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# Online Journal of Public Health Informatics

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## Contents

# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

Welcome to the current issue of the Online Journal of Public Health Informatics. At this stage I will like to take the opportunity to thank the reviewers who have been doing a wonderful job in providing prompt reviews of the articles assigned to them. We have achieved our status as a PubMed indexed, peer-reviewed journal mainly because you have taken this 'labor of love' assignment quite seriously. We plan to give graduate students an opportunity to submit summaries of their capstone reports and dissertations for publication as working papers in future issues of the journal. Authors will also be invited to deliver webinars on their articles to the public health informatics community. These webinars and their accompanying discussions will be recorded and archived. Students will be encouraged to attend these webinars. It is fair to say that, through the support of the reviewers and readers we have succeeded in positioning this journal as the sole portal for disseminating public health informatics research findings. The capability to exchange patient-specific health data among autonomous healthcare entities is at the core of successful implementation of Health Information Exchanges. This capability is also important for patient treatment, public health services delivery, and research. Wu Xu et al. describe efforts to create a statewide Master Person Index in Utah to uniquely identify each individual receiving healthcare or public health services. Exchanging personally identifiable information across enterprises for healthcare identity resolution requires new models for data sharing and a complex policy framework to mitigate risks to participants and ensure cooperative success. The authors developed a focus area maturity model to guide the complex process of developing a functional statewide Master Person Index (sMPI) among diverse, autonomous partners. The proposed framework provides an orderly path to address interdependences that can guide the complex process of developing a functional sMPI, avoiding conflicts between policy and technology that may lead to nonfunctional implementations. Immunization registries have been shown to increase vaccine coverage rates and reduce duplicate immunizations. In order to achieve meaningful use the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 encourages providers to submit electronic immunization data to regional or statewide immunization information systems. At present, many providers have established unidirectional interoperability for uploading EMR immunization data to designated registries. It is recognized that bidirectional interoperability is preferable because it allows immunization data to be transmitted directly to vendor EMRs. Integration is, however, expensive and difficult to achieve. Lindsay A. Stevens, Jonathan P. Palma, et.al develop and test the feasibility of visually integrating external registries into vendor EMR systems. The study shows that this procedure meets providers' need for relevant data, increases reporting of immunizations, improves provider satisfaction, and avoids the increased costs of bidirectional data integration. Approximately 300,000 individuals die from out-of-hospital cardiac arrest (OHCA) annually in the United States. It has been observed that there is a wide disparity in the OHCA survival rates between cities in USA. Hugh Semple et al. present results from an on-going project to develop user-friendly, interactive web mapping application that allows public health professionals and the general public to visualize the geographic patterns of cardiac arrest rates, bystander CPR rates, and target specific locations for public health services delivery. Participants in a preliminary evaluation felt that the web mapping application was a useful, user-friendly geovisualization tool. It is expected that this project will encourage the development of public health web mapping applications that are centered on interactive maps, summary statistics, and the use of social media technology. Various social and institutional issues present challenges in the implementation of school-based sexual health education in developing countries. Angella Musiimenta of Mbarara University of Science and Technology, Uganda, presents the results of a study aimed at identifying the factors responsible for successful implementation of technology-aided sexual health education in two Ugandan schools. The results indicate that, rather than focusing exclusively on technology, program administrators should create social, institutional, and religious climate that is more supportive of school-based computer-assisted education. Health services and public health researchers increasingly rely on search engines to identify relevant articles. The reliability of these search engines is very necessary if one is to avoid costly mistakes. Google Scholar (GS) is widely-recognized as an excellent source of grey literature in biomedicine. It is a useful tool to help researchers quickly locate relevant papers from billions of pages across the Web. Research by Dean Guistini et al. demonstrates that GS is not flexible, precise or indexed enough to be used alone for systematic reviews. The authors show that Google Search's 'keyword search' capability, allied to Google's PageRank, is a poor replacement for controlled vocabulary searching and its interface does not provide enough flexibility to accommodate search filters by discipline, such as 'health and medicine'. The authors recommend that Google Search developers should provide full details about its database coverage and improve its interface search capabilities (e.g., indexing, semantic search filters, stored searching, etc.) in order to satisfy the demands of thorough, replicable searches as required by systematic reviews for health services and public health research. Thomas G. Savel et al. describe the development of Partial Thromboplastin Time (PTT) Advisor, a CDC-supported initiative to develop a mobile clinical laboratory decision support application. This is among the first of a handful of iOS-based applications funded by CDC. The application offers clinicians a resource to quickly select the appropriate follow-up tests to

