to maps. Result(s): Mapping GWTG and PMT stroke data is feasible and may allow for additional analysis by location. Conclusion(s): Using GIS mapping and methodology can assist hospital stroke coordinators and public health officials in developing and implementing interventions to improvement stroke care and outcomes. Further analysis including socioeconomic, demographic and marketing/consumer preference data is planned to better understand variations by zip codes. This feasibility project provides an example of a useful application of GIS analyses applied to data registry including GWTG and PMT.
https://dx.doi.org/10.1161/hcq.12.suppl-1.141

185. McKee M, van Schalkwyk MCI, Stuckler D. **The second information revolution: digitalization brings opportunities and concerns for public health**. European journal of public health. 2019;29(Supplement_3):3-6.
The spread of the written word, facilitated by the introduction of the printing press, was an information revolution with profound implications for European society. Now, a second information revolution is underway, a digital transformation that is shaping the way Europeans live and interact with each other and the world around them. We are confronted with an unprecedented expansion in ways to share and access information and experiences, to express ourselves and communicate. Yet while these changes have undoubtedly provided many benefits for health, from information sharing to improved surveillance and diagnostics, they also open up many potential threats. These come in many forms. Here we review some the pressing issues of concern; discrimination; breaches of privacy; iatrogenesis; disinformation and misinformation or 'fake news' and cyber-attacks. These have the potential to impact negatively on the health and wellbeing of individuals as well as entire communities and nations. We call for a concerted European response to maximize the benefits of the digital revolution while minimizing the harms, arguably one of the greatest challenges facing the public health community today. Copyright © The Author(s) 2019. Published by Oxford University Press on behalf of the European Public Health Association.
https://dx.doi.org/10.1093/eurpub/ckz160

186. Liao Z, Zhou C, Tian W, Hu T, Guo R. **CBR-based integration of a hydrodynamic and water quality model and GIS-a case study of Chaohu City**. Environmental science and pollution research international. 2019;26(7):6436-49.

Monitoring on urban water environment and analysis of engineering improvement measures are intricate and time-consuming tasks. In previous studies, the integration of hydrodynamic and water quality models and geographical information system (GIS) usually takes three approaches: loose coupling, tight coupling, and full coupling. However, this paper adopted a special loose coupling approach-case-based reasoning (CBR) to develop an integrated decision support system. This was characterized by invoking the case base stored in the GIS platform as the output of the model. The fused capability of model's water quality predication and strong spatial data processing analysis of GIS can be realized at the same time by integration. The functionality of the integrated system was illustrated through a case study of Chaohu, a medium-sized city in China, which includes case retrieval, result interpretation, and the visual display in the GIS platform. Results verified the feasibility and operability of the developed method. As a useful tool, the integrated decision support system makes it simpler and more convenient for decision makers to make decisions efficiently and quickly.
https://dx.doi.org/10.1007/s11356-018-3862-5

187. Kruse CS, Guerra DA, Gelillo-Smith R, Vargas A, Krishnan L, Stigler-Granados P. **Leveraging Technology to Manage Chagas Disease by Tracking Domestic and Sylvatic Animal Hosts as Sentinels: A Systematic Review**. The American journal of tropical medicine and hygiene. 2019;101(5):1126-34.
Surveillance of Chagas in the United States show more is known about prevalence in animals and vectors than in humans. Leveraging health information technology (HIT) may augment surveillance efforts for Chagas disease (CD), given its ability to disseminate information through health information exchanges (HIE) and geographical information systems (GISs). This systematic review seeks to determine whether technological tracking of Trypanosoma cruzi-infected domestic and/or sylvatic animals as sentinels can serve as a potential surveillance resource to manage CD in the southern United States. A Boolean search string was used in PubMed and CINAHL. Relevance of results was established and analysis of articles was performed by multiple reviewers. The overall Cohen statistic was 0.73, demonstrating moderate agreement among the study team. Four major themes were derived for this systematic review (n = 41): animals act as reservoir hosts to perpetuate CD, transmission to humans could be dependent on cohabitation proximity, variations in T. cruzi genotypes could lead to different clinical manifestations, and leveraging technology to track T. cruzi in domestic animals could reveal prevalent areas or "danger zones." Overall, our systematic review identified that HIT can serve as a surveillance tool to manage CD. Health information technology can serve as a surveillance tool to manage CD. This can be accomplished by tracking domestic and/or sylvatic animals as sentinels within a GIS. Information can be disseminated through HIE for use by clinicians and public health officials to reach at-risk populations.
10.4269/ajtmh.19-0050

188. Kim DH, Yang SM, Park J, Kim J. **The Effect of Public Health Physical Program on Paretic Side in Environmental Water Quality**. Toxicology and Environmental Health Sciences. 2019;11(3):252-6.
Objective: The purpose of this study was to evaluate the effects of aquatic treadmill exercise, also called public health physical program (PHPP), including healthy environmental water quality on walking speed, step length, and gait symmetry ratios in stroke. Method(s): Ten patients with hemiplegic stroke admitted for treatment were recruited for this study. The walking program consisted of administering concentrative aquatic therapy for four weeks in a therapeutic pool with a water depth equal to the xiphoid process and a water temperature of 30degreeC. Walking parameters were measured using a gait analysis system adjusted to each subject's comfortable gait velocity. Result(s): The velocity of walking significantly increased after the PHPP in hemiplegic subjects. Step length of paretic and non-paretic lower limbs did not change significantly from before to after the PHPP. The stance phase ratio was significantly improved after the PHPP in stroke. However, no significant improvement was found in swing phase time ratio after the PHPP. Conclusion(s): These results suggest that the public health physical program during aquatic therapy may in part cont ribute to clinically relevant improvements in walking parameters.Copyright © 2019, The Korean Society of Environmental Risk Assessment and Health Science and Springer.
https://dx.doi.org/10.1007/s13530-019-0411-7

189. Kavurmaci M, Apaydin A. **Assessment of irrigation water quality by a Geographic Information System-Multicriteria Decision Analysis-based model: A case study from Ankara, Turkey**. Water environment research : a research publication of the Water Environment Federation. 2019;91(11):1420-32.

In this study, the irrigation water quality of Eryaman region in Ankara (Turkey) has been investigated using a Geographic Information System-Multicriteria Decision Analysis (GIS-MCDA)-based model. Two different irrigation water quality indices (IWQI-A and IWQI-B) based on Analytic Hierarchy Process (AHP) and Data Envelopment Analysis (DEA) have been developed to provide a single suitability score for all criteria of irrigation water quality. The irrigation water quality indices were composed of 3 main criteria and 11 sub-criteria. Based on irrigation water quality indices, four suitability classes have been identified as (a) excellent, (b) good, (c) permissible, and (d) unsuitable. Irrigation water quality maps were created by using kriging method and the water quality index scores. The temporal variation of irrigation water quality was evaluated using the models created for July 2007, 2010, and 2015 years. The most suitable areas for irrigation water are concentrated in the eastern and western parts of the region where the IWQI-B scores were >0.85. In recent years, the deterioration in irrigation water quality has increased in the southern parts of the basin. This research has demonstrated that the indices created by using DEA and AHP methods are reliable indicators to assess irrigation water quality. PRACTITIONER POINTS: Water quality indices can be used to depict the overall water quality status in water management planning. To avoid problems when modeling groundwater quality, the factors that have the most effect on water quality should be selected. Analytic Hierarchy Process and Data Envelopment Analysis techniques are efficient and reliable methods to determine water quality.
https://dx.doi.org/10.1002/wer.1133

190. Karakus CB. **Evaluation of groundwater quality in Sivas province (Turkey) using water quality index and GIS-based analytic hierarchy process**. International journal of environmental health research. 2019;29(5):500-19.
The main purpose of the research was to evaluate the groundwater quality in wet and dry seasons of the study area and determine the areas with high water quality. First, diagrams commonly used in groundwater quality assessment were prepared. Water quality index (WQI) values were calculated by using water quality parameters, spatial distribution maps of WQI and water quality parameters were created by using Geographical Information System (GIS). Groundwater quality mapping was performed with the help of GIS-based analytic hierarchy process. The obtained findings showed that, 91.66% and 77.07% of groundwater samples respectively received at wet and dry seasons have been suitable for drinking. Groundwater quality of around Sivas city center has been rated with 'excellent' water quality. The most important factors affecting the water quality of the research area were the lithological characteristics of the area and agricultural uses. TDS, NO3, SO4, Cr and As are the parameters that negatively affect water quality.
https://dx.doi.org/10.1080/09603123.2018.1551521

191. Holt JB, Matthews KA, Lu H, Wang Y, LeClercq JM, Greenlund KJ, et al. **Small Area Estimates of Populations With Chronic Conditions for Community Preparedness for Public Health Emergencies**. American Journal of Public Health. 2019;109:S325-S31.
Objectives. To demonstrate a flexible and practical method to obtain near real-time estimates of the number of at-risk community-dwelling adults with a chronic condition in a defined area potentially affected by a public health emergency. Methods. We used small area estimation with survey responses from the 2016 Behavioral Risk Factor Surveillance System together with a geographic information system to predict the number of adults with chronic obstructive pulmonary disease who lived in the forecasted path of Hurricane Florence in North and South Carolina in 2018. Results. We estimated that a range of 32 002 to 676 536 adults with chronic obstructive pulmonary disease resided between 50 and 200 miles of 3 consecutive daily forecasted landfalls. The number of affected counties ranged from 8 to 10 (at 50 miles) to as many as 119 to 127 (at 200 miles). Conclusions. Community preparedness is critical to anticipating, responding to, and ameliorating these health threats. We demonstrated the feasibility of quickly producing detailed estimates of the number of residents with chronic conditions who may face life-threatening situations because of a natural disaster. These methods are applicable to a range of planning and response scenarios. [ABSTRACT FROM AUTHOR]

10.2105/AJPH.2019.305241

192. Gu Y-G, Gao Y-P. **An unconstrained ordination- and GIS-based approach for identifying anthropogenic sources of heavy metal pollution in marine sediments**. Marine pollution bulletin. 2019;146:100-5.
A new method consisting of enrichment factor (EF) determination, nonmetric multidimensional scaling (NMS), and the geographic information system (GIS) technique was firstly developed to identify anthropogenic heavy metal sources in marine sediments of Hong Kong. Firstly, the EF was determined to differentiate between heavy metals originating from human and natural sources. Subsequently, NMS was applied to identify various source patterns of heavy metals, and the NMS score was calculated and spatially interpolated using GIS technology to evaluate the spatial influences of anthropogenic impacts in different areas. The concentrations of heavy metals in sediments of Hong Kong substantially exceeded their background values, demonstrating anthropogenic pollution. Two different types of human sources could be identified via NMS, one representing the industrial pollution discharges in the period from the 1960s to the 1980s before pollution control was introduced and one representing sewage discharge before the Tolo Harbour Action Plan in the mid-1980s.
https://dx.doi.org/10.1016/j.marpolbul.2019.06.008

193. Giovenco DP, Spillane TE. **Improving Efficiency in Mobile Data Collection for Place-Based Public Health Research**. American Journal of Public Health. 2019;109:S123-S5.
An editorial is presented which addresses the authors' views about improving the efficiency and accuracy of geographic mobile data collection in relation to public health research in America. The U.S. Centers for Disease Control and Prevention's 500 Cities Project involving health indicators for American cities is examined, along with geographic differences in health. Public health research-related mobile technologies and tobacco marketing in New York, New York are assessed.
10.2105/AJPH.2018.304875

194. Frutos B, Martín-Consuegra F, Alonso C, de Frutos F, Sánchez V, García-Talavera M. **Geolocation of premises subject to radon risk: Methodological proposal and case study in Madrid**. Environmental Pollution. 2019;247:556-63.
Useful information on the potential radon risk in existing buildings can be obtained by combining data from sources such as potential risk maps, the 'Sistema de Información sobre Ocupación del Suelo de España' (SIOSE) [information system on land occupancy in Spain], cadastral data on built property and population surveys. The present study proposes a method for identifying urban land, premises and individuals potentially subject to radon risk. The procedure draws from geographic information systems (GIS) pooled at the municipal scale and data on buildings possibly affected. The method quantifies the magnitude of the problem in the form of indicators on the buildings, number of premises and gross floor area that may be affected in each risk category. The findings are classified by type of use: residential, educational or office. That information may guide health/prevention policies by targeting areas to be measured based on risk category, or protection policies geared to the construction industry by estimating the number of buildings in need of treatment or remediation. Application of the methodology to Greater Madrid showed that 47% of the municipalities have houses located in high radon risk areas. Using cadastral data to zoom in on those at highest risk yielded information on the floor area of the vulnerable (basement, ground and first storey) premises, which could then be compared to the total. In small towns, the area affected differed only scantly from the total, given the substantial proportion of low-rise buildings in such municipalities. Graphical abstract Image 10209 Highlights • The new method developed detects buildings at high radon risk. • It is useful for sizing National Action Plan allocations. • Area and risk levels were quantified in Madrid's schools, dwellings and offices. • Estimated risk levels can be graphically displayed for individual buildings. • The method is applicable to other regions. [ABSTRACT FROM AUTHOR]

10.1016/j.envpol.2019.01.083

195. Devitt SK, Baxter PWJ, Hamilton G. **The Ethics of Biosurveillance**. Journal of Agricultural & Environmental Ethics. 2019;32(5/6):709-40.

Governments must keep agricultural systems free of pests that threaten agricultural production and international trade. Biosecurity surveillance already makes use of a wide range of technologies, such as insect traps and lures, geographic information systems, and diagnostic biochemical tests. The rise of cheap and usable surveillance technologies such as remotely piloted aircraft systems (RPAS) presents value conflicts not addressed in international biosurveillance guidelines. The costs of keeping agriculture pest-free include privacy violations and reduced autonomy for farmers. We argue that physical and digital privacy in the age of ubiquitous aerial and ground surveillance is a natural right to allow people to function freely on their land. Surveillance methods must be co-created and justified through using ethically defensible processes such as discourse theory, value-centred design and responsible innovation to forge a cooperative social contract between diverse stakeholders. We propose an ethical framework for biosurveillance activities that balances the collective benefits for food security with individual privacy: (1) establish the boundaries of a biosurveillance social contract; (2) justify surveillance operations for the farmers, researchers, industry, the public and regulators; (3) give decision makers a reasonable measure of control over their personal and agricultural data; and (4) choose surveillance methodologies that give the appropriate information. The benefits of incorporating an ethical framework for responsible biosurveillance innovation include increased participation and accumulated trust over time. Long term trust and cooperation will support food security, producing higher quality data overall and mitigating against anticipated information gaps that may emerge due to disrespecting landholder rights. [ABSTRACT FROM AUTHOR]

10.1007/s10806-019-09775-2

196. DePriest KN, Shields TM, Curriero FC. **Returning to our roots: The use of geospatial data for nurse-led community research**. Res Nurs Health. 2019;42(6):467-75.
In the early 20th century, public health nurse, Lillian Wald, addressed the social determinants of health (SDOH) through her work in New York City and her advocacy to improve policy in workplace conditions, education, recreation, and housing. In the early 21st century, addressing the SDOH is a renewed priority and provides nurse researchers with an opportunity to return to our roots. The purpose of this methods paper is to examine how the incorporation of geospatial data and spatial methodologies in community research can enhance the analyses of the complex relationships between social determinants and health. Geospatial technologies, software for mapping and working with geospatial data, statistical methods, and unique considerations are discussed. An exemplar for using geospatial data is presented regarding associations between neighborhood greenspace, neighborhood violence, and children's asthma control. This innovative use of geospatial data illustrates a new frontier in investigating nontraditional connections between the environment and SDOH outcomes.
10.1002/nur.21984

197. de Jong BC, Gaye BM, Luyten J, van Buitenen B, Andre E, Meehan CJ, et al. **Ethical Considerations for Movement Mapping to Identify Disease Transmission Hotspots**. Emerging infectious diseases. 2019;25(7).
Traditional public health methods for detecting infectious disease transmission, such as contact tracing and molecular epidemiology, are time-consuming and costly. Information and communication technologies, such as global positioning systems, smartphones, and mobile phones, offer opportunities for novel approaches to identifying transmission hotspots. However, mapping the movements of potentially infected persons comes with ethical challenges. During an interdisciplinary meeting of researchers, ethicists, data security specialists, information and communication technology experts, epidemiologists, microbiologists, and others, we arrived at suggestions to mitigate the ethical concerns of movement mapping. These suggestions include a template Data Protection Impact Assessment that follows European Union General Data Protection Regulations.
https://dx.doi.org/10.3201/eid2507.181421

198. Coudon T, Danjou AMN, Faure E, Praud D, Severi G, Mancini FR, et al. **Development and performance evaluation of a GIS-based metric to assess exposure to airborne pollutant emissions from industrial sources**. Environmental health : a global access science source. 2019;18(1):8.