evaluate patients with prolonged PTT and a normal prothrombin laboratory result. The authors address some of the challenges involved in the development and deployment of the application. The free mobile PTT Advisor app was approved by Apple and published in their iTunes App store. Lessons learned from this project will assist other mobile health/public health application developers understand and overcome some of the challenges involved in such projects. The determination of priorities is an essential component of community health status assessment. Priority setting enables the rational allocation of limited resources among competing programs. James Studnicki et al. utilized the analytical capabilities of online analytic processing( OLAP) interface to create a community health status prioritizing system which, among other attributes, is capable of ranking different types of health status outcomes and also provides flexibility in the weighting of the evaluation criteria. The authors demonstrate that rankings of community health outcomes based on OLAP provide sufficient information for priority setting compared to previous methods based on a static set of criteria with fixed weighting factors. The adoption of certified electronic health records and the implementation of health information exchanges are expected to facilitate the sharing of patients' health records by authorized providers. Records can thus follow patients resulting in reduced delays, duplications, errors, quality improvements and lower costs. Ultimately, the idea is to enable the patient to control access to their own data. Access to care records is currently often difficult or impossible in cases where records contain personal identifiers; they have to be secured behind services that greatly impede ready access. Existing access control infrastructures are proprietary, further making it impossible to retrieve patient records electronically on demand from a workstation that is not part of the record keeper's network. Existing solutions to the data portability problem have raised issues as to whether the public would have confidence that their personal records were safe, secure and private, especially when cloud-based or controlled by third party commercial service providers such as MicrosoftVault, GoogleHealth, etc. Roderick Neame outlines a platform-independent method that avoids most of the issues raised by existing record portability solutions and ensures continuum of care for patients such that their care records follow them wherever they go. In order for such a methodology to be implemented successfully the author acknowledges that it is necessary to have an agreement on the record data types and sub-types, their associated XML tags, as well as develop a browser add-on that can import and display flexibly the XML marked-up records. These conditions are not difficult to achieve with existing technologies. Research shows that the incidence of healthcare-associated infections (HAIs) has increased significantly in the past 20 years in USA. The number of patients who suffer from HAIs annually in USA is estimated to be approximately 2 million, with about 100,000 deaths annually, ranking HAI among the leading causes of death in US acute-care hospitals. The federal government has mandated hospitals to publically report HAI rates in order to increase transparency and trust between hospitals and consumers, and to disseminate best practices. However, there is limited guidance in the medical and public health literature related to public reporting of health care-associated infections data. Yair Rajwan et al. demonstrate that visual communication can provide effective evidence-based information to consumers for decision making and to practitioners for providing patient safety outcomes and processes. The prevention of hospital readmissions improves the quality of individual care as well as population health status. Under the Hospital Readmissions Reduction Program hospitals must reduce readmissions in order to avoid being penalized financially. Accurately predicting the risks of readmissions is a requirement for improving the transition of care process during and post-discharge. The use of administrative claims data is a major limitation of most risk prediction models. Shahid Choudhry, Jing Li et al. utilized electronic health records data and a mixed-method risk prediction model to evaluate post-discharge risk factors. The model demonstrated reasonable fit in heterogeneous populations. Given the range of variables that contribute to readmission risks it is necessary to include variables from electronic health records in developing hospital readmission risks. In recent years the world has witnessed disease outbreaks and epidemics resulting in loss of lives and significant economic costs. For example, the global Severe Acute Respiratory Syndrome of 2002-2003 resulted in a financial cost of \$40 billion to \$54 billion dollars while the anthrax attack in US in 2001 resulted in financial cost of 320 million dollars, 22 cases, including 5 deaths. The significant health impacts and economic costs of disease outbreaks illustrate the critical importance of effective public health surveillance and rapid response. In order to respond effectively to the growing threats to population health, public health surveillance systems must be built on a stable infrastructure of core workforce competencies, information systems, and organizational capacity, and must be supported by enterprise-based funding. Nabila Mirza, Terra Reynolds et al. present the recommendations of the Sustainable Surveillance Workgroup convened by the International Society for Disease Surveillance to identify strategies for building, strengthening, and maintaining surveillance systems. Best Regards Edward Mensah, PhD Editor-in-Chief, OJPHI

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# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

More than a decade into the 21st century, the ability to effectively monitor community health status, as well as forecast, detect, and respond to disease outbreaks and other events of public health significance, remains a major challenge. As an issue that affects population health, economic stability, and global security, the public health surveillance enterprise warrants the attention of decision makers at all levels. Public health practitioners responsible for surveillance functions are best positioned to identify the key elements needed for creating and maintaining effective and sustainable surveillance systems. This paper presents the recommendations of the Sustainable Surveillance Workgroup convened by the International Society for Disease Surveillance (ISDS) to identify strategies for building, strengthening, and maintaining surveillance systems that are equipped to provide data continuity and to handle both established and new data sources and public health surveillance practices.

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# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

In the chaotic environment of an emergency department trauma unit, accuracy and timeliness in decision making are required to save a patient's life. In a large urban city, where gun violence is high, emergency department physicians must have a wide array of tools in order to effectively and efficiently treat victims of gun violence and ensure that their diagnoses are properly coded. A disparity currently exists between the accuracy of ICD-9 admission coding and discharge coding with some error rates as much as seventy percent. [1,2,3,4] The elevated error rate is poised to increase even more, as the US transitions from ICD-9 to ICD-10 coding standard. The proposed decision support tool, the ICD-10 anatomographer, will have many advantages to medical professionals working in high-intensity settings. Emergency department physicians in busy trauma care units in large urban hospitals will be able to utilize this technology to find the accurate ICD-10 code in an efficient manner, thereby improving quality of care and saving lives. Keywords: decision support, ICD-9 to ICD-10 transition, anatomography

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# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

**Objectives:** This manuscript describes the development of PTT (Partial Thromboplastin Time) Advisor, one of the first of a handful of iOS-based mobile applications to be released by the US Centers for Disease Control and Prevention (CDC). PTT Advisor has been a collaboration between two groups at CDC (Informatics R&D and Laboratory Science), and one partner team (Clinical Laboratory Integration into Healthcare Collaborative - CLIHC). The application offers clinicians a resource to quickly select the appropriate follow-up tests to evaluate patients with a prolonged PTT and a normal prothrombin time (PT) laboratory result. **Methods:** The application was designed leveraging an agile methodology, and best practices in user experience (UX) design and mobile application development. **Results:** As it is an open-source project, the code to PTT Advisor was made available to the public under the Apache Software License. On July 6, 2012, the free app was approved by Apple, and was published to their App Store. **Conclusions:** Regardless of the complexity of the mobile application, the level of effort required in the development process should not be underestimated. There are several issues that make designing the UI for a mobile phone challenging (not just small screen size): the touchscreen, users' mobile mindset (tasks need to be quick and focused), and the fact that mobile UI conventions/expectations are still being defined and refined (due to the maturity level of the field of mobile application development).