BACKGROUND: Dioxins are environmental and persistent organic carcinogens with endocrine disrupting properties. A positive association with several cancers, including risk of breast cancer has been suggested., OBJECTIVES: This study aimed to develop and assess performances of an exposure metric based on a Geographic Information System (GIS) through comparison with a validated dispersion model to estimate historical industrial dioxin exposure for its use in a case-control study nested within a prospective cohort., METHODS: Industrial dioxin sources were inventoried over the whole French territory (n > 2500) and annual average releases were estimated between 1990 and 2008. In three selected areas (rural, urban and urban-costal), dioxin dispersion was modelled using SIRANE, an urban Gaussian model and exposure of the French E3N cohort participants was estimated. The GIS-based metric was developed, calibrated and compared to SIRANE results using a set of parameters (local meteorological data, characteristics of industrial sources, e.g. emission intensity and stack height), by calculating weighted kappa statistics (wkappa) and coefficient of determination (R2). Furthermore, as performance evaluation, the final GIS-based metric was tested to assess atmospheric exposure to cadmium., RESULTS: The concordance between the GIS-based metric and the dispersion model for dioxin exposure estimate was strong (wkappa median = 0.78 (1st quintile = 0.72, 3rd quintile =0.82) and R2 median = 0.82 (1st quintile = 0.71, 3rd quintile = 0.87)). We observed similar performance for cadmium., CONCLUSIONS: Our study demonstrated the ability of the GIS-based metric to reliably characterize long-term environmental dioxin and cadmium exposures as well as the pertinence of using dispersion modelling to construct and calibrate the GIS-based metric.
https://dx.doi.org/10.1186/s12940-019-0446-x

199. Clarke A, Blidi N, Dahn B, Agbo C, Tuopileyi R, Rude MJ, et al. **Strengthening acute flaccid paralysis surveillance post Ebola virus disease outbreak 2015 - 2017: the Liberia experience**. The Pan African medical journal. 2019;33(Suppl 2):2.
INTRODUCTION: Liberia remains at high risk of poliovirus outbreaks due to importation. The country maintained certification level acute flaccid paralysis (AFP) surveillance indicators each year until 2014 due to Ebola outbreak. During this time, there was a significant drop in non-polio AFP rate to (1.2/100,000 population under 15 years) in 2015 from 2.9/100, 000 population in 2013, due to a variety of reasons including suspension on shipment of acute flaccid paralysis stool specimen to the polio regional lab in Abidjan, refocusing of surveillance officers attention solely on Ebola virus disease (EVD) surveillance, inactivation of national polio expert committee (NPEC) and National Certification Committee (NCC). The Ministry of Health (MOH) supported by partners worked to restore AFP surveillance post EVD outbreak and ensure that Liberia maintains its polio free certification., METHODS: We conducted a desk review to summarize key activities conducted to restore acute flaccid paralysis (AFP) surveillance based on World Health Organization (WHO) AFP surveillance guidelines for Africa region. We also reviewed AFP surveillance indicators and introduction of new technologies. Data sources were from program reports, scientific and gray literature, AFP database, auto visual AFP detection and reporting (AVADAR) and ONA Servers. Data analysis was done using Microsoft excel and access spread sheets, ONA software and Geographic Information System (Arc GIS)., RESULTS: AFP surveillance indicators improved with a rebound of non-polio AFP rate (NPAFP) rate from 1.2/100, 000 population under 15 years in 2015 to 4.3 in 2017. The stool adequacy rate at the national level also improved from 79% in 2016 to 82% in 2017, meeting the global target. The percentage of counties meeting the two critical AFP surveillance indicators NPAFP rate and stool adequacy improved from 47% in 2016 to 67% in 2017. The Last polio case reported in Liberia was in late 2010., CONCLUSION: There was significant improvement in the key AFP surveillance indicators such as NPAFP rate and stool adequacy with a 3.5 fold increase in NPAFP from 2014 to 2017. By 2017, the stool adequacy rate was up to target levels compared to 2016, which was below target level of 80%. The number of counties meeting target for the two critical AFP surveillance indicators also increased by 20% points between 2016 and 2017. Similarly there was approximately two-fold increase in the oral polio vaccines (OPV) coverage for the reported AFP cases between 2015 and 2017. Strategies employed to address gaps in AFP surveillance included enhanced active case search for AFP, re-instatement of laboratory testing, supportive supervision in addition to facilitating enhanced community engagement in surveillance activities. New technologies such as AVADAR Pilot, electronic integrated supportive supervision (ISS) and electronic surveillance (eSurv) tools were introduced to improve real time AFP case reporting. However, there remain residual gaps in AFP surveillance in the country especially at the sub-national level. Similarly, the newly introduced technologies will require continued funding and capacity building for MOH staff to ensure sustainability of the initiatives.
https://dx.doi.org/10.11604/pamj.supp.2019.33.2.16848

200. Chen J, Zhu W, Zheng Y, Tian YQ, Yu Q. **Monitoring seasonal variations of colored dissolved organic matter for the saginaw river based on landsat-8 data**. Water Science and Technology: Water Supply. 2019;19(1):274-81.
Remote sensing is an effective tool for studying CDOM (colored dissolved organic matter) variations and its relevant environmental factors. Monitoring CDOM distribution and dynamics in small water is often limited by the coarse spatial resolution of traditional ocean color sensors. In this study, because of its high spatial resolution of 30 m, Landsat-8 data were used to assess seasonal variations of CDOM in the Saginaw River, by using an empirical statistic model. Pearson correlation analysis between CDOM variations and other environmental factors, such as temperature, discharge, and dissolved oxygen, shows that temperature was negatively correlated to CDOM variations and discharge played a positive role. We also calculated the monthly mean aCDOM(440) (the absorption coefficient of CDOM at 440 nm) for the Saginaw River between April and November from 2013 to 2016. This study demonstrates a good example for future applications in small waters: observing CDOM variations and other relevant environmental factors change by using Landsat remote sensing, so that we can know more about water quality and ecosystem health of small waters as well as the climate change impact on regional watersheds.
https://dx.doi.org/10.2166/ws.2018.077

201. Buse CG, Smith M, Silva DS. **Attending to scalar ethical issues in emerging approaches to environmental health research and practice**. Monash bioethics review. 2019;37(1-2):4-21.
Accelerated changes to the planet have created novel spaces to re-imagine the boundaries and foci of environmental health research. Climate change, mass species extinction, ocean acidification, biogeochemical disturbance, and other emergent environmental issues have precipitated new population health perspectives, including, but not limited to, one health, ecohealth, and planetary health. These perspectives, while nuanced, all attempt to reconcile broad global challenges with localized health impacts by attending to the reciprocal relationships between the health of ecosystems, animals, and humans. While such innovation is to be encouraged, we argue that a more comprehensive engagement with the ethics of these emerging fields of inquiry will add value in terms of the significance and impact of associated interventions. In this contribution, we highlight how the concept of spatial and temporal scale can be usefully deployed to shed light on a variety of ethical issues common to emerging environmental health perspectives, and that the potential of scalar analysis implicit to van Potter's conceptualization of bioethics has yet to be fully appreciated. Specifically, we identify how scale interacts with key ethical issues that require consideration and clarification by one health, ecohealth, and planetary health researchers and practitioners to enhance the effectiveness of research and practice, including justice and governance.
https://dx.doi.org/10.1007/s40592-018-0080-3

202. Bekemeier B, Park S, Whitman G. **Challenges and lessons learned in promoting adoption of standardized local public health service delivery data through the application of the Public Health Activities and Services Tracking model**. Journal of the American Medical Informatics Association : JAMIA. 2019;26(12):1660-3.
Population-level prevention activities are often publicly invisible and excluded in planning and policymaking. This creates an incomplete picture of prevention service-related inputs, particularly at the local level. We describe the process and lessons learned by the Public Health Activities and Services Tracking team in promoting adoption of standardized service delivery measures developed to assess public health inputs and guide system transformations. The 3 factors depicted in our Public Health Activities and Services Tracking model-data need and use, data access, and standardized measures-must be realized to promote collection of standard public health system data. Bureaucratic, resource, system, and policy challenges hampered our efforts toward adoption of the standardized measures we promoted. Substantial investments of time, resources, and coordination appear necessary for systems to adopt changes needed for collecting comparable service delivery data. Lessons from our process of promoting adoption of standardized measures provide recommendations to support future efforts to measure public health system contributions to the public's health.

https://dx.doi.org/10.1093/jamia/ocz160

203. Araujo MB, Anderson RP, Marcia Barbosa A, Beale CM, Dormann CF, Early R, et al. **Standards for distribution models in biodiversity assessments**. Science advances. 2019;5(1):eaat4858.

Demand for models in biodiversity assessments is rising, but which models are adequate for the task? We propose a set of best-practice standards and detailed guidelines enabling scoring of studies based on species distribution models for use in biodiversity assessments. We reviewed and scored 400 modeling studies over the past 20 years using the proposed standards and guidelines. We detected low model adequacy overall, but with a marked tendency of improvement over time in model building and, to a lesser degree, in biological data and model evaluation. We argue that implementation of agreed-upon standards for models in biodiversity assessments would promote transparency and repeatability, eventually leading to higher quality of the models and the inferences used in assessments. We encourage broad community participation toward the expansion and ongoing development of the proposed standards and guidelines.
https://dx.doi.org/10.1126/sciadv.aat4858

204. Andrew AS, Shi X, Guetti B, Butt T, Piepart D, Pioro E, et al. **Residential history of volatile solvent exposure and ALS risk: An interdisciplinary GIS-based spatiotemporal approach**. Amyotrophic Lateral Sclerosis and Frontotemporal Degeneration. 2019;20(Supplement 1):103-4.
Background: With only 10% of ALS cases explained by inherited genetic abnormalities, the vast majority may be attributed to environmental exposures. However, few causal contaminants have been identified. People live and work in multiple settings over a long exposure periods, making cross-sectional analysis a less viable strategy for understanding how environmental contaminants may cause disease. We have developed and will demonstrate the utility of an interdisciplinary process for investigating environmental contaminants that link to disease etiology. Our approach utilizes our databases of comprehensive residential histories for individuals, as well as spatiotemporal data on environmental contaminants. Objective(s): The objective of this project is to perform an individual-level case-control analysis linking detailed residential histories with temporally and geospatially referenced solvent levels to assess associations with ALS risk. Method(s): We have constructed a GIS-based spatiotemporal database with annual levels of air and groundwater solvent contamination. Comprehensive self-reported residential history calendars were used to build the sequential residential histories for n ~ 150 El Escorial 'definite' or 'probable' ALS patients residing in New Hampshire, Vermont, or Ohio, U.S. at diagnosis (2014-2018), and n ~ 470 population controls from the same regions. We built interpolated map layers estimating the airborne and groundwater solvent levels at each residence for each year. We calculated cumulative and lagged exposures based on etiologic period residential histories. We then used these individual level cumulative exposure estimates to model the association between the solvent exposure level and ALS risk, with adjusting for covariates. Result(s): We constructed a nationwide spatiotemporal database of annual air releases of the volatile solvent trichloro-ethylene beginning in 1987, as reported to the U.S. Toxics Release Inventory (TRI) maintained by the U.S. Environmental Protection Agency. We spatially interpolated the levels of airborne solvent, assuming a 5 km dispersion distance from each source, and then estimated the exposure at each case or control's U.S. residence in each year of the ~30 year etiologic period prior to diagnosis. Logistic regression analyses assessed the relationship between the cumulative trichloroethylene exposure level and ALS risk, adjusting for age, gender, family history of ALS, and smoking. We found an increased risk of ALS associated with cumulative airborne trichloroethylene exposure during 1987-2012 ($p < 0.05$). Lagged analyses suggested a modest increase in risk for trichloroethylene exposure occurring 1997-2007 (>75th percentile vs. <50th). Discussion and conclusion: Rodents chronically exposed to trichloroethylene show neuronal oxidative stress and protein mis-folding that leads to progressive neurodegeneration, providing evidence of a mechanistic link. Developing our capacity for spatiotemporal contaminant exposure assessment and disease linkage is critical for public health protection by identifying the environmental pollutant levels that pose an increased risk of developing ALS.
https://dx.doi.org/10.1080/21678421.2019.1646989

205. Weeramanthri TS, Dawkins HJS, Baynam G, Bellgard M, Gudes O, Semmens JB. **Editorial: Precision Public Health**. Frontiers in public health. 2018;6:121.

https://dx.doi.org/10.3389/fpubh.2018.00121

206. Wang YC, DeSalvo K. **Timely, Granular, and Actionable: Informatics in the Public Health 3.0 Era**. American journal of public health. 2018;108(7):930-4.

Ensuring the conditions for all people to be healthy, though always the core mission of public health, has evolved in approaches in response to the changing epidemiology and challenges. In the Public Health 3.0 era, multisectorial efforts are essential in addressing not only infectious or noncommunicable diseases but also upstream social determinants of health. In this article, we argue that actionable, geographically granular, and timely intelligence is an essential infrastructure for the protection of our health today. Even though local and state efforts are key, there are substantial federal roles in accelerating data access, connecting existing data systems, providing guidance, incentivizing nonproprietary analytic tools, and coordinating measures that matter most.
https://dx.doi.org/10.2105/AJPH.2018.304406

207. Wagenaar BH, Augusto O, Asbjornsdottir K, Akullian A, Manaca N, Chale F, et al. **Developing a representative community health survey sampling frame using open-source remote satellite imagery in Mozambique**. International journal of health geographics. 2018;17(1):37.
BACKGROUND: Lack of accurate data on the distribution of sub-national populations in low- and middle-income countries impairs planning, monitoring, and evaluation of interventions. Novel, low-cost methods to develop unbiased survey sampling frames at sub-national, sub-provincial, and even sub-district levels are urgently needed. This article details our experience using remote satellite imagery to develop a provincial-level representative community survey sampling frame to evaluate the effects of a 7-year health system intervention in Sofala Province, Mozambique., METHODS: Mozambique's most recent census was conducted in 2007, and no data are readily available to generate enumeration areas for representative health survey sampling frames. To remedy this, we partnered with the Humanitarian OpenStreetMap Team to digitize every building in Sofala and Manica provinces (685,189 Sofala; 925,713 Manica) using up-to-date remote satellite imagery, with final results deposited in the open-source OpenStreetMap database. We then created a probability proportional to size sampling frame by overlaying a grid of 2.106 km resolution (0.02 decimal degrees) across each province, and calculating the number of buildings within each grid square. Squares containing buildings were used as our primary sampling unit with replacement. Study teams navigated to the geographic center of each selected square using geographic positioning system coordinates, and then conducted a standard "random walk" procedure to select 20 households for each time a given square was selected. Based on sample size calculations, we targeted a minimum of 1500 households in each province. We selected 88 grids within each province to reach 1760 households, anticipating ongoing conflict and transport issues could preclude the inclusion of some clusters., RESULTS: Civil conflict issues forced the exclusion of 8 of 31 subdistricts in Sofala and 15 of 39 subdistricts in Manica. Using Android tablets, Open Data Kit software, and a remote RedCap data capture system, our final sample included 1549 households in Sofala (4669 adults; 4766 children; 33 missing age) and 1538 households in Manica (4422 adults; 4898 children; 33 missing age)., CONCLUSIONS: Other implementation or evaluation teams may consider employing similar methods to track population distributions for health systems planning or the development of representative sampling frames using remote satellite imagery.
https://dx.doi.org/10.1186/s12942-018-0158-4

208. VoPham T, Hart JE, Laden F, Chiang Y-Y. **Emerging trends in geospatial artificial intelligence (geoAI): potential applications for environmental epidemiology**. Environmental Health: A Global Access Science Source. 2018;17(1):N.PAG-N.PAG.
Geospatial artificial intelligence (geoAI) is an emerging scientific discipline that combines innovations in spatial science, artificial intelligence methods in machine learning (e.g., deep learning), data mining, and high-performance computing to extract knowledge from spatial big data. In environmental epidemiology, exposure modeling is a commonly used approach to conduct exposure assessment to determine the distribution of exposures in study populations. geoAI technologies provide important advantages for exposure modeling in environmental epidemiology, including the ability to incorporate large amounts of big spatial and temporal data in a variety of formats; computational efficiency; flexibility in algorithms and workflows to accommodate relevant characteristics of spatial (environmental) processes including spatial nonstationarity; and scalability to model other environmental exposures across different geographic areas. The objectives of this commentary are to provide an overview of key concepts surrounding the evolving and interdisciplinary field of geoAI including spatial data science, machine learning, deep learning, and data mining; recent geoAI applications in research; and potential future directions for geoAI in environmental epidemiology. [ABSTRACT FROM AUTHOR]

10.1186/s12940-018-0386-x

209. Sullivan SM, Peters ES, Trapido EJ, Oral E, Scribner RA, Rung AL. **Neighborhood Environment Measurements and Anthropometric Indicators of Obesity: Results From the Women and Their Children's Health (WaTCH) Study**. Environment & Behavior. 2018;50(9):1032-55.
We compared geographic information system (GIS)- and Census-based approaches for measuring the physical and social neighborhood environment at the census tract-level versus an audit approach on associations with body mass index (BMI), waist circumference (WC), and waist-to-hip ratio (WHR). Data were used from the 2012-2014 Women and Their Children's Health (WaTCH) Study (n = 940). Generalized linear models were used to obtain odds ratios (ORs) for BMI (≥30 kg/m2), WC (>88 cm), and WHR (>0.85). Using an audit approach, more adverse neighborhood characteristics were associated with a higher odds of WC (OR: 1.10; 95% confidence interval [CI]: [1.05, 1.15]) and WHR (OR: 1.09; 95% CI: [1.05, 1.14]) after adjustment for age, race/ethnicity, income, and oil spill exposure. There were no significant associations between GIS- and Census-based measures with obesity in adjusted models. Quality aspects of the neighborhood environment captured by audits at the individual-level may be more relevant to obesity than physical or social aspects at the census tract-level. [ABSTRACT FROM AUTHOR]

10.1177/0013916517726827

210. Stulberg JJ, Haut ER. **Practical Guide to Surgical Data Sets: Healthcare Cost and Utilization Project National Inpatient Sample (NIS)**. JAMA surgery. 2018;153(6):586-7.

https://dx.doi.org/10.1001/jamasurg.2018.0542

211. Richter W. **The verified neighbor approach to geoprivacy: An improved method for geographic masking**. Journal of exposure science & environmental epidemiology. 2018;28(2):109-18.
Geographic information adds a powerful component to environmental epidemiology studies but can compromise subject confidentiality. Although locations are often masked by perturbing spatial coordinates, existing masks do not ensure that the perturbation area contains a sufficient number of valid surrogates to prevent disclosure, nor are they designed to minimize perturbation while maintaining a specified level of privacy. I introduce a new approach to geoprivacy in which real property parcel data with information about land use are used to develop a pool of verified neighbors. GIS (geographic information system) processing optionally restricts the pool to residences with values of environmental variables similar to those of the subject parcel. A surrogate is then randomly selected from the k members of the pool closest to the subject with k chosen to achieve the desired spatial privacy protection. The method guarantees the specified level of privacy even where population density is uneven while minimizing spatial distortion and changes to the values of environmental variables assigned to subjects. The method is illustrated with an example that found it to be more effective than random perturbation-based methods in both protecting privacy and preserving spatial fidelity to the original locations.
https://dx.doi.org/10.1038/jes.2017.17

212. Ramai D, Etienne D, Ayide G, Fields PJ, Mavronicolas HA, Reddy M. **GEOGRAPHIC MAPPING: AN EFFECTIVE TOOL TO EVALUATE DISPARITIES IN COLORECTAL CANCER SCREENING UPTAKE IN AN URBAN MINORITY POPULATION**. Gastroenterology. 2018;154(6 Supplement 1):S-777.
Background: Routine screening has been shown to effectively reduce the risk colorectal cancer (CRC) and increases the chances of survival when CRC is detected early. There is a growing recognition that area-based socioeconomic characteristics such as the concentration of persons uninsured at the census tract (CT) level may play a role in screening

behavior, which may contribute to geographic disparities in CRC screening uptake. Method(s): We conducted a cross-sectional study using data from the Cancer Services Program of Brooklyn. We collected data from January 1, 2014 - November 30, 2016. We excluded CSP participants that were insured, resided outside of Brooklyn, and aged less than 50 years. Screening uptake was defined as fecal immunochemical testing (FIT) return to a CSP site. Geographic information systems (GIS) was used to examine CRC screening uptake in relation to area-based characteristics. Thematic maps were created using data from the U.S. Census Bureau's American Community Survey 2011-2015 five-year estimates (Figure 1). Hot spot analysis was performed using the Getis-Ord Gi statistic. Descriptive statistics and a logistic regression model to examine associations of screening uptake was carried out. Result(s): 1,367 CSP participants met our study criteria. The study sample was predominantly female (95.2%) and minority (46% African American, 24.7% Hispanic, 11.4% Asian). A large majority (73%) had household incomes below $20,000/year. Half of the CSP participants returned the FIT. We found several clusters of low screening uptake; the most striking cluster was in East Flatbush neighborhood ($p < 0.01$). Similar clustering were seen in areas with a higher level of uninsured persons and had greater burden of poverty. Females were twice as likely return the FIT as compared to males ($p<0.01$). Ethnicity also played a role in screening uptake. African Americans were least likely to to return the FIT as compared to Caucasians and Hispanics (45% vs. 28% vs. 12%, $p<0.01$). Educational attainment, previous FIT, and previous colonoscopy were also statistically significantly associated with FIT return. Those with high school level education or less were 2.3 times more likely to return the FIT compared to their college educated counterparts ($p<0.01$). Income was not an important predictor of FIT return. Discussion(s): Clusters of low screening uptake were found in areas with higher level of uninsured persons and greater burden of poverty. Gender, ethnicity and level of educational attainment were all significant indicators of uptake likelihood. As such, implementation of more targeted outreach may be a indicated among these demographic group. Thus, spatial analysis complements more traditional approaches to evaluating community health disparities and colon cancer screening uptake. [Figure Presented] [Figure Presented]
https://dx.doi.org/10.1016/S0016-5085%2818%2932684-2

213. Padilla M, Mattson CL, Scheer S, Udeagu C-CN, Buskin SE, Hughes AJ, et al. **Locating People Diagnosed With HIV for Public Health Action: Utility of HIV Case Surveillance and Other Data Sources**. Public health reports (Washington, DC : 1974). 2018;133(2):147-54.
INTRODUCTION: Human immunodeficiency virus (HIV) case surveillance and other health care databases are increasingly being used for public health action, which has the potential to optimize the health outcomes of people living with HIV (PLWH). However, often PLWH cannot be located based on the contact information available in these data sources. We assessed the accuracy of contact information for PLWH in HIV case surveillance and additional data sources and whether time since diagnosis was associated with accurate contact information in HIV case surveillance and successful contact., MATERIALS AND METHODS: The Case Surveillance-Based Sampling (CSBS) project was a pilot HIV surveillance system that selected a random population-based sample of people diagnosed with HIV from HIV case surveillance registries in 5 state and metropolitan areas. From November 2012 through June 2014, CSBS staff members attempted to locate and interview 1800 sampled people and used 22 data sources to search for contact information., RESULTS: Among 1063 contacted PLWH, HIV case surveillance data provided accurate telephone number, address, or HIV care facility information for 239 (22%), 412 (39%), and 827 (78%) sampled people, respectively. CSBS staff members used additional data sources, such as support services and commercial people-search databases, to locate and contact PLWH with insufficient contact information in HIV case surveillance. PLWH diagnosed <1 year ago were more likely to have accurate contact information in HIV case surveillance than were PLWH diagnosed >=1 year ago (P = .002), and the benefit from using additional data sources was greater for PLWH with more longstanding HIV infection (P < .001)., PRACTICE IMPLICATIONS: When HIV case surveillance cannot provide accurate contact information, health departments can prioritize searching additional data sources, especially for people with more longstanding HIV infection.
https://dx.doi.org/10.1177/0033354918754541

214. Mzobe P, Berggren M, Pilesjo P, Lundin E, Olefeldt D, Roulet NT, et al. **Dissolved organic carbon in streams within a subarctic catchment analysed using a GIS/remote sensing approach**. PloS one. 2018;13(7):e0199608.
Climate change projections show that temperature and precipitation increases can alter the exchange of greenhouse gases between the atmosphere and high latitude landscapes, including their freshwaters. Dissolved organic carbon (DOC) plays an important role in greenhouse gas emissions, but the impact of catchment productivity on DOC release to subarctic waters remains poorly known, especially at regional scales. We test the hypothesis that increased terrestrial

productivity, as indicated by the normalized difference vegetation index (NDVI), generates higher stream DOC concentrations in the Stordalen catchment in subarctic Sweden. Furthermore, we aimed to determine the degree to which other generic catchment properties (elevation, slope) explain DOC concentration, and whether or not land cover variables representing the local vegetation type (e.g., mire, forest) need to be included to obtain adequate predictive models for DOC delivered into rivers. We show that the land cover type, especially the proportion of mire, played a dominant role in the catchment's release of DOC, while NDVI, slope, and elevation were supporting predictor variables. The NDVI as a single predictor showed weak and inconsistent relationships to DOC concentrations in recipient waters, yet NDVI was a significant positive regulator of DOC in multiple regression models that included land cover variables. Our study illustrates that vegetation type exerts primary control in DOC regulation in Stordalen, while productivity (NDVI) is of secondary importance. Thus, predictive multiple linear regression models for DOC can be utilized combining these different types of explanatory variables.
https://dx.doi.org/10.1371/journal.pone.0199608

215. Musonda AM. **Improving access to care through community engagement: Zambian case**. Journal of Global Oncology. 2018;4(Supplement 2):161s.
Background and context: Zambia has total population of 16,405,229, life expectancy at birth is 53.3% and HIV prevalence rate is 13.3%. Though established in November 1977, the Zambia National Cancer Registry was only enhanced in 2015 leading to the publication of the 2008-2012 report. The overall age-standardized cancer incidence rate for both sexes in 2012 was 136.2 per 100,000 for all cancers, mortality rate was 104.9 per 100,000 71% these being new cancer cases due to patients presenting late with advanced disease. Aim(s): Increasing awareness and access to cancer care services within the existing health care and community-based systems in addressing the barriers to accessing care. Strategy/Tactics: Designed village-based screening program to provide services to the women in rural and hard to reach areas. Formulate a multisectoral approach engagement of the Ministry of Chiefs and Traditional Affairs (MOCTA) and Ministry of Local Government and Ministry of Education Formulated a VBS national roadmap based on: National Cancer Register Report (2012) and national geographical mapping of breast and cervical cancer clinics. Program/Policy process: Developed and signed a memorandum of understanding with Ministry of Chiefs and Traditional Affairs (MOCTA). Outcome(s): Community engagement enabled easy flow of communication to all key stakeholders on the upcoming VBS activities within their area at all levels. Enabled easy acceptance of health education meetings by all key stakeholders to seek leadership buying and support, share VBS objectives and strategic planning of a successful community-based screening program in their area. Community awareness process: training/orientation: community health care workers (CHW) are trained on key messages on breast and cervical cancer and community-based referrals to health centers. Community sensitization: conducted by trained CHW and program staff through: PA announcing, one-to-one and focused group discussions. Developed referral systems: community based: trained community health care workers sensitize clients, clients who accepts to undergo screening are referred to the nearest screening clinic. Clinic based: trained health care workers screen clients those with positive findings are referred. Breast cancer screening: referred to the provincial hospital. Cervical cancer screening: eligible treated. Not eligible referred for further investigation (LEEP/biopsy) to the provincial hospital. What was learned: Engagement of key community stakeholders, multisectoral approach, strategic scale up of breast and cervical cancer services (HR, diagnostic equipment, pathology), standardized referrals systems at all levels (community, district and provincial), strategic continuous health promotion activities and advocacy, implementation of National Cancer Control Strategic Plan, monitoring and evaluation.
https://dx.doi.org/10.1200/jgo.18.49600

216. Mohsen A, Elshemy M, Zeidan BA. **Change detection for Lake Burullus, Egypt using remote sensing and GIS approaches**. Environmental science and pollution research international. 2018;25(31):30763-71.
Lake Burullus is the second largest natural coastal lake in Egypt. It has an economic importance for fish yield. However, several anthropogenic activities such as industrial, agriculture, and reclamation activities lead to a deterioration of its water quality and a decrease of the water body area of the lake. This study aims to detect the spatiotemporal changes of Lake Burullus in the period 1972-2015 using 12 Landsat {(1,3-MSS), (4,5-TM), and (7-ETM+)} imageries and water indices approach. To extract water feature from imageries, the Normalized Difference Water Index (NDWI) and the Water Ratio Index (WRI) were applied. The NDWI was applied to the MSS imageries. For other TM and ETM+ imageries, the WRI was applied. Obtained results show a significant decrease in the water area of the Lake Burullus, where it lost about (49%) of its surface area during the period from the year 1972 to the year 2015. A rapid decrease in the lake surface area was

noticed through the period from 1972 to 1984. A prediction model was built depending on the calculated water area of the lake. Finally, the multi-temporal maps of the lake surface area are overlaid to produce a map for the changes of the lake surface area using Geographic Information System (GIS).
https://dx.doi.org/10.1007/s11356-016-8167-y

217. Mohammadi A, Valinejadi A, Sakipour S, Hemmat M, Zarei J, Askari Majdabadi H. **Improving the Distribution of Rural Health Houses Using Elicitation and GIS in Khuzestan Province (the Southwest of Iran)**. International journal of health policy and management. 2018;7(4):336-44.
BACKGROUND: Rural health houses constitute a major provider of some primary health services in the villages of Iran. Given the challenges of providing health services in rural areas, health houses should be established based on the criteria of health network systems (HNSs). The value of these criteria and their precedence over others have not yet been thoroughly investigated. The present study was conducted to propose a model for improving the distribution of rural health houses in HNSs., METHODS: The present applied study was conducted in Khuzestan province in the southwest of Iran in 2014-2016. First, the descriptive and spatial data required were collected and entered into ArcGIS after modifications, and the Geodatabase was then created. Based on the criteria of the HNS and according to experts' opinions, the main criteria and the sub-criteria for an optimal site selection were determined. To determine the criteria's coefficient of importance (ie, their weight), the main criteria and the sub-criteria were compared in pairs according to experts' opinions. The results of the pairwise comparisons were entered into Expert Choice and the weight of the main criteria and the sub-criteria were determined using the analytic hierarchy process (AHP). The application layers were then formed in geographic information system (GIS). A model was ultimately proposed in the GIS for the optimal distribution of rural health houses by overlaying the weighting layers and the other layers related to villages and rural health houses., RESULTS: Based on the experts' opinions, six criteria were determined as the main criteria for an optimal site selection for rural health houses, including welfare infrastructures, population, dispersion, accessibility, corresponding routes, distance to the rural health center and the absence of natural barriers to accessibility. Of the main criteria proposed, the highest weight was given to "population" (0.506). The priorities suggested in the proposed model for establishing rural health houses are presented within five zoning levels -from excellent to very poor., CONCLUSION: The results of the study showed that the proposed model can help provide a better picture of the distribution of rural health houses. The GIS is recommended to be used as a means of making the HNS more efficient.
https://dx.doi.org/10.15171/ijhpm.2017.101

218. Mikles SP, Suh H, Kientz JA, Turner AM. **The use of model constructs to design collaborative health information technologies: A case study to support child development**. Journal of biomedical informatics. 2018;86:167-74.
OBJECTIVE: Health information technology could provide valuable support for inter-professional collaboration to address complex health issues, but current HIT systems do not adequately support such collaboration. Existing theoretical research on supporting collaborative work can help inform the design of collaborative HIT systems. Using the example of supporting collaboration between child development service providers, we describe a deductive approach that leverages concepts from the literature and analyzes qualitative user-needs data to aid in collaborative system design., MATERIALS AND METHODS: We use the Collaboration Space Model to guide the deductive qualitative analysis of interviews focused on the use of information technology to support child development. We deductively analyzed 44 interviews from two separate research initiatives and included data from a wide range of stakeholder groups including parents and various service providers. We summarized the deductively coded interview excerpts using quantitative and qualitative methods., RESULTS: The deductive analysis method provided a rich set of design data, highlighting heterogeneity in work processes, barriers to adequate communication, and gaps in stakeholder knowledge in supporting child development work., DISCUSSION: Deductive qualitative analysis considering constructs from a literature-based model provided useful, actionable data to aid in design. Design implications underscore functions needed to adequately share data across many stakeholders. More work is needed to validate our design implications and to better understand the situations where specific system features would be most useful., CONCLUSIONS: Deductive analysis considering model constructs provides a useful approach to designing collaborative HIT systems, allowing designers to consider both

empirical user data and existing knowledge from the literature. This method has the potential to improve designs for collaborative HIT systems.
https://dx.doi.org/10.1016/j.jbi.2018.09.003

219. McGillen JB, Stover J, Klein DJ, Xaba S, Ncube G, Mhangara M, et al. **The emerging health impact of voluntary medical male circumcision in Zimbabwe: An evaluation using three epidemiological models**. PloS one. 2018;13(7):e0199453.
BACKGROUND: Zimbabwe adopted voluntary medical male circumcision (VMMC) as a priority HIV prevention strategy in 2007 and began implementation in 2009. We evaluated the costs and impact of this VMMC program to date and in future., METHODS: Three mathematical models describing Zimbabwe's HIV epidemic and program evolution were calibrated to household survey data on prevalence and risk behaviors, with circumcision coverage calibrated to program-reported VMMCs. We compared trends in new infections and costs to a counterfactual without VMMC. Input assumptions were agreed in workshops with national stakeholders in 2015 and 2017., RESULTS: The VMMC program averted 2,600-12,200 infections (among men and women combined) by the end of 2016. This impact will grow as circumcised men are protected lifelong, and onward dynamic transmission effects, which protect women via reduced incidence and prevalence in their male partners, increase over time. If other prevention interventions remain at 2016 coverages, the VMMCs already performed will avert 24,400-69,800 infections (2.3-5% of all new infections) through 2030. If coverage targets are achieved by 2021 and maintained, the program will avert 108,000-171,000 infections (10-13% of all new infections) by 2030, costing $2,100-3,250 per infection averted relative to no VMMC. Annual savings from averted treatment needs will outweigh VMMC maintenance costs once coverage targets are reached. If Zimbabwe also achieves ambitious UNAIDS targets for scaling up treatment and prevention efforts, VMMC will reduce the HIV incidence remaining at 2030 by one-third, critically contributing to the UNAIDS goal of 90% incidence reduction., CONCLUSIONS: VMMC can substantially impact Zimbabwe's HIV epidemic in the coming years; this investment will save costs in the longer term.
https://dx.doi.org/10.1371/journal.pone.0199453

220. Longbottom J, Shearer FM, Devine M, Alcoba G, Chappuis F, Weiss DJ, et al. **Vulnerability to snakebite envenoming: a global mapping of hotspots**. Lancet (London, England). 2018;392(10148):673-84.
BACKGROUND: Snakebite envenoming is a frequently overlooked cause of mortality and morbidity. Data for snake ecology and existing snakebite interventions are scarce, limiting accurate burden estimation initiatives. Low global awareness stunts new interventions, adequate health resources, and available health care. Therefore, we aimed to synthesise currently available data to identify the most vulnerable populations at risk of snakebite, and where additional data to manage this global problem are needed., METHODS: We assembled a list of snake species using WHO guidelines. Where relevant, we obtained expert opinion range (EOR) maps from WHO or the Clinical Toxinology Resources. We also obtained occurrence data for each snake species from a variety of websites, such as VertNet and iNaturalist, using the spocc R package (version 0.7.0). We removed duplicate occurrence data and categorised snakes into three groups: group A (no available EOR map or species occurrence records), group B (EOR map but <5 species occurrence records), and group C (EOR map and >=5 species occurrence records). For group C species, we did a multivariate environmental similarity analysis using the 2008 WHO EOR maps and newly available evidence. Using these data and the EOR maps, we produced contemporary range maps for medically important venomous snake species at a 5 x 5 km resolution. We subsequently triangulated these data with three health system metrics (antivenom availability, accessibility to urban centres, and the Healthcare Access and Quality [HAQ] Index) to identify the populations most vulnerable to snakebite morbidity and mortality., FINDINGS: We provide a map showing the ranges of 278 snake species globally. Although about 6.85 billion people worldwide live within range of areas inhabited by snakes, about 146.70 million live within remote areas lacking quality health-care provisioning. Comparing opposite ends of the HAQ Index, 272.91 million individuals (65.25%) of the population within the lowest decile are at risk of exposure to any snake for which no effective therapy exists compared with 519.46 million individuals (27.79%) within the highest HAQ Index decile, showing a disproportionate coverage in reported antivenom availability. Antivenoms were available for 119 (43%) of 278 snake species evaluated by WHO, while globally 750.19 million (10.95%) of those living within snake ranges live more than 1 h from population centres. In total, we identify about 92.66 million people living within these vulnerable geographies, including many sub-Saharan countries, Indonesia, and other parts of southeast Asia., INTERPRETATION: Identifying exact populations vulnerable to the most severe outcomes of snakebite envenoming at a subnational level is important for

prioritising new data collection and collation, reinforcing envenoming treatment, existing health-care systems, and deploying currently available and future interventions. These maps can guide future research efforts on snakebite envenoming from both ecological and public health perspectives and better target future estimates of the burden of this neglected tropical disease., FUNDING: Bill & Melinda Gates Foundation.
https://dx.doi.org/10.1016/S0140-6736(18)31224-8

221. Kumar M, Mostafa J, Ramaswamy R. **Federated health information architecture: Enabling healthcare providers and policymakers to use data for decision-making**. Health information management : journal of the Health Information Management Association of Australia. 2018;47(2):85-93.
Health information systems (HIS) in India, as in most other developing countries, support public health management but fail to enable healthcare providers to use data for delivering quality services. Such a failure is surprising, given that the population healthcare data that the system collects are aggregated from patient records. An important reason for this failure is that the health information architecture (HIA) of the HIS is designed primarily to serve the information needs of policymakers and program managers. India has recognised the architectural gaps in its HIS and proposes to develop an integrated HIA. An enabling HIA that attempts to balance the autonomy of local systems with the requirements of a centralised monitoring agency could meet the diverse information needs of various stakeholders. Given the lack of in-country knowledge and experience in designing such an HIA, this case study was undertaken to analyse HIS in the Bihar state of India and to understand whether it would enable healthcare providers, program managers and policymakers to use data for decision-making. Based on a literature review and data collected from interviews with key informants, this article proposes a federated HIA, which has the potential to improve HIS efficiency; provide flexibility for local innovation; cater to the diverse information needs of healthcare providers, program managers and policymakers; and encourage data-based decision-making.
https://dx.doi.org/10.1177/1833358317709704

222. Jewer J. **Patients' intention to use online postings of ED wait times: A modified UTAUT model**. International journal of medical informatics. 2018;112:34-9.
BACKGROUND: As health care becomes more reliant on technology, a better understanding of the factors that contribute to acceptance and use of technology is now critical. The Unified Theory of Acceptance and Use of Technology (UTAUT) has been applied to study a variety of technologies in different settings, and it is one of the most cited theories in Information Systems (IS) research. However, there has been limited application of UTAUT to health IT and, in particular, to patients' IT use., OBJECTIVES: The aim of this study is to adapt UTAUT to the context of patient acceptance and use of an Emergency Department (ED) wait-times website, and to empirically test the modified model and compare the results to those of the original UTAUT model. Specifically, it is proposed that there will be a significant relationship between facilitating conditions and behavioral intention., METHODS: A survey of patients in the ED of a Canadian hospital was conducted, yielding 118 completed surveys, and subsequently analyzed using Partial least squares (PLS)., RESULTS: This study found that the modified UTAUT produced a substantial improvement in variance explained in behavioral intention compared to the original UTAUT (66% versus 46%). The modified-UTAUT model showed significant effects in performance expectancy ($r=0.302$, $p<0.01$) and facilitating conditions ($r=0.539$, $p<0.001$) on behavioral intention to use the website, while the effort expectancy impact was not significant., CONCLUSIONS: This study provides empirical support for the modified-UTAUT in the context of patients' intention to use an ED wait times website. Some results of this study support prior research, while some differ, such as the non-significant relationship between effort expectancy and behavioral intention and the finding that performance expectancy is not the main driver of intention to use. As proposed, facilitating conditions - having the resources necessary to view the website and having the ability to find the website - were the most important factors influencing behavioral intention. UTAUT is a key theoretical advance in IS research and by modifying it to the context of patient use, we contribute to both IS and health research.
https://dx.doi.org/10.1016/j.ijmedinf.2018.01.008

223. Jelks NTO, Hawthorne TL, Dai D, Fuller CH, Stauber C. **Mapping the Hidden Hazards: Community-Led Spatial Data Collection of Street-Level Environmental Stressors in a Degraded, Urban Watershed**. International journal of environmental research and public health. 2018;15(4).