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# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

Background: The CDC established a national objective to create population-based tracking of immunizations through regional and statewide registries nearly 2 decades ago, and these registries have increased coverage rates and reduced duplicate immunizations. With increased adoption of commercial electronic medical records (EMR), some institutions have used unidirectional links to send immunization data to designated registries. However, access to these registries within a vendor EMR has not been previously reported. Purpose: To develop a visually integrated interface between an EMR and a statewide immunization registry at a previously non-reporting hospital, and to assess subsequent changes in provider use and satisfaction. Methods: A group of healthcare providers were surveyed before and after implementation of the new interface. The surveys addressed access of the California Immunization Registry (CAIR), and satisfaction with the availability of immunization information. Information Technology (IT) teams developed a “smart-link” within the electronic patient chart that provides a single-click interface for visual integration of data within the CAIR database. Results: Use of the tool has increased in the months since its initiation, and over 20,000 new immunizations have been exported successfully to CAIR since the hospital began sharing data with the registry. Survey data suggest that providers find this tool improves workflow and overall satisfaction with availability of immunization data. (p=0.009). Conclusions: Visual integration of external registries into a vendor EMR system is feasible and improves provider satisfaction and registry reporting.

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# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

The purpose of this study was to evaluate information visualization of publicly-reported central line-associated blood stream infection (CLABSI) outcome data for decision making by diverse target audiences—health care consumers and practitioners. We describe the challenges in publicly reporting of healthcare-associated infections (HAIs) data and the interpretation of an evaluation metric. Several options for visualization of CLABSI data were designed and evaluated employing exploratory working group, two confirmatory focus groups' observations, and experts' committee validation of the final designs. Survey-data collection and evaluation criteria results, collected from the two focus groups, are presented and are used to develop the final recommendations for how to visualize publicly report CLABSI data from Maryland acute care hospitals. Both health care consumer and practitioner's perspectives are highlighted and categorized based on the visualizations' dimensions framework. Finally, a recommended format for visualizing CLABSI outcome data based on the evaluation study is summarized.

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# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

Improving survival rates at the neighborhood level is increasingly seen as priority for reducing overall rates of out-of-hospital cardiac arrest (OHCA) in the United States. Since wide disparities exist in OHCA rates at the neighborhood level, it is important for public health officials and residents to be able to quickly locate neighborhoods where people are at elevated risk for cardiac arrest and to target these areas for educational outreach and other mitigation strategies. This paper describes an OHCA web mapping application that was developed to provide users with interactive maps and data for them to quickly visualize and analyze the geographic pattern of cardiac arrest rates, bystander CPR rates, and survival rates at the neighborhood level in different U.S. cities. The data comes from the Cares Registry and is provided over a period spanning several years so users can visualize trends in neighborhood out-of-hospital cardiac arrest patterns. Users can also visualize areas that are statistical hot and cold spots for cardiac arrest and compare OHCA and bystander CPR rates in the hot and cold spots. Although not designed as a public participation GIS (PPGIS), this application seeks to provide a forum around which data and maps about local patterns of OHCA can be shared, analyzed and discussed with a view of empowering local communities to take action to address the high rates of OHCA in their vicinity.

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# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

**Introduction:** Preventing the occurrence of hospital readmissions is needed to improve quality of care and foster population health across the care continuum. Hospitals are being held accountable for improving transitions of care to avert unnecessary readmissions. Advocate Health Care in Chicago and Cerner (ACC) collaborated to develop all-cause, 30-day hospital readmission risk prediction models to identify patients that need interventional resources. Ideally, prediction models should encompass several qualities: they should have high predictive ability; use reliable and clinically relevant data; use vigorous performance metrics to assess the models; be validated in populations where they are applied; and be scalable in heterogeneous populations. However, a systematic review of prediction models for hospital readmission risk determined that most performed poorly (average C-statistic of 0.66) and efforts to improve their performance are needed for widespread usage. **Methods:** The ACC team incorporated electronic health record data, utilized a mixed-method approach to evaluate risk factors, and externally validated their prediction models for generalizability. Inclusion and exclusion criteria were applied on the patient cohort and then split for derivation and internal validation. Stepwise logistic regression was performed to develop two predictive models: one for admission and one for discharge. The prediction models were assessed for discrimination ability, calibration, overall performance, and then externally validated. **Results:** The ACC Admission and Discharge Models demonstrated modest discrimination ability during derivation, internal and external validation post-recalibration (C-statistic of 0.76 and 0.78, respectively), and reasonable model fit during external validation for utility in heterogeneous populations. **Conclusions:** The ACC Admission and Discharge Models embody the design qualities of ideal prediction models. The ACC plans to continue its partnership to further improve and develop valuable clinical models. **Key Words:** 30-day All-Cause Hospital Readmission, Readmission Risk Stratification Tool, Predictive Analytics, Prediction Model, Derivation and External Validation of a Prediction Model, Clinical Decision Prediction Model

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# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

**Background** Google Scholar (GS) has been noted for its ability to search broadly for important references in the literature. Gehanno et al. recently examined GS in their study: 'Is Google scholar enough to be used alone for systematic reviews?' In this paper, we revisit this important question, and some of Gehanno et al.'s other findings in evaluating the academic search engine. **Methods** The authors searched for a recent systematic review (SR) of comparable size to run search tests similar to those in Gehanno et al. We selected Chou et al. (2013) contacting the authors for a list of publications they found in their SR on social media in health. We queried GS for each of those 506 titles (in quotes "\""), one by one. When GS failed to retrieve a paper, or produced too many results, we used the allintitle: command to find papers with the same title. Results Google Scholar produced records for ~95% of the papers cited by Chou et al. (n=476/506). A few of the 30 papers that were not in GS were later retrieved via PubMed and even regular Google Search. But due to its different structure, we could not run searches in GS that were originally performed by Chou et al. in PubMed, Web of Science, Scopus and PsycINFO®. Identifying 506 papers in GS was an inefficient process, especially for papers using similar search terms. **Conclusions** Has Google Scholar improved enough to be used alone in searching for systematic reviews? No. GS' constantly-changing content, algorithms and database structure make it a poor choice for systematic reviews. Looking for papers when you know their titles is a far different issue from discovering them initially. Further research is needed to determine when and how (and for what purposes) GS can be used alone. Google should provide details about GS' database coverage and improve its interface (e.g., with semantic search filters, stored searching, etc.). Perhaps then it will be an appropriate choice for systematic reviews.

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# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

**Introduction:** The determination of priorities is an essential component of community health status assessment. Yet, there is an acknowledged need for a systematic method which will utilize data in standardized comparisons to yield priorities based on objective analyses. **Method:** We have deployed a web-based system with: a flexible online analytic processing (OLAP) interface; multiple sources of event-level data conformed to common definitions in a data warehouse structure; and, centralized technical infrastructure with distributed analytical capabilities. The PRIORITIZATION TOOL integrated into the system takes full advantage of the granularity of multidimensional sources of data to: apply a series of defined objective criteria; vary the weight of those criteria and detect the reordering of the rankings in real-time; and, apply the prioritization algorithm to different categories of health status outcomes. **Results:** In our example, mortality outcomes for Miami-Dade County, Florida, were considered with three different weighting combinations of the four primary ranking criteria. The resultant analyses return markedly different mortality priority rankings based upon the selection and weighting of the criteria. **Conclusion:** Rankings of community health outcomes based on a static set of criteria with fixed weighting factors may not provide sufficient information necessary for priority setting and may, in fact, be misleading.