We utilized a participatory mapping approach to collect point locations, photographs, and descriptive data about select built environment stressors identified and prioritized by community residents living in the Proctor Creek Watershed, a degraded, urban watershed in Northwest Atlanta, Georgia. Residents (watershed researchers) used an indicator identification framework to select three watershed stressors that influence urban livability: standing water, illegal dumping on land and in surface water, and faulty stormwater infrastructure. Through a community-university partnership and using Geographic Information Systems and digital mapping tools, watershed researchers and university students designed a mobile application (app) that enabled them to collect data associated with these stressors to create a spatial narrative, informed by local community knowledge, that offers visual documentation and representation of community conditions that negatively influence the environment, health, and quality of life in urban areas. By elevating the local knowledge and lived experience of community residents and codeveloping a relevant data collection tool, community residents generated fine-grained, street-level, actionable data. This process helped to fill gaps in publicly available datasets about environmental hazards in their watershed and helped residents initiate solution-oriented dialogue with government officials to address problem areas. We demonstrate that community-based knowledge can contribute to and extend scientific inquiry, as well as help communities to advance environmental justice and leverage opportunities for remediation and policy change.
https://dx.doi.org/10.3390/ijerph15040825

224. Jankowska MM, Gaines TO, Little SJ, Mehta SR, Chaillon A. **Fine tuning spatial resolution of HIV epidemiologic data while protecting privacy**. Topics in Antiviral Medicine. 2018;26(Supplement 1):541s.
Background: Privacy is a major concern with HIV-associated data. These data are often aggregated into larger spatial units to preserve privacy. However, the absence of HIV data at finer geographic scales limits the utility of spatial analyses to optimally target HIV interventions. Dasymetric mapping (DASY) is an areal interpolation method where the target polygons are zones of relative homogeneity with the purpose of best portraying the underlying statistical surface of the data being mapped. Here, we developed a cartographic DASY approach coupled with probabilistic reweighting to identify clusters of new HIV infections in San Diego County. Method(s): Age, sex, and ethnicity were collected for 657 HIV individuals enrolled in the San Diego Primary Resource Consortium (SDPIRC) across 6 SD Health and Human Services Agency (HHSA) regions. Transforming the data from HHSA region to a high resolution grid involved the following steps (Fig.): Generation of a background 500x500m grid surface combined with residential use data (step 1); DASY to interpolate data on residential land use, U.S. Census demographic data, and HIV prevalence data from Health Department into a 500x500m grid (step 2); finally, probabilistic reweighting was applied to the SDPRIC data to redistribute HIV new infection from HHSA regions to the 500x500m grid (step 3). Constraining variables (data from the SDPIRC cohort and grid cell map) were used to infer which grid cells HIV+ individuals were most likely to reside. A map was generated for each individual, and then aggregated for the full cohort to generate a final grid-based model of the distribution of the SDPIRC cohort. Result(s): The resolved grid map shows considerably more details of where clusters of new infections reside throughout the county compared to the map divided into the 6 HHSA regions. While the expected cluster of infection in central San Diego remains, two hot spots that are not visible at the HHSA region level map emerge in north SD County, and in east SD County (Fig., circled in blue). Furthermore, the final grid model shows increased resolution of hotspots of HIV new infections in central and south-central SD. Conclusion(s): The ability to identify and predict the spread of transmissible diseases, including HIV, is crucial to optimally target treatment and prevention programs. Downscaling health data without violating privacy and confidentiality restrictions can help to reveal spatial patterns at the local level that are not apparent in aggregated data sets. (Figure Presented).

225. Hvidtfeldt UA, Ketzel M, Sorensen M, Hertel O, Khan J, Brandt J, et al. **Evaluation of the Danish AirGIS air pollution modeling system against measured concentrations of PM2.5, PM10, and black carbon**. Environmental Epidemiology. 2018;2(2):e014.
Background: Adverse health effects of air pollution have been reported in previous studies with varying methodological approaches to the exposure assessment. Measuring individual air pollution exposure for large-scale epidemiological studies is infeasible, calling for refined modeling tools. We evaluated the performance of the Geographical Information System-based air pollution and human exposure modeling system (AirGIS). Method(s): Modeled concentrations were evaluated against measured concentrations of particulate matter (PM) less than 10 and 2.5 mum in aerodynamic diameter (PM10/PM2.5) from two fixed-site monitoring stations (background and street) and from two measurement campaigns in Copenhagen, Denmark. Modeled concentrations of black carbon (BC) were evaluated against measured

PM2.5 absorbance and PM10 absorbance. Result(s): Mean concentrations measured in the four series were in the range of 10.4-15.3 mug/m3 for PM2.5 and 17.8-25.1 mug/m3 for PM10. The model underestimated by 7%-13% in comparison to the fixed-site monitoring stations. Correlation coefficients of 0.82 and 0.73 were observed for monthly and daily averages of measured and modeled PM2.5 at the background site and, correspondingly, 0.85 and 0.74 at the street site. The spatial variation, as evaluated from the two measurement campaigns, was also well reproduced. Correlation coefficients of 0.77 and 0.79 were observed for BC and PM2.5 absorbance and 0.76 for PM10 absorbance. Conclusion(s): The AirGIS framework showed an overall high degree of accuracy and will be applicable to future epidemiological studies on health effects of PM and BC.
https://dx.doi.org/10.1097/EE9.0000000000000014

226. Halecki W, Stachura T, Fudala W, Rusnak M. **Evaluating the applicability of MESS (matrix exponential spatial specification) model to assess water quality using GIS technique in agricultural mountain catchment (Western Carpathian)**. Environmental monitoring and assessment. 2018;191(1):26.
The formation of many sources of pollution in a short period of time is due to mountain soil erosion by water. One of the major mechanisms decisive in the intensification of such erosion is the loosening of soil material on the slope. Water quality studies show the impact of diversified spatial management and allow making the right decisions in environmental management in mountain areas with high variability of use and land cover. The research undertaken as part of the paper was carried out in order to determine the dependency between total suspended solids (TSS) and the physicochemical parameters of surface waters and the amount of soil losses in the use structure within the mountain catchment. The paper focused on the frequency of phenomena in time and the possibility of stopping the surface runoff on the slope and on the soil's susceptibility to water erosion. The dependencies between multipoint sampling and the concentration of material washed off the slope due to precipitation were verified with a multivariate analysis. Sampling took place in hydrometric sections, and during small floods, in the waterbed cross section. Research shows that such sampling is the basis for the calculation of the transported load, reflecting the average variation in concentration. The variation in the volume of the load from the individual parts of the catchment was assessed by the spatial autoregressive model. It was found that the use of river basin areas affects water chemistry. Water reservoirs are an important ecological barrier for the migration of nitrate nitrogen (N-NO3) and phosphate phosphorus (P-PO4), which is marked by changes in the growing season. Water along the sections of the river near the quarry with a high degree of sodding showed good quality condition. Despite significant differences between measurement sampling sites, high total dissolved solid (TDS) values were found in communities adjacent to forests and meadows. However, the highest electrical conductivity (EC) and TSS concentrations were found in the interface with cultivated areas. Biogenic indices showed variation depending on the way the adjacent areas were used. GIS linked spatial variables with the formation of water pollution. The analysis of spatial autoregression pointed to the impact of arable land. Moreover, the analysis of spatial autoregression with the MESS function designated a connection between agricultural land use and nitrite nitrogen (N-NO2), EC, TSS, and dissolved oxygen (DO). Graphical abstract .
https://dx.doi.org/10.1007/s10661-018-7137-x

227. Griffith DA. **Uncertainty and Context in Geography and GIScience: Reflections on Spatial Autocorrelation, Spatial Sampling, and Health Data**. Annals of the American Association of Geographers. 2018;108(6):1499-505.
One of the conference themes for the 2017 American Association of Geographers (AAG) annual meeting was “Uncertainty and Context in Geography and GIScience.” It included a triplet of special sessions cosponsored by the Spatial Analysis and Modeling (SAM) and the Health & Medical Geography (HMG) specialty groups. One session dealt with spatial autocorrelation, another featured spatial sampling, and a third focused on public health data. A conceptual framework and overviews of these three sessions emphasize research frontiers and advances in theory, method, and research practice that address challenges of uncertainty and context in geography and GIScience. This article summarizes these three sessions. [ABSTRACT FROM AUTHOR]

10.1080/24694452.2017.1416282

228. Gianquitieri L, Brovelli MA, Brambilla P, Pagliosa A, Villa GF, Caiani EG. **A health geomatics framework for the assessment of the spatial distribution of out-of-hospital cardiac arrests and effective use of automated external defibrillators: The case of the city of Milan**. European Heart Journal. 2018;39(Supplement 1):499-500.
Background: The occurrence of out-of-hospital cardiac arrest (OHCA) is a critical life-threatening event, with an average incidence of 1 inhabitants and survival rates below 10%. Early defibrillation by automated external defibrillator (AED) is the primary determinant of survival. Optimization of allocating a limited number of AEDs on a specific territory becomes primarily important. We hypothesized that health geomatics (HG), representing the process of gathering, storing, processing, and delivering geographic information related to health data through a Geographical Information System, could serve this goal. Aim(s): To study the spatial distribution of OHCA in the city of Milan, Italy during 2015-2016, AED territory and population coverage and AED potential and effective use. Method(s): Using open source software and open database for streets and intersections, for each known AED position a catchment area was defined as the real distance effectively traveled at a walking speed of 1.5 m/s in a roundtrip of 6 minutes - time limit to perform defibrillation to minimize patient's damage. The union of catchment areas represented the % of territory effectively covered by AED. To derive the population living in such area, a inhabitants distribution model was computed: a) from the topographic database, the volume of each residen- tial building was derived; b) the total residential volume for each of the 88 Milan neighborhoods was computed; c) from the citizen registry, the population density for each neighborhood was obtained; d) the estimated residents/building were computed based on its position. Result(s): During 2015-16, 3927 OHCA were recorded in Milan (average population 1360000, average incidence 1.44),of which 3480 (88.6%) at home and 847 outside (11.4%). The number and position of AED (518) available at 31/12/2015 was considered. Only 12.77% of the territory was covered by AED, including 3.3% overlapped by different catchment areas, resulting in 22.41% of total population covered (5.7% in overlapped areas). Based on the location of the call to 112 emergency number, 876 OHCA (22.31% of the total) were inside at least one catchment area (6.65% at least in two), and thus could have potentially benefited by AED. However, only in 32/876 (3.65%) cases, an AED was effectively used by layman rescuers. Conclusion(s): The use of HG tools for representing both the position of OHCA and AED is a novel and valuable opportunity to derive information to guide spatial optimization planning for public health. The distribution of AEDs in Milan resulted not homogeneous, with areas with no coverage and areas with overlapped coverage. Even when in the vicinity of an AED, only a minimal part of OHCA benefited from its utilization, probably due to the high % of OHCA events at home. New decision-making strategies to assist in AED repositioning are needed, as well as new ways to inform citizens about their position and recruit them in case of emergency.
https://dx.doi.org/10.1093/eurheartj/ehy565.P2548

229. Feng Y, Yang Q, Tong X, Chen L. **Evaluating land ecological security and examining its relationships with driving factors using GIS and generalized additive model**. Science of the Total Environment. 2018;633:1469-79.
Land ecological security (LES) refers to the environmental health and sustainability of the land resources and ecosystems, which are substantially affected by biophysical and socio-economic factors. We assess the spatiotemporal patterns of LES in Ningbo city on the southeast coast of China from 1975 to 2015 and explore the effects of driving factors. Expert evaluation is used to estimate the LES score for each 2 × 2 km grid and map the patterns by Kriging. Five levels of LES are used: very secure, secure, neutral, insecure and very insecure. A generalized additive model (GAM) captures the relationships between LES and driving factors, and identifies the dominant factors. Our results show that the Ningbo LES has been deteriorating since 1975, and it is now very insecure in Ningbo city center and the central area of the satellite city Cixi. The dominant factors affecting LES are distances to city center (D city), district center (D district) and road networks (D roads), and the moving window built-up area (D ndbi). Among these, D ndbi is most important as inferred by the highest explained deviance of the GAM. This study improves our understanding of the spatiotemporal patterns of LES in Ningbo and how LES changes. As a result, it provides insight to help local governments optimize land-use configuration, potentially improving the environment and ecosystems and creating a more environmentally friendly city. [ABSTRACT FROM AUTHOR]

about the accuracy of the copy. Users should refer to the original published version of the material for the full abstract. (Copyright applies to all Abstracts.).
10.1016/j.scitotenv.2018.03.272

230. Fatima SH, Zaidi F, Adnan M, Ali A, Jamal Q, Khisroon M. **Rat-bites of an epidemic proportion in Peshawar vale; a GIS based approach in risk assessment**. Environmental monitoring and assessment. 2018;190(4):233.
Contemporary studies demonstrate that rodent bites do not occur frequently. However, a huge number of cases were reported from Peshawar vale, Pakistan during 2016. Two species, the local black rat Rattus rattus (Linnaeus, 1758) and the invasive brown rat Rattus norvegicus (Berkenhout, 1769) might be the suspected cause. Several studies indicated the invasion of brown rats into Pakistan presumably via port city of Karachi. In this study, we modeled geospatial distribution of rodent bites for risk assessment in the region. Bite cases reported to tertiary care lady reading hospital were monitored from January 1 to August 31, 2016. Among 1747 cases, statistically informative data (n = 1295) was used for analyses. MaxEnt algorithm was employed for geospatial modeling, taking into account various environmental variables (temperature, precipitation, humidity, and elevation) and anthropogenic factors (human population density, distance from roads, distance from water channels, and land use/land cover). MaxEnt results revealed that urban slums (84.5%) are at highest risk followed by croplands (10.9%) and shrublands (2.7%). Anthropogenic factors affecting incidence of rodent bites included host density (contribution: 34.7), distance from water channels (3.2), land use/land cover (2.8), and distance from roads (2). Most of the cases occurred within a radius of 0.3 km from roads and 5 km from water channels. Rodent bite incidence is currently at its peak in Peshawar vale. Factors significantly affecting rodents' bite activity and their distribution and dispersal include urbanization, distance from roads, and water channels. Further studies are needed to determine the impact of invasion by brown rat on bite incidence.
https://dx.doi.org/10.1007/s10661-018-6605-7

231. Edoh T. **Risk Prevention of Spreading Emerging Infectious Diseases Using a HybridCrowdsensing Paradigm, Optical Sensors, and Smartphone**. Journal of medical systems. 2018;42(5):91.
The risk of spreading diseases within (ad-hoc)crowds and the need to pervasively screen asymptomatic individuals to protect the population against emerging infectious diseases, request permanentcrowd surveillance., particularly in high-risk regions. Thecase of Ebola epidemic in West Africa in recent years has shown the need for pervasive screening. The trend today in diseases surveillance is consisting of epidemiological data collection about emerging infectious diseases using social media, wearable sensors systems, or mobile applications and data analysis. This approach presents various limitations. This paper proposes a novel approach for diseases monitoring and risk prevention of spreading infectious diseases. The proposed approach, aiming at overcoming the limitation of existing disease surveillance approaches, combines the hybrid crowdsensing paradigm with sensing individuals' bio-signals using optical sensors for monitoring any risks of spreading emerging infectious diseases in any (ad-hoc) crowds. A proof-of-concept has been performed using a drone armed with a cat s60 smartphone featuring a Forward Looking Infra-Red (FLIR) camera. According to the results of the conducted experiment, the concept has the potential to improve the conventional epidemiological data collection. The measurement is reliable, and the recorded data are valid. The measurement error rates are about 8%.
https://dx.doi.org/10.1007/s10916-018-0937-2

232. Dodson ZM, Enki Yoo E-H, Martin-Gill C, Roth R. **Spatial Methods to Enhance Public Health Surveillance and Resource Deployment in the Opioid Epidemic**. American Journal of Public Health. 2018;108(9):1191-6.
Objectives. To improve public health surveillance and response by using spatial optimization. Methods. We identified cases of suspected nonfatal opioid overdose events in which naloxone was administered from April 2013 through December 2016 treated by the city of Pittsburgh, Pennsylvania, Bureau of Emergency Medical Services. We used spatial modeling to identify areas hardest hit to spatially optimize naloxone distribution among pharmacies in Pittsburgh. Results. We identified 3182 opioid overdose events with our classification approach, which generated spatial patterns of opioid overdoses within Pittsburgh. We then used overdose location to spatially optimize accessibility to naloxone via pharmacies in the city. Only 24 pharmacies offered naloxone at the time, and only 3 matched with our optimized solution. Conclusions. Our methodology rapidly identified communities hardest hit by the opioid epidemic with standard public health data. Naloxone accessibility can be optimized with established location-allocation approaches. Public Health Implications. Our methodology can be easily implemented by public health departments for automated

surveillance of the opioid epidemic and has the flexibility to optimize a variety of intervention strategies. [ABSTRACT FROM AUTHOR]

10.2105/AJPH.2018.304524

233. de la Vara-Salazar E, Suarez-Lopez L, Rivera L, Lazcano-Ponce E. **Providers perspective and geographic and institutional factors associated with family planning counseling**. Sexual & reproductive healthcare : official journal of the Swedish Association of Midwives. 2018;16:33-8.
OBJECTIVES: Family planning (FP) counseling is an essential activity to prevent unplanned pregnancies and allow a fulfilling sex life. We defined adequate counseling in FP as the counseling given to women and men of reproductive age that provided complete information about use, application, effectiveness, side effects, and contraindications. Two objectives are proposed in this study. First, we seek to analyze geographic and institutional factors associated with FP counseling in primary and secondary healthcare facilities in Mexico. Second, we seek to identify the cultural barriers that providers perceive as a limitation of the clients so that they can come to request information related to FP and that are associated with FP counseling., METHODS: This cross-sectional study uses a complex, probabilistic, stratified sampling design representative at national level by institution, region and rural-urban areas. We collected 16,829 provider questionnaires at healthcare facilities. Bivariate and logistic regression analyses were performed., RESULTS: Providers in rural areas had a greater possibility of offering adequate counseling (OR=2.98; 95%CI 1.18-7.53). Providers in the northern region of the country were more likely to provide adequate counseling (OR=5.37; 95% CI 1.91-15.12). Providers whom perceive religion as a limitation for clients to come to request information about FP are less likely to provide adequate counseling (OR=0.37; 95% CI 0.15-0.88)., CONCLUSIONS: Physical space exclusively for the provision of FP counseling and the availability of manuals were not associated with adequate counseling. There is a need to address the social and cultural influences on the quality of counseling in these healthcare facilities.
https://dx.doi.org/10.1016/j.srhc.2018.01.005

234. de Albuquerque BC, Pinto RC, Sadahiro M, Sampaio VS, de Castro DB, Terrazas WCM, et al. **Relationship between local presence and density of Aedes aegypti eggs with dengue cases: a spatial analysis approach**. Tropical medicine & international health : TM & IH. 2018;23(11):1269-79.
OBJECTIVES: To analyze the relationship between the occurrence of dengue and ovitrap positivity and dengue egg density in two Amazonas municipalities (Brazil) in 2016., METHODS: We performed a case-control study using secondary data from the dengue fever surveillance system. Ovitraps distributed regularly in the urban area of two cities were used to monitor the presence of the vector. The relationship between egg positivity, egg density and the location of dengue cases was evaluated using two approaches as follows: (i) based on the result of the nearest neighbour ovitrap and (ii) based on the results of the set of ovitraps within the influence area of 300 m from the location of each case and control., RESULTS: During the study period, 229 confirmed cases of dengue fever were reported in Tabatinga and 89 cases in Itacoatiara. In this study, we found that the positivity of ovitraps was related to the occurrence of dengue in Tabatinga and Itacoatiara. An association between egg density of Ae. aegypti and dengue occurrence was also observed in Itacoatiara. The temporal lags for ovitrap positivity measurements were predominantly 15 or 30 days. A dengue association for egg density for a 15-day time lag was detected for one of the case-control approaches., CONCLUSIONS: The location of dengue cases is related to ovitrap egg positivity, while a less evident possible association may exist for egg density. This indicates that these traps could be used to improve vector control actions.
https://dx.doi.org/10.1111/tmi.13150

235. Buraimoh FO, Popoola AO. **Epidemiology of breast malignancies in sub-Saharan Africa: A ten-year retrospective evaluation of 2,419 patients at a major tertiary institution in Southwestern Nigeria**. Cancer Research. 2018;78(13 Supplement 1).

Background: There is limited information on the epidemiology and clinical presentation of breast cancer in Sub-Saharan Africa. This analysis evaluated the prevalence, characteristics of the disease over a ten-year period, as well as the impact of sociodemographic factors on late breast cancer presentation in Lagos State University Teaching Hospital (LASUTH) Lagos, a major tertiary institution in Nigeria, the most populous country in Africa. Objective(s): The aim of this study is to determine the epidemiological variants of all breast cancer cases at LASUTH, 2007- 2017. Material(s) and Method(s): There was no restriction on gender or age groups. Late presentation was defined by symptomatic presentation. Tumors were characterized by histological subtypes. Mean, frequencies and percentages were performed using STATA/IC 12.1 for Windows. Result(s): A total of 2419 breast cancer patients were seen during the ten-year period. There were more female malignancies (n=2380, 98.4%) compared to male malignancies (n=39, 1.6%). The prevalence of breast cancer was found to be 37.5%. The overall mean age (years) was 47.27, the age range was 19 to 91 years. Increased risk of late presentation (n=1910, 79%). Overall higher presentation were made from christians (n= 1849, 76.4%), married individuals (n=2089, 86.4%), people in unskilled professions such as traders (n=808, 33.4%) and people with a tertiary level of education (n= 239, 12.8%). As the primary level of treatment, most of the patients had mastectomy (n=1533, 63.4%), chemotherapy (n=600, 24.8%) and radiotherapy (n=51, 2.1%). The topography of all reported cases include upper-outer quadrant of breast (n=433, 17.9%), axillary tail of breast (n=381, 15.8%), overlying lesion of breast (n=144, 11.5%), lower-inner quadrant of breast (n=133, 5.5%), upper-inner quadrant of breast (n=92, 3.8%), nipple (n=77, 3.2%), lower-outer quadrant of breast (n= 75, 3.1%) and the central portion of breast (n= 42, 1.7%). The three most common morphologies were Pleomorphic carcinoma (n=717, 29.6%), Infiltrating duct carcinoma (n=630, 26%) and giant cell type of the malignant tumor (322, 13.3%). Conclusion(s): Our study shows that breast cancers usually present mostly in young women in Nigeria, and shows the influence of culture on late presentation. Therefore we should institute deliberate public health education and counseling in our social institutions such as religious circles that are designed particularly to favour the peculiar demographics of the population to prevent late presentation. In addition, cross-sectional studies of breast cancer tumors in younger women (before the age of 40) should be explored to better understand the disease and further understanding too of breast cancers in African American women.
https://dx.doi.org/10.1158/1538-7445.AM2018-1215

236. Bright J, De Sabbata S, Lee S, Ganesh B, Humphreys DK. **OpenStreetMap data for alcohol research: Reliability assessment and quality indicators**. Health & Place. 2018:130-6.
There is a growing interest in using OpenStreetMap [OSM] data in health research. We evaluate the usefulness of OSM data for researching the spatial availability of alcohol, a field which has been hampered by data access difficulties. We find OSM data is about 50% complete, which appears adequate for replicating findings from other studies using alcohol licensing data. Further, we show how OSM quality metrics can be used to select areas with more complete alcohol data. The ease of access and use may create opportunities for analysts and researchers seeking to understand broad patterns of alcohol availability. [ABSTRACT FROM AUTHOR]

10.1016/j.healthplace.2018.01.009

237. Braz RM, Barcellos C. **Analysis of the process of malaria transmission elimination with a spatial approach to incidence variation in the Brazilian Amazon, 2016**. Analise do processo de eliminacao da transmissao da malaria na Amazonia brasileira com abordagem espacial da variacao da incidencia da doenca em 2016. 2018;27(3):e2017253.
OBJECTIVE: to identify areas where malaria transmission has been eliminated and levels of malaria incidence variation in the Brazilian Amazon in 2016, and to present an indicator of priorities for control actions., METHODS: an ecological study was conducted with data from the Malaria Epidemiological Surveillance Information System (Sivep-Malaria); municipalities were classified into three groups - elimination achieved, in the process of elimination and in search of reduction -; a composite indicator was created to stratify municipalities prioritized for control actions., RESULTS: a total of 337 (41.7%) municipalities were found to have achieved elimination, 398 (49.3%) were in the process of elimination and 73 (9.0%) were in search of reduction; the priority indicator created identified 71 municipalities that accounted for 95% of cases., CONCLUSION: the vast majority of municipalities have already achieved elimination of malaria

transmission or are in the process of eliminating transmission; the priority indicator may contribute to targeting malaria control actions.
https://dx.doi.org/10.5123/S1679-49742018000300010

238. Blumenstock J. **Don't forget people in the use of big data for development**. Nature. 2018;561(7722):170-2.

https://dx.doi.org/10.1038/d41586-018-06215-5

239. Bekemeier B, Park S. **Development of the PHAST model: generating standard public health services data and evidence for decision-making**. Journal of the American Medical Informatics Association : JAMIA. 2018;25(4):428-34.
Objective: Standardized data regarding the distribution, quality, reach, and variation in public health services provided at the community level and in wide use across states and communities do not exist. This leaves a major gap in our nation's understanding of the value of prevention activities and, in particular, the contributions of our government public health agencies charged with assuring community health promotion and protection. Public health and community leaders, therefore, are eager for accessible and comparable data regarding preventive services that can inform policy decisions about where to invest resources., Methods: We used literature review and a practice-based approach, employing an iterative process to identify factors that facilitate data provision among public health practitioners., Results: This paper describes the model, systematically developed by our research team and with input from practice partners, that guides our process toward maximizing the uptake and integration of these standardized measures into state and local data collection systems., Discussion: The model we developed, using a dissemination and implementation science framework, is intended to foster greater interest in and accountability for data collection around local health department services and to facilitate spatial exploration and statistical analysis of local health department service distribution, change, and performance., Conclusion: Our model is the first of its kind to thoroughly develop a means to guide research and practice in realizing the National Academy of Medicine's recommendation for developing systems to measure and track state and local public health system contributions to population health.
https://dx.doi.org/10.1093/jamia/ocx126

240. Atreja A, Szigethy E, Otobo E, Chang HL, Keefer L, Rogers J, et al. **IMPROVED QUALITY OF CARE AND QUALITY OF LIFE FOR IBD PATIENTS USING HEALTHPROMISE APP: A RANDOMIZED, CONTROL TRIAL**. Gastroenterology. 2018;154(6 Supplement 1):S-6.
Background: Inflammatory bowel disease (IBD) is a chronic condition affecting over a million people in the United States. The recurrent and debilitating nature of the disease makes IBD patients an ideal population to assess the therapeutic potential of a digital intervention used in conjunction with clinical methods for long-term disease management. HealthPROMISE, a patient mobile application linked to a cloud-based decision support dashboard, is designed to improve health outcomes and enhance quality of care ("QOC") by increasing patient engagement, self-management skills, and communication transparency Method: Recruited patients were randomized into intervention (HealthPROMISE) or control group. Patients completed an intake questionnaire assessing health literacy, disease severity and general health status. Primary analysis was a comparison of the change in percentage of met QOC items between both groups. Secondary analyses were made between the two groups for disparities in IBD-related emergency room visits and hospitalizations, change in quality of life (QOL) score from baseline, and proportion of patients reporting controlled disease status. HealthPROMISE patients update their information and receive a disease summary of QOC metrics and QOL trends. A population health coordinator monitored patient data in real-time on the HealthPROMISE dashboard and communicated with the care team and patients as needed(Fig 1). Ongoing collection of follow-up exit survey data captures medication adherence, system usability scale, SIBDQ, patient activation measures (PAM-13) and general health status (EQ-5D) Results: Out of 320 patients enrolled, 162 were randomized to intervention group and 158 to control group (Females 49.1%; White 82.2%; Black 5.3%; Hispanics 9.1%; English as primary language 96.3%; Everyday Computer Usage 93.4%). IBD-QOL continued to improve among HealthPROMISE patients over a follow-up of 575 days (25.2+/-11.3 vs 30.3+/-11.3 baseline, p<0.001)(Fig 2). Patients reported that uncontrolled anxiety (89.4%) and fatigue (80.9%) were major drivers of poor QOL. After an average follow-up of 495+/-135 days, QOC improved among all patients (78% vs 59% control), with a more significant increase observed among HealthPROMISE users (+28 ppt vs +9 ppt, p<0.01). After a second follow-up of 575+/-135 days, compared to control, HealthPROMISE patients experienced a significantly greater increase in QOC from baseline (+34 ppt vs +15 ppt, p<0.01) Conclusion(s): A significant improvement

in QOC was observed among patients using HealthPROMISE. IBD patients engaging with HealthPROMISE reported more equitable participation in their care decision-making process and showed improved health outcomes compared to patients not using HealthPROMISE. Digital health interventions and IBD remote monitoring can address gaps in QOC, increase patient engagement, and improve health outcomes. [Figure Presented]
https://dx.doi.org/10.1016/S0016-5085%2818%2930506-7

241. Ashish A, Sameer K, Eva S, Emamuzo O, Hersh S, Helena C, et al. **Improved Quality of Care for IBD Patients Using HealthPROMISE App: A Randomized, Control Trial**. American Journal of Gastroenterology. 2018;113(Supplement):S1.
BACKGROUND: Inflammatory bowel disease (IBD) is a chronic condition affecting over one million people in the United States (1). The recurrent and potentially debilitating nature of IBD elevates patients' risk for adverse health outcomes. IBD patients and providers report rushed visits, impersonal communications, and constrained resources as barriers to quality care (2). IBD patients are an ideal population to assess the therapeutic potential of a digital intervention used in conjunction with clinical methods for long-term IBD management. Health PROMISE is an innovative software platform, developed by Sinai AppLab, comprising a patient mobile application linked to a cloudbased decision support dashboard designed to improve health outcomes and enhance quality of care (QOC) by increasing patient engagement, self-management skills, and communication transparency (3,4). METHOD(S): Recruited patients provided informed consent during in-person office visits and were randomized into intervention (HealthPROMISE) or control. Patients completed an intake questionnaire assessing health literacy, disease severity, general health status, and demographic information. The primary endpoint is QOC data based on American Gastroenterological Association's QOC indicator checklist, which was verified against and conformed to EPIC records. Secondary endpoints include decrease in IBD-related emergency visits and hospitalizations, change in quality of life (QOL) score from baseline, and proportion of patients reporting controlled disease status per group. In the app, HealthPROMISE patients update their information and receive a disease summary of QOC metrics and IBD-specific QOL trends. A population health coordinator monitored patient data in real-time on the HealthPROMISE dashboard and communicated with the care team and patients as needed. Ongoing collection of followup exit survey data captures overall medication adherence, system usability scale (SUS), SIBDQ, patient activation measures (PAM-13), and general health status (EQ-5D). (https://clinicaltrials.gov/ct2/show/NCT02322307) RESULTS: 320 patients were enrolled in the study. 162 were randomized to intervention group and 158 to control group (Females 49.1%; White 82.2%; Black 5.3%; Hispanics 9.1%; English as primary language 96.3%; Everyday Computer Usage 93.4%) (Figure 1). IBD-QOL continued to improve among Health- PROMISE patients over a follow-up of 575 days (25.2+/-11.3 vs. 30.3+/-11.3 baseline, P <0.001) (Figure 2). Patients reported that uncontrolled anxiety (89.4%) and uncontrolled fatigue (80.9%) were major drivers of poor QOL and disproportionately contributed to disease burden (Figure 3). After an average followup of 495+/-135 days, QOC improved among all patients (78% vs. 59% control), with a more significant increase since baseline observed among HealthPROMISE users (+28 ppt vs. +9 ppt, P <0.01). After a second follow-up of 575+/-135 days, QOC continued improving (84% vs. 65% control) with a more significant change from baseline observed among HealthPROMISE users (+34 ppt vs. +15 ppt, P <0.01) (Figure 4). After 575 days, Screening Colonoscopy was the most met QOC indicator (92% met) while Smoking Cessation Screening with the least documented QOC indicator (7% met) (Figure 5). CONCLUSION(S): A significant improvement in QOC was observed among patients using Health-PROMISE. IBD patients engaging with HealthPROMISE reported more equitable participation in their care decision-making process, and showed improved health outcomes compared to patients not using HealthPROMISE. Digital health interventions and IBD remote monitoring can address gaps in QOC, increase patient engagement, and improve health outcomes.
https://dx.doi.org/10.1038/ajg.2017.451

242. Al-Nasrawi AKM, Hamylton SM, Jones BG. **An assessment of anthropogenic and climatic stressors on estuaries using a spatio-temporal GIS-modelling approach for sustainability: Towamba estuary, southeastern Australia**. Environmental monitoring and assessment. 2018;190(7):375.
Monitoring estuarine ecological-geomorphological dynamics has become a crucial aspect of studying the impacts of climate change and worldwide infrastructure development in coastal zones. Together, these factors have changed the natural eco-geomorphic processes that affect estuarine regimes and comprehensive modelling of coastal resources can assist managers to make appropriate decisions about their sustainable use. This study has utilised Towamba estuary (southeastern NSW, Australia), to demonstrate the value and priority of modelling estuarine dynamism as a measure of

the rates and consequences of eco-geomorphic changes. This research employs several geoinformatic modelling approaches over time to investigate and assess how climate change and human activities have altered this estuarine eco-geomorphic setting. Multitemporal trend/change analysis of sediment delivery, shoreline positions and land cover, determined from fieldwork and GIS analysis of remote sensing datasets, shows significant spatio-temporal changes to the elevation and areal extent of sedimentary facies in the Towamba estuary over the past 65 years. Geomorphic growth (~ 2600 m2 annually) has stabilised the estuarine habitats, particularly within native vegetation, salt marsh and mangrove areas. Geomorphic changes have occurred because of a combination of sediment runoff from the mostly unmodified terrestrial catchment, nearshore processes (ocean dynamics) and human activities. The construction of GIS models, verified with water and sediment samples, can characterise physical processes and quantify changes within the estuarine ecosystem. Such robust models will allow resource managers to evaluate the potential effects of changes to the current coastal ecosystems.
https://dx.doi.org/10.1007/s10661-018-6720-5

243. Ahmad I. **Digital elevation model (DEM) coupled with geographic information system (GIS): an approach towards erosion modeling of Gumara watershed, Ethiopia**. Environmental monitoring and assessment. 2018;190(10):568.
This study describes efforts to identify erosion-prone areas in the Gumara watershed using digital elevation model (DEM) data coupled with geographic information system (GIS). The software used to perform the overall analysis were the ESRI ArcGIS v10.3.1 with the ESRI Spatial Analyst and ArcHydro extension. All thematic layers (viz., slope, stream power index, drainage frequency, drainage density, drainage texture, relative relief, plan curvature, profile curvature) were integrated and analyzed in a GIS. A numeric evaluation scale from 1 to 4 was selected for ranking the subclasses of themes. The higher value, 4, represents higher impacts, while the lower value, 1, represents the lowest impact. About 21.71% of the total watershed area is under severe erosion zone. While 32.13%, 23.75%, and 22.42% of the total watershed area falls in moderate, low, and very low erosion zones respectively. In this paper, the numerical classification scheme presented constitutes an integrated approach that shows how to leverage basic watershed information to demarcate erosion prospective zones and measures at various scales for the purposes of watershed management.
https://dx.doi.org/10.1007/s10661-018-6888-8

244. Zhang L, Lee CS, Zhang R, Chen L. **Spatial and temporal evaluation of long term trend (2005-2014) of OMI retrieved NO2 and SO2 concentrations in Henan Province, China**. Atmospheric Environment. 2017;154:151-66.
Tropospheric NO2and SO2concentrations are of great importance with regard to air quality, atmospheric chemistry, and climate change. Due to lack of surface monitoring stations, this study analyzes long term trend of NO2and SO2levels (2005-2014), retrieved from Ozone Monitoring Instrument (OMI) board on the NASA's Aura satellite, in an important region of China - Henan Province. Henan Province, located in North China Plain, has encountered serious air pollution problems including extremely high PM2.5concentrations and as one of the most polluted region in China. The satellite spatial images clearly show that high levels of both NO2and SO2are concentrated in north and northeastern regions with much lower levels observed in other parts of Henan. Both pollutants exhibit the highest levels in winter with the least in summer/spring. The temporal trend analysis based on moving average of deseasonalized and decyclic data indicates that for NO2, there is a continuous increasing pattern from 2005 to 2011 at 6.4% per year, thereafter, it shows a decreasing trend (10.6% per year). As for SO2, the increasing trend is about 16% per year from 2005 to 2007 with decreasing rate 7% per year from 2007 to 2014. The economic development with incredible annual 11% GDP growth in Henan is responsible for increasing levels of NO2and SO2. The observed decreasing SO2level starting in 2007 is due to reduced SO2emission, utilization of flue gas desulfurization (FGD) devices and to some extent, in preparation of Beijing 2008 Olympic Games. On the other hand, increasing vehicle numbers (155% from 2006 to 2012) and coal consumption (37% during the same span), along with the lack of denitration process for removing flue/exhaust gas NOxare responsible for increasing NO2trend until 2011. The ratio of SO2/NO2started decreasing in 2007 and dropped significantly from 2011 to 2013 indicating good performance of FGD and ever increasing NOxcontribution from mobile sources. Unlike those observed in developed countries (US, EU and Japan) where a decreasing trend for both SO2and NO2has been observed since 1990s, the observed upward and downward trend found in Henan is similar to those found in North China Plain and other parts of China. The spatial and temporal trend analyses of SO2and NO2in four other regions in Henan further indicate a similar trend to those observed in Henan Province, albeit with different increasing

and decreasing rate. The results provide regulatory agency to develop action plans to combat air pollution problem in general and SO2and NO2problems in particular in Henan. The implications of our findings and recommendations for decision makers are discussed in the paper.Copyright © 2016.
https://dx.doi.org/10.1016/j.atmosenv.2016.11.067

245. Yuan M, Powell G, Lavigne M, Okhmatovskaia A, Buckeridge DL. **Initial Usability Evaluation of a Knowledge-Based Population Health Information System: The Population Health Record (PopHR)**. AMIA Annual Symposium proceedings AMIA Symposium. 2017;2017:1878-84.
We report the baseline usability of a novel web-based application, the Population Health Record (PopHR), designed to facilitate the effective use of population health information by public health professionals and to support evidence-based decision-making. The usability test was conducted with ten potential users who each completed eight tasks using the PopHR system. Participant responses were recorded, including timestamps for each data entry. Overall, the task completion rate was 96% while the success rate was 88%. The average time-on-task was 3.11 minutes, with more time spent on tasks requiring a user to stratify data along multiple dimensions, such as age, sex, or geographical region. Usability scores indicated that the current version of PopHR has good usability. Potential improvements identified included adding supporting information, offering different visualizations, and enhancing system stability. These findings are examples of addressable usability problems encountered in developing a population health record system.