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# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

**Objective:** School-based sexual health education interventions can reach young people of diverse backgrounds and equip them with knowledge and skills for preventing themselves against HIV/AIDS, unwanted pregnancies, and live healthy and responsible lives. However, given that school-based sexual health education intervention are health projects implemented in educational settings, variety of social and institutional issues can present challenges. This study aimed to obtain rich insights into the facilitating or inhibiting mediators for the implementation of a school-based sexual health education intervention in Uganda. **Method:** This study conducted 16 qualitative interviews to investigate the mediators for the implementation of the school-based sexual health education intervention based on experiences of two Ugandan schools: the school which successfully completed the implementation of the intervention, and the school which abandoned the intervention half-way the implementation. **Results:** Rather than the technological aspects, results indicate that the implementation was strongly influenced by interplay of social and institutional mediators, which were more favourable in the “successful” school than in the “failure school”. These mediators were: perceived students’ vulnerability to HIV and unwanted pregnancies; teachers’ skills and willingness to deliver the intervention, management support; match with routine workflow, social-cultural and religious compatibility, and stakeholder involvement. **Conclusion:** Rather than focusing exclusively on technological aspects, experiences from this evaluation suggest the urgent need to also create social, institutional, and religious climate which are supportive of school-based computer-assisted sexual health education. Evidence-based recommendations are provided, which can guide potential replications, improvements, and policy formulation in subsequent school-based sexual health education interventions.

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# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

Noncommunicable diseases are the leading causes of death in all regions except Africa. The worldwide number of internet users has doubled over the past five years. The internet can ease the access to information on low-threshold prevention activities and, thereby, help to promote health. Against this background, I present a recent web-based open access initiative by two German states that focuses on lessening four common behavioral risk factors associated with noncommunicable diseases. This open access web portal to strengthen prevention and health promotion constitutes a public health project with potential for scaling up in other areas that have or will gain internet access.

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# Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

## Abstract

A principal goal of computerisation of medical records is to join up care services for the patient, so that their records can follow them wherever they go thereby reducing delays, duplications, risks and errors, and costs. Healthcare records are increasingly being stored electronically, so creating the necessary conditions for them potentially to be readily shared. The three main obstacles to realising these potential benefits relate to record accessibility, maintaining privacy and assuring the usefulness of the shared information. These constitute a set of issues that need new thinking, since existing systems are struggling to deliver them. The solution to this puzzle lies in three main parts. One is to store the sharable parts of care records in readily accessible locations, on 'the web' or in 'the cloud' and in standard web-format so that anyone can access them at any time. For privacy these publicly-accessible records must be stripped of all identifiers (names, addresses, dates, places etc) replacing these with a linktag that means nothing to anyone except those authorised to access them, but serves to identify and authenticate a specific record. The second is to give control over record access and sharing to the patient (or their identified representative), enabling them to authorise access providing the storage location (URL), linktag, security keys and context (dates, places, people etc). This can be done using a token (eg smart card) which holds these details, thereby relieving the record keeper of responsibility for access control and privacy. The third is to mark up the content of the stored records using XML tags for each data element 'type' (eg administrative, financial, operational, clinical etc); and within those types to tag sub-types such as diagnosis, medication, procedure, investigation result etc so providing the recipient with the tools necessary to read, display and manipulate the records as they prefer.

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## Abstract

**Objective:** The sharing of personally identifiable information across organizational boundaries to facilitate patient identification in Utah presents significant policy challenges. Our objective was to create a focus area maturity model to describe and evaluate our progress in developing a policy framework to support data a statewide master person index (sMPI) for healthcare and public health operations and research in Utah. **Materials and Methods:** We used various artifacts, including minutes from policy guidance committee meetings over a span of 18 months, a report from Utah's Digital Health Services Commission, and a draft technical requirements document to retrospectively analyze our work and create a focus area maturity model describing the domain of policy needed to support the sMPI. We then used our model to assess our progress and future goals. **Conclusions:** The focus area maturity model provides an orderly path that can guide the complex process of developing a functional statewide master person index among diverse, autonomous partners. While this paper focuses on our experience in Utah, we believe that the arguments for using a focus area maturity model to guide the development of state or regional MPIs is of general interest.

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