246. Young NE, Anderson RS, Chignell SM, Vorster AG, Lawrence R, Evangelista PH. **A survival guide to Landsat preprocessing**. Ecology. 2017;98(4):920-32.
Landsat data are increasingly used for ecological monitoring and research. These data often require preprocessing prior to analysis to account for sensor, solar, atmospheric, and topographic effects. However, ecologists using these data are faced with a literature containing inconsistent terminology, outdated methods, and a vast number of approaches with contradictory recommendations. These issues can, at best, make determining the correct preprocessing workflow a difficult and time-consuming task and, at worst, lead to erroneous results. We address these problems by providing a concise overview of the Landsat missions and sensors and by clarifying frequently conflated terms and methods. Preprocessing steps commonly applied to Landsat data are differentiated and explained, including georeferencing and co-registration, conversion to radiance, solar correction, atmospheric correction, topographic correction, and relative correction. We then synthesize this information by presenting workflows and a decision tree for determining the appropriate level of imagery preprocessing given an ecological research question, while emphasizing the need to tailor each workflow to the study site and question at hand. We recommend a parsimonious approach to Landsat preprocessing that avoids unnecessary steps and recommend approaches and data products that are well tested, easily available, and sufficiently documented. Our focus is specific to ecological applications of Landsat data, yet many of the concepts and recommendations discussed are also appropriate for other disciplines and remote sensing platforms.
https://dx.doi.org/10.1002/ecy.1730

247. Wan N, Lin Kan G, Wilson G. **Addressing location uncertainties in GPS-based activity monitoring: A methodological framework**. Transactions in GIS. 2017;21(4):764-81.
Location uncertainty has been a major barrier in information mining from location data. Although the development of electronic and telecommunication equipment has led to an increased amount and refined resolution of data about individuals' spatio-temporal trajectories, the potential of such data, especially in the context of environmental health studies, has not been fully realized due to the lack of methodology that addresses location uncertainties. This article describes a methodological framework for deriving information about people's continuous activities from individual-collected Global Positioning System (GPS) data, which is vital for a variety of environmental health studies. This framework is composed of two major methods that address critical issues at different stages of GPS data processing: (1) a fuzzy classification method for distinguishing activity patterns; and (2) a scale-adaptive method for refining activity locations and outdoor/indoor environments. Evaluation of this framework based on smartphone-collected GPS data indicates that it is robust to location errors and is able to generate useful information about individuals' life trajectories. [ABSTRACT FROM AUTHOR]

10.1111/tgis.12231

248. Timmermans R, Kranenburg R, Manders A, Hendriks C, Segers A, Denier van der Gon H, et al. **Source apportionment of PM2.5 across China using LOTOS-EUROS**. Atmospheric Environment. 2017;164:370-86.
China's population is exposed to high levels of particulate matter (PM) due to its strong economic growth and associated urbanization and industrialization. To support policy makers to develop cost effective mitigation strategies it is of crucial importance to understand the emission sources as well as formation routes responsible for high pollution levels. In this study we applied the LOTOS-EUROS model with its module to track the contributions of predefined source sectors to China for the year 2013 using the MEIC emission inventory. It is the first application of the model system to a region outside Europe. The source attribution was aimed to provide insight in the sector and area of origin of PM2.5 for the cities of Beijing and Shanghai. The source attribution shows that on average about half of the PM2.5 pollution in both cities originates from the municipality itself. About a quarter of the PM2.5 comes from the neighbouring provinces, whereas the remaining quarter is attributed to long range transport from anthropogenic and natural components. Residential combustion, transport, and industry are identified as the main sources with comparable contributions allocated to these sectors. The importance of the sectors varies throughout the year and differs slightly between the cities. During winter, urban contributions from residential combustion are dominant, whereas industrial and traffic contributions with a larger share of regional transport are more important during summer. The evaluation of the model results against satellite and in-situ observations shows the ability of the LOTOS-EUROS model to capture many features of the variability in particulate matter and its precursors in China. The model shows a systematic underestimation of particulate matter concentrations, especially in winter. This illustrates that modelling particulate matter remains challenging as it comes to components like secondary organic aerosol and suspended dust as well as emissions and formation of PM during winter time haze situations. All in all, the LOTOS-EUROS system proves to be a powerful tool for policy support applications outside Europe as the intermediate complexity of the model allows the assessment of the area and sector of origin over decadal time periods.Copyright © 2017 Elsevier Ltd.
https://dx.doi.org/10.1016/j.atmosenv.2017.06.003

249. Strong JA, Elliott M. **The value of remote sensing techniques in supporting effective extrapolation across multiple marine spatial scales**. Marine pollution bulletin. 2017;116(1-2):405-19.
The reporting of ecological phenomena and environmental status routinely required point observations, collected with traditional sampling approaches to be extrapolated to larger reporting scales. This process encompasses difficulties that can quickly entrain significant errors. Remote sensing techniques offer insights and exceptional spatial coverage for observing the marine environment. This review provides guidance on (i) the structures and discontinuities inherent within the extrapolative process, (ii) how to extrapolate effectively across multiple spatial scales, and (iii) remote sensing techniques and data sets that can facilitate this process. This evaluation illustrates that remote sensing techniques are a critical component in extrapolation and likely to underpin the production of high-quality assessments of ecological phenomena and the regional reporting of environmental status. Ultimately, is it hoped that this guidance will aid the production of robust and consistent extrapolations that also make full use of the techniques and data sets that expedite this process. Copyright © 2017 Elsevier Ltd. All rights reserved.
https://dx.doi.org/10.1016/j.marpolbul.2017.01.028

250. Sosa BS, Porta A, Colman Lerner JE, Banda Noriega R, Massolo L. **Human health risk due to variations in PM10-PM2.5 and associated PAHs levels**. Atmospheric Environment. 2017;160:27-35.
WHO (2012) reports that chronic exposure to air pollutants, including particulate matter (PM), causes the death of 7 million people, constituting the most important environmental risk for health in the world. IARC classifies contaminated outdoor air as carcinogenic, Group 1 category. However, in our countries there are few studies regarding air pollution levels and possible associated effects on public health. The current study determined PM and associated polycyclic aromatic hydrocarbons (PAHs) levels in outdoor air, identified their possible emission sources and analysed health risks

in the city of Tandil (Argentina). PM10 and PM2.5 samples were collected using a low volume sampler (MiniVol TAS) in three areas: city centre, industrial and residential. Concentrations were determined by gravimetric methods and the content of the US EPA 16 priority PAHs was found by high performance liquid chromatography (HPLC). Description of the main emission sources and selection of monitoring sites resulted from spatial analysis and the IVE (International Vehicle Emissions) model was used in the characterisation of the traffic flow. Median values of 35.7 mugm-3 and 9.6 mugm-3 in PM10 and PM2.5 respectively and characteristic profiles were found for each area. Local values PAHs associated to PM10 and PM2.5, in general, were lower than 10ngm-3. The estimated Unit Risk for the three areas exceeds US EPA standards (9 x 10-5). The number of deaths attributable to short term exposure to outdoor PM10 was 4 cases in children under 5 years of age, and 21 cases in total population, for a relative risk of 1.037.
https://dx.doi.org/10.1016/j.atmosenv.2017.04.004

251. Sirisena P, Noordeen F, Kurukulasuriya H, Romesh TA, Fernando L. **Effect of Climatic Factors and Population Density on the Distribution of Dengue in Sri Lanka: A GIS Based Evaluation for Prediction of Outbreaks**. PloS one. 2017;12(1):e0166806.
Dengue is one of the major hurdles to the public health in Sri Lanka, causing high morbidity and mortality. The present study focuses on the use of geographical information systems (GIS) to map and evaluate the spatial and temporal distribution of dengue in Sri Lanka from 2009 to 2014 and to elucidate the association of climatic factors with dengue incidence. Epidemiological, population and meteorological data were collected from the Epidemiology Unit, Department of Census and Statistics and the Department of Meteorology of Sri Lanka. Data were analyzed using SPSS (Version 20, 2011) and R studio (2012) and the maps were generated using Arc GIS 10.2. The dengue incidence showed a significant positive correlation with rainfall ($p<0.0001$). No positive correlation was observed between dengue incidence and temperature ($p = 0.107$) or humidity ($p = 0.084$). Rainfall prior to 2 and 5 months and a rise in the temperature prior to 9 months positively correlated with dengue incidence as based on the auto-correlation values. A rise in humidity prior to 1 month had a mild positive correlation with dengue incidence. However, a rise in humidity prior to 9 months had a significant negative correlation with dengue incidence based on the auto-correlation values. Remote sensing and GIS technologies give near real time utility of climatic data together with the past dengue incidence for the prediction of dengue outbreaks. In that regard, GIS will be applicable in outbreak predictions including prompt identification of locations with dengue incidence and forecasting future risks and thus direct control measures to minimize major outbreaks.
https://dx.doi.org/10.1371/journal.pone.0166806

252. Shu Y, McCauley J. **GISAID: Global initiative on sharing all influenza data - from vision to reality**. Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin. 2017;22(13).

https://dx.doi.org/10.2807/1560-7917.ES.2017.22.13.30494

253. Shpigelman L, Chorev M, Waks Z, Goldschmidt Ya, Michael E. **Epidemiological Models Lacking Process Noise Can Be Overconfident**. Studies in health technology and informatics. 2017;235:136-40.
Mathematic models of epidemics are the key tool for predicting future course of disease in a population and analyzing the effects of possible intervention policies. Typically, models that produce deterministic are applied for making predictions and reaching decisions. Stochastic modeling methods present an alternative. Here, we demonstrate by example why it is important that stochastic modeling be used in population health decision support systems.

254. Shaban-Nejad A, Lavigne M, Okhmatovskaia A, Buckeridge DL. **PopHR: a knowledge-based platform to support integration, analysis, and visualization of population health data**. Annals of the New York Academy of Sciences. 2017;1387(1):44-53.
Population health decision makers must consider complex relationships between multiple concepts measured with differential accuracy from heterogeneous data sources. Population health information systems are currently limited in their ability to integrate data and present a coherent portrait of population health. Consequentially, these systems can provide only basic support for decision makers. The Population Health Record (PopHR) is a semantic web application that automates the integration and extraction of massive amounts of heterogeneous data from multiple distributed sources (e.g., administrative data, clinical records, and survey responses) to support the measurement and monitoring

of population health and health system performance for a defined population. The design of the PopHR draws on the theories of the determinants of health and evidence-based public health to harmonize and explicitly link information about a population with evidence about the epidemiology and control of chronic diseases. Organizing information in this manner and linking it explicitly to evidence is expected to improve decision making related to the planning, implementation, and evaluation of population health and health system interventions. In this paper, we describe the PopHR platform and discuss the architecture, design, key modules, and its implementation and use. Copyright © 2016 New York Academy of Sciences.
https://dx.doi.org/10.1111/nyas.13271

255. Riveros BS, Smala A, Goncalves VF, Pedro GO, Rosim MP, Lucchetta RC, et al. **Economic evaluation of remote monitoring of CRT/ICD therapy in heart failure patients**. Value in Health. 2017;20(5):A246.
OBJECTIVES: To estimate efficiency of Remote Monitoring (Home MonitoringTM, HM) of Cardiac Resyncronisation Therapy (CRT) and Implantable Cardioverter-Defibrillator (ICD) in Brazilian Public Healthcare System (SUS). METHOD(S): In patients with CRT/ICD therapy to treat heart failure (ICD-10 I50), continuous follow-up is based on outpatient visits (Conventional Follow-Up, CFU). HM is a new alternative which transmits real-time data to a central and then, to patient's cardiologists. By means of a health-state transition model, incremental costs (in Brazilian currency, BRL) and efficacy (in life-years gained, LYG) were estimated in a time horizon of 10 years. Costs related to SUS were retrieved through Health Informatics Department of the Brazilian Ministry of Health (DATASUS). From patient-level data of IN-TIME study, a survival analysis (Exponential distribution) was run in order to predict risk of death across the years between CFU and HM groups. Probabilistic sensitivity analysis (PSA) and alternative scenarios were carried out to assess parametric and structural uncertainties. RESULT(S): Base-case showed an incremental cost-effectiveness ratio (ICER) of BRL 2,599 per incremental LYG when HM and CFU are compared. PSA pointed out similar central point and indicates that thresholds over BRL 2,450 favours HM as the technology most efficient. As an alternative scenario, mortality was assumed to be the same for both groups. In this case, HM promotes an incremental cost of BRL 3,839 on average. Other alternative scenarios brought similar results. CONCLUSION(S): Discussing threshold in Brazil remains a controversial subject. Irrespective of this issue, economic evaluations are still useful to bring about additional information. In this view, HM is likely to promote additional direct costs and LYG. Compared to drugs, the cost of each additional benefit is much cheaper. In addition, this model is not sensitive to opportunity costs as less demand for cardiology outpatient clinics.

256. Requia WJ, Adams MD, Arain A, Koutrakis P, Lee W-C, Ferguson M. **Spatio-temporal analysis of particulate matter intake fractions for vehicular emissions: Hourly variation by micro-environments in the Greater Toronto and Hamilton Area, Canada**. Science of the Total Environment. 2017;599:1813-22.
Previous investigations have reported intake fraction (iF) for different environments, which include ambient concentrations (outdoor exposure) and microenvironments (indoor exposure). However, little is known about iF variations due to space-time factors, especially in microenvironments. In this paper, we performed a spatio-temporal analysis of particulate matter (PM 2.5) intake fractions for vehicular emissions. Specifically, we investigated hourly variation (12:00 am–11:00 pm) by micro-environments (residences and workplaces) in the Greater Toronto and Hamilton Area (GTHA), Canada. We used GIS modeling to estimate air pollution data (ambient concentration, and traffic emission) and population data in each microenvironment. Our estimates showed that the total iF at residences and workplaces accounts for 85% and 15%, respectively. Workplaces presented the highest 24 h average iF (1.06 ppm), which accounted for 25% higher than residences. Observing the iF by hour at residences, our estimates showed the highest average iF at 2:00 am (iF = 3.72 ppm). These estimates indicate that approximately 4 g of PM 2.5 emitted from motor vehicles are inhaled for every million grams of PM 2.5 emitted. For the workplaces, the highest exposure was observed at 10:00 am, with average iF equal to 2.04 ppm. The period of the day with the lower average iF for residences was at 8:00 am (average iF = 0.11 ppm), while for the workplaces was at 4:00 am (average iF = 0.47 ppm). Our approach provides a new perspective on human exposure to air pollution. Our results showed significant hourly variation in iF across the GTHA. Our findings can be incorporated in future investigations to advance environmental health effects research and human health risk assessment. [ABSTRACT FROM AUTHOR]

about the accuracy of the copy. Users should refer to the original published version of the material for the full abstract. (Copyright applies to all Abstracts.).
10.1016/j.scitotenv.2017.05.134

257. Ramezankhani R, Hosseini A, Sajjadi N, Khoshabi M, Ramezankhani A. **Environmental risk factors for the incidence of cutaneous leishmaniasis in an endemic area of Iran: A GIS-based approach**. Spatial and spatio-temporal epidemiology. 2017;21:57-66.
OBJECTIVES: This study was designed to determine the environmental factors associated with cutaneous leishmaniasis (CL) in Isfahan Province, using spatial analysis., METHODS: Data of monthly CL incidence from 2010 to 2013, climate and environmental factors including: temperature, humidity, rainfall, wind speed, normalized difference vegetation index (NDVI), altitude and population density across the Isfahan's cities was used to perform spatial analysis by ordinary least square (OLS) regression and geographically weighted regression (GWR)., RESULTS: OLS revealed a significant correlation between CL incidence and five predictors including temperature, population density, wind speed, humidity and NDVI; which explained 28.6% of variation in CL incidence in the province. Considering AICc and adjusted R2, GWR provided a better fit to the data compared with OLS., CONCLUSION: There was a positive correlation between temperature and population density with CL incidence in both local (city) and global (province) level. Copyright © 2017 Elsevier Ltd. All rights reserved.
https://dx.doi.org/10.1016/j.sste.2017.03.003

258. Rajaram R, Ganeshkumar A, Vinothkumar S, Rameshkumar S. **Multivariate statistical and GIS-based approaches for toxic metals in tropical mangrove ecosystem, southeast coast of India**. Environmental monitoring and assessment. 2017;189(6):288.
The heavy metal concentrations in water and sediment samples were investigated in the tropical Muthupet mangrove ecosystem, southeast coast of India. The results demonstrated that, ranges of metals in water comprise of Cd-0.05 to 3.72; Cu-0.5 to 4.43; Pb-6.31 to 17.87; Zn-0.0 to12.91 ppm and sediment comprises of Cd-0.06 to 0.57; Cu-4.46 to 20.59; Pb-2.90 to 21.35; Zn-4.41 to 39.18 ppm. In all the three sites, heavy metals in sediment exhibited significant higher concentrations compared to water, except Cd. The spatial distribution of metals in water and sediment samples followed a similar pattern except Cd with the preponderance of Zn (75% of total metals) followed by Cu and Pb. Muller's Geoaccumulation indexes (Igeo) showed Cd is a potent pollutant in the ecosystem and moderately contaminated the study area. The aquaculture and agricultural culture practices follow improper disposal of municipal wastages, and idol immersion activities are the potent metallic sources for heavy metal pollution were identified by performing principle component analysis. In order to protect the ecosystem from further contamination, regular monitoring is needed to in order to control the anthropogenic discharges. Graphical abstract.
https://dx.doi.org/10.1007/s10661-017-5980-9

259. Pajak M, Halecki W, Gasiorek M. **Accumulative response of Scots pine (Pinus sylvestris L.) and silver birch (Betula pendula Roth) to heavy metals enhanced by Pb-Zn ore mining and processing plants: Explicitly spatial considerations of ordinary kriging based on a GIS approach**. Chemosphere. 2017;168:851-9.
Plants have an accumulative response to heavy metals present in soils or deposited from airborne sources of emissions. Therefore, their tissues are very often used in studies of heavy metal contamination originating from different sources as a bioindicator of environmental pollution. This research was undertaken to examine accumulation capacities of Pb, Zn, Cd, Cu and Cr in washed and unwashed needles of Scots pine (Pinus sylvestris L.) and leaves of silver birch (Betula pendula Roth) growing in a contaminated area. We collected needles of Scots pine and leaves of silver birch in an area around a sedimentation pond and metallurgic plant processing Pb and Zn ores near Olkusz, Poland. Concentrations of heavy metals, which have been linked with exposure to emissions, were determined from foliar samples collected at 33 sites. These sites were established at various distances (0.5-3.6 km) from the pond and metallurgic plant so as to identify the predominant accumulative response of plants. Spatial gradients for Pb and Zn were calculated using an ordinary kriging interpolation algorithm. A spatial pattern was identified by a GIS method to visualize maps over the Pb-Zn ore mining area. The accumulation of Zn ($R2 = 0.74$, $p < 0.05$) and Pb ($R2 = 0.85$, $p < 0.01$) in plant tissues correlated with soil concentrations. This tendency was not found in the case of Cu, Cd and Cr. Copyright © 2016 Elsevier Ltd. All rights reserved.
https://dx.doi.org/10.1016/j.chemosphere.2016.10.125

260. Morgan D, Xiao L, McNabola A. **Evaluation of combined sewer overflow assessment methods: case study of Cork City, Ireland**. Water and Environment Journal. 2017;31(2):202-8.
Discharges of untreated wastewater from combined sewer overflows (CSOs) present a potential threat to human health and the chemical and ecological status of receiving waters. Sewer monitoring coupled with hydraulic models are frequently applied to estimate CSO impacts and to test alternative improvement strategies, but their cost can be prohibitive. Therefore, municipal authorities must apply subjective assessment criteria to identify problematic CSOs which require immediate monitoring. In this paper, subjective assessment criteria for CSOs were reviewed and applied using a case study from Cork City, Ireland. Whilst the subjective criteria were robust in identifying nuisance CSOs (those giving rise to public complaint), the assessment of impacts on chemical and ecological status were confounded by other pollutant sources in the catchment and a lack of CSO monitoring data. A methodology was developed, using a geographical information systems (GIS) model, to prioritise monitoring of problematic CSOs on a national basis.
https://dx.doi.org/10.1111/wej.12239

261. Massoudi BL, Chester KG. **Public Health, Population Health, and Epidemiology Informatics: Recent Research and Trends in the United States**. Yearbook of medical informatics. 2017;26(1):241-7.
Objectives: To survey advances in public and population health and epidemiology informatics over the past 18 months. Methods: We conducted a review of English-language research works conducted in the domain of public and population health informatics and published in MEDLINE or Web of Science between January 2015 and June 2016 where information technology or informatics was a primary subject or main component of the study methodology. Selected articles were presented using a thematic analysis based on the 2011 American Medical Informatics Association (AMIA) Public Health Informatics Agenda tracks as a typology. Results: Results are given within the context developed by Dixon et al., (2015) and key themes from the 2011 AMIA Public Health Informatics Agenda. Advances are presented within a socio-technical infrastructure undergirded by a trained, competent public health workforce, systems development to meet the business needs of the practice field, and research that evaluates whether those needs are adequately met. The ability to support and grow the infrastructure depends on financial sustainability. Conclusions: The fields of public health and population health informatics continue to grow, with the most notable developments focused on surveillance, workforce development, and linking to or providing clinical services, which encompassed population health informatics advances. Very few advances addressed the need to improve communication, coordination, and consistency with the field of informatics itself, as identified in the AMIA agenda. This will likely result in the persistence of the silos of public health information systems that currently exist. Future research activities need to aim toward a holistic approach of informatics across the enterprise.
https://dx.doi.org/10.15265/IY-2017-035

262. Martin EG, Law J, Ran W, Helbig N, Birkhead GS. **Evaluating the Quality and Usability of Open Data for Public Health Research: A Systematic Review of Data Offerings on 3 Open Data Platforms**. Journal of public health management and practice : JPHMP. 2017;23(4):e5-e13.
CONTEXT: Government datasets are newly available on open data platforms that are publicly accessible, available in nonproprietary formats, free of charge, and with unlimited use and distribution rights. They provide opportunities for health research, but their quality and usability are unknown., OBJECTIVE: To describe available open health data, identify whether data are presented in a way that is aligned with best practices and usable for researchers, and examine differences across platforms., DESIGN: Two reviewers systematically reviewed a random sample of data offerings on NYC OpenData (New York City, all offerings, n = 37), Health Data NY (New York State, 25% sample, n = 71), and HealthData.gov (US Department of Health and Human Services, 5% sample, n = 75), using a standard coding guide., SETTING: Three open health data platforms at the federal, New York State, and New York City levels., MAIN OUTCOME MEASURES: Data characteristics from the coding guide were aggregated into summary indices for intrinsic data quality, contextual data quality, adherence to the Dublin Core metadata standards, and the 5-star open data deployment scheme., RESULTS: One quarter of the offerings were structured datasets; other presentation styles included charts (14.7%), documents describing data (12.0%), maps (10.9%), and query tools (7.7%). Health Data NY had higher intrinsic data quality ($P < .001$), contextual data quality ($P < .001$), and Dublin Core metadata standards adherence ($P < .001$). All met basic "web availability" open data standards; fewer met higher standards of "hyperlinked to other data.",

CONCLUSIONS: Although all platforms need improvement, they already provide readily available data for health research. Sustained effort on improving open data websites and metadata is necessary for ensuring researchers use these data, thereby increasing their research value.
https://dx.doi.org/10.1097/PHH.0000000000000388

263. Lopez-Aparicio S, Vogt M, Schneider P, Kahila-Tani M, Broberg A. **Public participation GIS for improving wood burning emissions from residential heating and urban environmental management**. Journal of environmental management. 2017;191:179-88.
A crowdsourcing study supported by a public participation GIS tool was designed and carried out in two Norwegian regions. The aim was to improve the knowledge about emissions from wood burning for residential heating in urban areas based on the collection of citizens' localized insights. We focus on three main issues: 1) type of dwelling and residential heating source; 2) wood consumption and type of wood appliances; and 3) citizens' perception of the urban environment. Our study shows the importance of wood burning for residential heating, and of the resulted particle emissions, in Norwegian urban areas. Citizens' localized insights on environmental perception highlight the areas in the city that require particular attention as part of clean air strategies. Information about environmental perception is combined with existing environmental data showing certain correlation. The results support the urban environmental management based on co-benefit approaches, achieving several outcomes from a single policy measure. Measures to reduce urban air pollution will have a positive impact on the citizens' environmental perception, and therefore on their quality of life, in addition to reducing the negative consequences of air pollution on human health. The characterization of residential heating by fuelwood is still a challenging activity. Our study shows the potential of a crowdsourcing method as means for bottom-up approaches designed to increase our knowledge on human activities at urban scale that result on emissions.
https://dx.doi.org/10.1016/j.jenvman.2017.01.018

264. Kourgialas NN, Karatzas GP, Koubouris GC. **A GIS policy approach for assessing the effect of fertilizers on the quality of drinking and irrigation water and wellhead protection zones (Crete, Greece)**. Journal of environmental management. 2017;189:150-9.
Fertilizers have undoubtedly contributed to the significant increase in yields worldwide and therefore to the considerable improvement of quality of life of man and animals. Today, attention is focussed on the risks imposed by agricultural fertilizers. These effects include the dissolution and transport of excess quantities of fertilizer major- and trace-elements to the groundwater that deteriorate the quality of drinking and irrigation water. In this study, a map for the Fertilizer Water Pollution Index (FWPI) was generated for assessing the impact of agricultural fertilizers on drinking and irrigation water quality. The proposed methodology was applied to one of the most intensively cultivated with tree crops area in Crete (Greece) where potential pollutant loads are derived exclusively from agricultural activities and groundwater is the main water source. In this region of 215 km2, groundwater sampling data from 235 wells were collected over a 15-year time period and analyzed for the presence of anionic (NuOmicron-3, PO-34) and cationic (K+1, Fe+2, Mn+2, Zn+2, Cu+2, B+3) fertilizer trace elements. These chemicals are the components of the primary fertilizers used in local tree crop production. Eight factors/maps were considered in order to estimate the spatial distribution of groundwater contamination for each fertilizer element. The eight factors combined were used to generate the Fertilizer Water Pollution Index (FWPI) map indicating the areas with drinking/irrigation water pollution due to the high groundwater contamination caused by excessive fertilizer use. Moreover, by taking into consideration the groundwater flow direction and seepage velocity, the pathway through which groundwater supply become polluted can be predicted. The groundwater quality results show that a small part of the study area, about 8 km2 (3.72%), is polluted or moderately polluted by the excessive use of fertilizers. Considering that in this area drinking water sources (wells) are located, this study highlights an analytic method for delineation wellhead protection zones. All these approaches were incorporated in a useful GIS decision support system that aids decision makers in the difficult task of protection groundwater resources.
https://dx.doi.org/10.1016/j.jenvman.2016.12.038

265. Kepper MM, Sothern MS, Theall KP, Griffiths LA, Scribner RA, Tseng T-S, et al. **A Reliable, Feasible Method to Observe Neighborhoods at High Spatial Resolution**. American Journal of Preventive Medicine. 2017;52:S20-S30.

<bold>Introduction: </bold>Systematic social observation (SSO) methods traditionally measure neighborhoods at street level and have been performed reliably using virtual applications to increase feasibility. Research indicates that collection at even higher spatial resolution may better elucidate the health impact of neighborhood factors, but whether virtual applications can reliably capture social determinants of health at the smallest geographic resolution (parcel level) remains uncertain. This paper presents a novel, parcel-level SSO methodology and assesses whether this new method can be collected reliably using Google Street View and is feasible.<bold>Methods: </bold>Multiple raters (N=5) observed 42 neighborhoods. In 2016, inter-rater reliability (observed agreement and kappa coefficient) was compared for four SSO methods: (1) street-level in person; (2) street-level virtual; (3) parcel-level in person; and (4) parcel-level virtual. Intra-rater reliability (observed agreement and kappa coefficient) was calculated to determine whether parcel-level methods produce results comparable to traditional street-level observation.<bold>Results: </bold>Substantial levels of inter-rater agreement were documented across all four methods; all methods had >70% of items with at least substantial agreement. Only physical decay showed higher levels of agreement (83% of items with >75% agreement) for direct versus virtual rating source. Intra-rater agreement comparing street- versus parcel-level methods resulted in observed agreement >75% for all but one item (90%).<bold>Conclusions: </bold>Results support the use of Google Street View as a reliable, feasible tool for performing SSO at the smallest geographic resolution. Validation of a new parcel-level method collected virtually may improve the assessment of social determinants contributing to disparities in health behaviors and outcomes. [ABSTRACT FROM AUTHOR]

10.1016/j.amepre.2016.06.010

266. Jinpon P, Jaroensutasinee M, Jaroensutasinee K. **Integrated information visualization to support decision-making in order to strengthen communities: Design and usability evaluation**. Informatics for health & social care. 2017;42(4):335-48.
Community well-being refers to the qualities of an optimally healthy community life. This is the ultimate goal of all the various processes and strategies created to meet the needs of people living together in communities. We propose a holistic integrated visualization, in the form of a community well-being assessment system, as a web-based advanced tool to be used by the executive and health officers of the sub-district administration organization (SAO) network to improve decision-making in order to strengthen their communities. Data were obtained from the Family and Community Assessment Program (FAP) and the SAO in nine sub-districts, covering all of the four regions of Thailand. The system incorporates dashboard architecture and assists the executive and health officers in the SAO to achieve better decision-making for the deployment of proper measures in communities. The model was developed for the Pakpoon SAO and was applied to the other eight SAOs. In order to evaluate the model, 243 users, covering all user groups from three sites, were asked to answer 18 questions during a meeting. The overall average score for user satisfaction was 4.12. The results indicate that this model can be used for community well-being assessment, in order to improve decision-making to strengthen communities in Thailand.
https://dx.doi.org/10.1080/17538157.2016.1255626

267. Jia P, Cheng X, Xue H, Wang Y. **Applications of geographic information systems (GIS) data and methods in obesity-related research**. Obesity reviews : an official journal of the International Association for the Study of Obesity. 2017;18(4):400-11.
Geographic information systems (GIS) data/methods offer good promise for public health programs including obesity-related research. This study systematically examined their applications and identified gaps and limitations in current obesity-related research. A systematic search of PubMed for studies published before 20 May 2016, utilizing synonyms for GIS in combination with synonyms for obesity as search terms, identified 121 studies that met our inclusion criteria. We found primary applications of GIS data/methods in obesity-related research included (i) visualization of spatial distribution of obesity and obesity-related phenomena, and basic obesogenic environmental features, and (ii) construction of advanced obesogenic environmental indicators. We found high spatial heterogeneity in obesity prevalence/risk and obesogenic environmental factors. Also, study design and characteristics varied considerably across

studies because of lack of established guidance and protocols in the field, which may also have contributed to the mixed findings about environmental impacts on obesity. Existing findings regarding built environment are more robust than those regarding food environment. Applications of GIS data/methods in obesity research are still limited, and related research faces many challenges. More and better GIS data and more friendly analysis methods are needed to expand future GIS applications in obesity-related research.
10.1111/obr.12495

268. Hall LW, Anderson RD, Killen WD. **Spatiotemporal trend analysis of metal concentrations in sediments of a residential California stream with toxicity and regulatory implications**. Journal of environmental science and health Part A, Toxic/hazardous substances & environmental engineering. 2017;52(7):680-5.
The objective of this study was to determine if concentrations of arsenic, cadmium, chromium, copper, lead, nickel and zinc measured in the sediments of a residential stream in California (Pleasant Grove Creek) have changed temporally or spatially from 2006 to 2016. Threshold Effect Levels (TELs), conservative ecological effects benchmarks, and exceedances for the seven metals were also evaluated over the 11-year time period to provide insight into potential metal toxicity to resident benthic communities. In addition, the bioavailability of metals in sediments was also determined by calculating Simultaneous Extracted Metal/Acid Volatle Sulfide (SEM/AVS) ratios to allow an additional assessment of toxicity. Regulatory implications of this data set and the role of metal toxicity are also discussed. Stream-wide temporal trend analysis showed no statistically significant trends for any of the metals. However, spatial analysis for several sites located near storm drains did show a significant increase for most metals over the 11-year period. TEL exceedances during the 7 years of sampling, spanning 2006-2016, were reported for all metals with the number of exceedances ranging from 47 for copper and zinc to 1 for lead. A spatial analysis showed that the highest number of TEL exceedances and the highest number of SEM/AVS ratios greater than one with at least one metal exceeding a TEL occurred at upstream sites. The potentially toxic metal concentrations reported in Pleasant Grove Creek should be used in the 303 (d) listing process for impaired water bodies in California.
https://dx.doi.org/10.1080/10934529.2017.1297149

269. Gordon WJ, Fairhall A, Landman A. **Threats to Information Security - Public Health Implications**. The New England journal of medicine. 2017;377(8):707-9.

https://dx.doi.org/10.1056/NEJMp1707212

270. Franch-Gras L, Garcia-Roger EM, Franch B, Carmona MJ, Serra M. **Quantifying unpredictability: A multiple-model approach based on satellite imagery data from Mediterranean ponds**. PloS one. 2017;12(11):e0187958.
Fluctuations in environmental parameters are increasingly being recognized as essential features of any habitat. The quantification of whether environmental fluctuations are prevalently predictable or unpredictable is remarkably relevant to understanding the evolutionary responses of organisms. However, when characterizing the relevant features of natural habitats, ecologists typically face two problems: (1) gathering long-term data and (2) handling the hard-won data. This paper takes advantage of the free access to long-term recordings of remote sensing data (27 years, Landsat TM/ETM+) to assess a set of environmental models for estimating environmental predictability. The case study included 20 Mediterranean saline ponds and lakes, and the focal variable was the water-surface area. This study first aimed to produce a method for accurately estimating the water-surface area from satellite images. Saline ponds can develop salt-crusted areas that make it difficult to distinguish between soil and water. This challenge was addressed using a novel pipeline that combines band ratio water indices and the short near-infrared band as a salt filter. The study then extracted the predictable and unpredictable components of variation in the water-surface area. Two different approaches, each showing variations in the parameters, were used to obtain the stochastic variation around a regular pattern with the objective of dissecting the effect of assumptions on predictability estimations. The first approach, which is based on Colwell's predictability metrics, transforms the focal variable into a nominal one. The resulting discrete categories define the relevant variations in the water-surface area. In the second approach, we introduced General Additive Model (GAM) fitting as a new metric for quantifying predictability. Both approaches produced a wide range of predictability for the studied ponds. Some model assumptions-which are considered very different a priori-had minor effects, whereas others produced predictability estimations that showed some degree of divergence. We hypothesize that these diverging estimations of predictability reflect the effect of fluctuations on different types of

organisms. The fluctuation analysis described in this manuscript is applicable to a wide variety of systems, including both aquatic and non-aquatic systems, and will be valuable for quantifying and characterizing predictability, which is essential within the expected global increase in the unpredictability of environmental fluctuations. We advocate that a priori information for organisms of interest should be used to select the most suitable metrics for estimating predictability, and we provide some guidelines for this approach.
https://dx.doi.org/10.1371/journal.pone.0187958

271. Faure E, Danjou AMN, Clavel-Chapelon F, Boutron-Ruault M-C, Dossus L, Fervers B. **Accuracy of two geocoding methods for geographic information system-based exposure assessment in epidemiological studies**. Environmental Health: A Global Access Science Source. 2017;16:1-12.
<bold>Background: </bold>Environmental exposure assessment based on Geographic Information Systems (GIS) and study participants' residential proximity to environmental exposure sources relies on the positional accuracy of subjects' residences to avoid misclassification bias. Our study compared the positional accuracy of two automatic geocoding methods to a manual reference method.<bold>Methods: </bold>We geocoded 4,247 address records representing the residential history (1990-2008) of 1,685 women from the French national E3N cohort living in the Rhône-Alpes region. We compared two automatic geocoding methods, a free-online geocoding service (method A) and an in-house geocoder (method B), to a reference layer created by manually relocating addresses from method A (method R). For each automatic geocoding method, positional accuracy levels were compared according to the urban/rural status of addresses and time-periods (1990-2000, 2001-2008), using Chi Square tests. Kappa statistics were performed to assess agreement of positional accuracy of both methods A and B with the reference method, overall, by time-periods and by urban/rural status of addresses.<bold>Results: </bold>Respectively 81.4% and 84.4% of addresses were geocoded to the exact address (65.1% and 61.4%) or to the street segment (16.3% and 23.0%) with methods A and B. In the reference layer, geocoding accuracy was higher in urban areas compared to rural areas (74.4% vs. 10.5% addresses geocoded to the address or interpolated address level, $p < 0.0001$); no difference was observed according to the period of residence. Compared to the reference method, median positional errors were 0.0 m (IQR = 0.0-37.2 m) and 26.5 m (8.0-134.8 m), with positional errors <100 m for 82.5% and 71.3% of addresses, for method A and method B respectively. Positional agreement of method A and method B with method R was 'substantial' for both methods, with kappa coefficients of 0.60 and 0.61 for methods A and B, respectively.<bold>Conclusion: </bold>Our study demonstrates the feasibility of geocoding residential addresses in epidemiological studies not initially recorded for environmental exposure assessment, for both recent addresses and residence locations more than 20 years ago. Accuracy of the two automatic geocoding methods was comparable. The in-house method (B) allowed a better control of the geocoding process and was less time consuming. [ABSTRACT FROM AUTHOR]

10.1186/s12940-017-0217-5

272. Cota E, Ribeiro L, Bezerra JS, Costa A, da Silva RE, Cota G. **Using formal methods for content validation of medical procedure documents**. International journal of medical informatics. 2017;104:10-25.
OBJECTIVE: We propose the use of a formal approach to support content validation of a standard operating procedure (SOP) for a therapeutic intervention. Such an approach provides a useful tool to identify ambiguities, omissions and inconsistencies, and improves the applicability and efficacy of documents in the health settings., MATERIALS AND METHODS: We apply and evaluate a methodology originally proposed for the verification of software specification documents to a specific SOP. The verification methodology uses the graph formalism to model the document. Semi-automatic analysis identifies possible problems in the model and in the original document. The verification is an iterative process that identifies possible faults in the original text that should be revised by its authors and/or specialists., RESULTS: The proposed method was able to identify 23 possible issues in the original document (ambiguities, omissions, redundant information, and inaccuracies, among others). The formal verification process aided the specialists to consider a wider range of usage scenarios and to identify which instructions form the kernel of the proposed SOP and which ones represent additional or required knowledge that are mandatory for the correct application of the medical

document., CONCLUSION: By using the proposed verification process, a simpler and yet more complete SOP could be produced. As consequence, during the validation process the experts received a more mature document and could focus on the technical aspects of the procedure itself.
https://dx.doi.org/10.1016/j.ijmedinf.2017.04.012

273. Chen C-C, Chuang J-H, Wang D-W, Wang C-M, Lin B-C, Chan T-C. **Balancing geo-privacy and spatial patterns in epidemiological studies**. Geospatial health. 2017;12(2):573.
To balance the protection of geo-privacy and the accuracy of spatial patterns, we developed a geo-spatial tool (GeoMasker) intended to mask the residential locations of patients or cases in a geographic information system (GIS). To elucidate the effects of geo-masking parameters, we applied 2010 dengue epidemic data from Taiwan testing the tool's performance in an empirical situation. The similarity of pre- and post-spatial patterns was measured by D statistics under a 95% confidence interval. In the empirical study, different magnitudes of anonymisation (estimated Kanonymity >=10 and 100) were achieved and different degrees of agreement on the pre- and post-patterns were evaluated. The application is beneficial for public health workers and researchers when processing data with individuals' spatial information.
https://dx.doi.org/10.4081/gh.2017.573

274. Carney TJ, Shea CM. **Informatics Metrics and Measures for a Smart Public Health Systems Approach: Information Science Perspective**. Computational and mathematical methods in medicine. 2017;2017:1452415.
Public health informatics is an evolving domain in which practices constantly change to meet the demands of a highly complex public health and healthcare delivery system. Given the emergence of various concepts, such as learning health systems, smart health systems, and adaptive complex health systems, health informatics professionals would benefit from a common set of measures and capabilities to inform our modeling, measuring, and managing of health system "smartness." Here, we introduce the concepts of organizational complexity, problem/issue complexity, and situational awareness as three codependent drivers of smart public health systems characteristics. We also propose seven smart public health systems measures and capabilities that are important in a public health informatics professional's toolkit.
https://dx.doi.org/10.1155/2017/1452415

275. Browning M, Lee K. **Within What Distance Does "Greenness" Best Predict Physical Health? A Systematic Review of Articles with GIS Buffer Analyses across the Lifespan**. International journal of environmental research and public health. 2017;14(7).
Is the amount of "greenness" within a 250-m, 500-m, 1000-m or a 2000-m buffer surrounding a person's home a good predictor of their physical health? The evidence is inconclusive. We reviewed Web of Science articles that used geographic information system buffer analyses to identify trends between physical health, greenness, and distance within which greenness is measured. Our inclusion criteria were: (1) use of buffers to estimate residential greenness; (2) statistical analyses that calculated significance of the greenness-physical health relationship; and (3) peer-reviewed articles published in English between 2007 and 2017. To capture multiple findings from a single article, we selected our unit of inquiry as the analysis, not the article. Our final sample included 260 analyses in 47 articles. All aspects of the review were in accordance with PRISMA guidelines. Analyses were independently judged as more, less, or least likely to be biased based on the inclusion of objective health measures and income/education controls. We found evidence that larger buffer sizes, up to 2000 m, better predicted physical health than smaller ones. We recommend that future analyses use nested rather than overlapping buffers to evaluate to what extent greenness not immediately around a person's home (i.e., within 1000-2000 m) predicts physical health.
10.3390/ijerph14070675

276. Bereskie T, Haider H, Rodriguez MJ, Sadiq R. **Small drinking water systems under spatiotemporal water quality variability: a risk-based performance benchmarking framework**. Environmental monitoring and assessment. 2017;189(9):464.
Traditional approaches for benchmarking drinking water systems are binary, based solely on the compliance and/or non-compliance of one or more water quality performance indicators against defined regulatory guidelines/standards. The consequence of water quality failure is dependent on location within a water supply system as well as time of the year (i.e., season) with varying levels of water consumption. Conventional approaches used for water quality comparison

purposes fail to incorporate spatiotemporal variability and degrees of compliance and/or non-compliance. This can lead to misleading or inaccurate performance assessment data used in the performance benchmarking process. In this research, a hierarchical risk-based water quality performance benchmarking framework is proposed to evaluate small drinking water systems (SDWSs) through cross-comparison amongst similar systems. The proposed framework (R WQI framework) is designed to quantify consequence associated with seasonal and location-specific water quality issues in a given drinking water supply system to facilitate more efficient decision-making for SDWSs striving for continuous performance improvement. Fuzzy rule-based modelling is used to address imprecision associated with measuring performance based on singular water quality guidelines/standards and the uncertainties present in SDWS operations and monitoring. This proposed R WQI framework has been demonstrated using data collected from 16 SDWSs in Newfoundland and Labrador and Quebec, Canada, and compared to the Canadian Council of Ministers of the Environment WQI, a traditional, guidelines/standard-based approach. The study found that the R WQI framework provides an in-depth state of water quality and benchmarks SDWSs more rationally based on the frequency of occurrence and consequence of failure events.
https://dx.doi.org/10.1007/s10661-017-6176-z

277. Ben Ramadan AA, Jackson-Thompson J, Boren SA. **Geographic Information Systems: Usability, Perception, and Preferences of Public Health Professionals**. Online journal of public health informatics. 2017;9(2):e191.
BACKGROUND: Analyzing and visualizing health-related databases using Geographic Information Systems (GISs) becomes essential in controlling many public health problems., OBJECTIVES: To explore the perception and preferences of public health professionals (PHPs) about the usability of GISs in public health field., METHODS: For this scoping review, the investigators searched Medline Ovid, PubMed, IEEE, Scopus, and GeoBase databases. A total of 105 articles were identified. Nine articles met the inclusion criteria., RESULTS: Iterative evaluations, training, and involvement of GIS end users are productive in GIS usability. More methodologies are needed to support the validity of GIS usability studies. The exchange of GIS technology impacts public health policy and research positively., DISCUSSION: PHPs are aware of the use of GISs in the public health field, and the exchange of visualized health data in determining inequalities and inaccessibility issues., CONCLUSION: GISs are essential to control public health problems, if the related health datasets are analyzed carefully and if the mapping reports are extensively evaluated and interpreted.
https://dx.doi.org/10.5210/ojphi.v9i2.7437

278. Rushon G. **GIS to Improve Public Health**. Transactions in GIS. 2000;4(1):1.
Focuses on the use of geographical information systems (GIS) in improving public health in the United States. Need for research to support the application of GIS in public health analysis; Proposals of health and environmental agencies to develop a health-related GIS; Problems encountered in the application of GIS to health analysis.

Appendix: Sample Search Strategy

The following search strategy has been provided for your review. For dissemination or publication of the strategy and to request search methodology please contact library@kflaph.ca. Thank you!

Ovid MEDLINE(R) ALL <1946 to October 26, 2023>

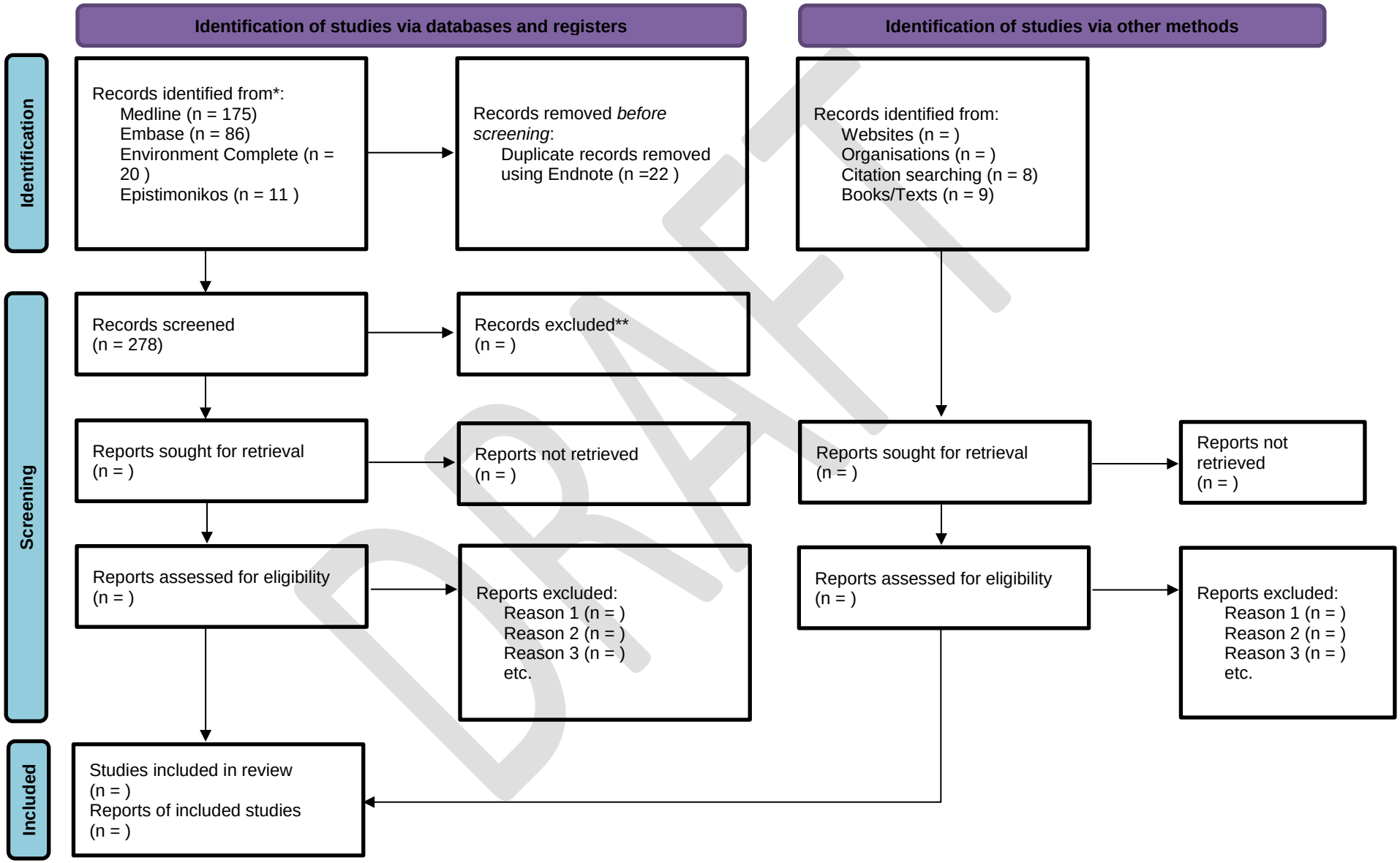
#	Searches	Results	Type
1	"Spatial-Temporal Analysis"/ or Geographic Information Systems/ or Geographic Mapping/ or Census Tract/ or Infodemiology/ or Remote Sensing Technology/ or Satellite Imagery/ or Spatial Analysis/ or Topography, Medical/	27435	Advanced
2	(((aerial or satellite) adj1 (data or tech* or image* or imaging)) or epidemiological model* or "health geographics" or census tract? or geographic cartography or geographic inform* system* or geographic map* or georeferenc* or geoanalytic* or geo-analytic* or (remote sensing adj1 (data* or imag* or tech*)) or ((spatial	13401	Advanced

	or spatiotemporal) adj1 (data science* or analys?s)) or (epidemiolog* adj2 geographic*) or spatial report* or GIS or "mapping software" or "medical geography" or (topography adj1 medical)).ti,kw,kf.		
3	or/1-2 [GIS]	35827	Advanced
4	Community Health Nursing/ or Community Health Services/ or Community Medicine/ or Environmental Medicine/ or Environmental Monitoring/ or Epidemiologic Methods/ or Epidemiological Monitoring/ or Epidemiology/ or Epidemiological Models/ or Epidemiologic Research Design/ or Health Care Coalitions/ or Population Health Management/ or Population Health/ or Population Surveillance/ or Preventive Health Services/ or Preventive Medicine/ or Public Health Administration/ or Public Health Informatics/ or Public Health Nursing/ or Public Health Practice/ or Public Health Surveillance/ or Public Health/ or Rural Health/ or Sentinel Surveillance/ or Suburban Health/ or Urban Health/	493079	Advanced
5	("community health*" or ((environmental or community) adj1 (medicine or monitor*)) or epidemiology or (epidemiologic adj1 (method* or monitor*)) or ("health* care*" adj (medicine or prevent* or coalition*)) or (prevent* adj (health* care* or medicine)) or "public health*" or "health* unit" or "health* units" or ("local health*" adj (unit or units or agenc* or department* or center* or centre* or organi#ation* or administrat* or governanc* or jurisdiction*)) or ((sentinel or syndromic) adj1 surveillance) or biosurveillance or ((rural or "farm* communit*" or town* or village* or urban or peri-urban or city or cities or suburban or municipal* or (vertical adj2 communit*) or (High adj rise*) or (inner adj cit*) or ((density or densely or highly) adj2 popula*) or metropolitan or suburb*) adj1 (health* or "health* program*")) or "urban health*" or (population adj2 (health* or surveillance))).ti,kf,kw.	325318	Advanced
6	or/4-5 [PH/POP HEALTH/EPPI]	727253	Advanced
7	Public health Informatics/ or "public health informatics".ti,kf,kw.	1449	Advanced
8	(3 and 6) or 7 [PUBLIC HEALTH GIS]	10487	Advanced
9	Codes of Ethics/ or Confidentiality/ or Ethics/ or Genetic Privacy/ or Privacy/ or es.fs.	115540	Advanced
10	(data protection or "Electronic Documents Act" or "Health Insurance Portability and Accountability Act" or "Personal Health Information Protection Act" or "Personal Information Protection" or "PIPA Personal Information Protection Act" or confidential* or ethical or ethics or HIPAA or PHIPA or PIPEDA or privacy or private info*).ti,kw.	77724	Advanced
11	(("name" or named or names or identifi* or identifying or ((personal or protected or privileged or sensitive or private) adj2 information) or (privacy adj2 information) or ((personal or home) adj (address* or phone or number* or telephone)) or "date of birth" or SIN number* or "social insurance number*" or (health* adj1 (card? or number*)) or blood type* or ((health* or illness* or medical) adj2 histor*)) adj3 ("de identify" or "de identification" or deidentif* or anonymi* or ((scrub or scrubbing or cleansing) adj2 (data or text*)) or ((delete* or deleting or mask or masking) adj2 personal identifi*))).ti,ab,kw.	623	Advanced
12	or/9-11 [PRIVACY]	158227	Advanced
13	"Information Storage and Retrieval"/ or Benchmarking/ or Data Collection/mt or Data Curation/ or Filing/ or Systems Analysis/ or Systems Integration/	68607	Advanced
14	(((file or filing or information*) adj2 architecture) or data flow* or workflow* or (divid* adj2 responsibilit*) or (collect* adj2 info) or data governance or usability).ti,kw.	12002	Advanced
15	or/13-14 [WORK PROCESSES]	80225	Advanced

16	Guidelines as Topic/ or Implementation Science/ or Information Systems/ or Models, Organizational/ or Practice Guidelines as Topic/ or Evidence-Based Practice/ or Quality Assurance, Health Care/ or Quality Improvement/ or Quality of Health Care/ or Total Quality Management/ or Workflow/	384437	Advanced
17	("best practice*" or implement* or improv* or evaluat* or effectiv* or comparative effectiveness research* or* benchmark* or practice guideline* or quality).ti,kw. not Medline.st.	260948	Advanced
18	((((aerial or satellite) adj1 (data or tech* or image* or imaging)) or epidemiological model* or "health geographics" or census tract? or geographic cartography or geographic inform* system* or geographic map* or georeferenc* or geoanalytic* or geo-analytic* or (remote sensing adj1 (data* or imag* or tech*)) or ((spatial or spatiotemporal) adj1 (data science* or analys?s)) or (epidemiolog* adj2 geographic*) or spatial report* or GIS or "mapping software" or "medical geography" or (topography adj1 medical)) adj3 (approach* or implement* or improv* or evaluat* or effectiv* or "best practice*" or comparative effectiveness research* or benchmark* or practice guideline* or quality or methodological* or process*)).ti,kw.	460	Advanced
19	or/16-18 [GENERAL QUALITY TERMS]	645769	Advanced
20	12 or 15 or 19	857667	Advanced
21	8 and 20	760	Advanced
22	limit 21 to (english language and yr="2017 -Current")	175	Advanced

***Library staff make every effort to provide accurate and complete database search results. However, we assume no liability for information retrieved, its interpretation, applications or omissions*

Appendix 2: PRISMA



*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers).

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. For more information, visit: http://www.prisma-statement.org/