A National Research Agenda for Public Health Services and Systems

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Abstract: The field of public health services and systems research (PHSSR) has emerged over the past decade to produce the evidence needed to address critical uncertainties about how best to organize, finance, and deliver effective public health strategies to all Americans. To advance these efforts, a national PHSSR research agenda–setting process was used to identify a broad inventory of information needs and uncertainties that public health stakeholders face in the domains of public health workforce, public health system structure and performance, public health financing, and public health information and technology. This paper presents the results of an expert review process used to transform the identified information needs into a concise set of research questions that can be pursued through new scientific inquiry in PHSSR.

Established research frameworks were used to specify the contexts, mechanisms of action, and outcomes within the public health system that require further study. A total of 72 research questions were developed from the 113 original items in the PHSSR inventory of information needs. The questions include both persistent problems and newly emerging needs in public health practice and policy. The resulting research agenda provides a starting point for mobilizing the public health scientific enterprise around contemporary, high-priority uncertainties identified by broad cross sections of public health stakeholders. Regular updates to this agenda will be required to achieve continuous improvements in both the science and practice of public health.

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Background

Public health strategies hold considerable promise for improving the duration and quality of life experienced by Americans and for moderating healthcare costs associated with preventable diseases and injuries. To realize this promise, the nation's scientific community must mobilize to address critical uncertainties in how best to organize, finance, and deliver effective public health strategies to all Americans.[1,2] The field of public health services and systems research (PHSSR) has emerged over the past decade to produce the evidence needed by public health practitioners and policy decision makers to improve the nation's public health system.[3,4]

The PHSSR research agenda–setting process described earlier in this supplement identified a broad inventory of information needs and uncertainties that public health stakeholders experience in the four domains of public health workforce, public health system structure and performance, public health financing and economics, and public health information and technology.[5] These information needs were solicited from a wide array of stakeholders who participated in the agenda-setting process during 2011, including practicing public health professionals at local, state, and federal levels as well as researchers, educators, policy analysts, and representatives from public health funding agencies and professional associations.

Information needs can be addressed through an array of different strategies for acquiring and processing knowledge, including: (1) learning from experience; (2) synthesizing knowledge from previously conducted research studies; and (3) conducting new empirical research studies. For this reason, a key step in developing a research agenda involves parsing broad information needs into their component research questions that must be answered through new scientific studies. This paper presents the results of an expert review process used to transform the information

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needs compiled in the PHSSR inventory into a concise set of research questions that can be pursued through new scientific inquiry.

Methods

A team of nine research scientists and research staff with content and methodologic expertise in PHSSR reviewed the items included in the PHSSR inventory of information needs to identify items requiring revision and further specification in order to transform them into empirical research questions. Items were determined to be fully specified research questions if they incorporated key elements from one or more of two generalized research frameworks that are widely used in the health and social science fields: (1) the PICOT framework, which requires specification of the populations, interventions, comparators, and outcomes to be studied[6]; and (2) the CMO framework, which requires specification of the contexts, mechanisms of action, and outcomes to be studied.[7,8] Reviewers identified items on the inventory that lacked sufficient clarity and specificity with regard to one or more key elements of these frameworks. (The time frame element of the PICOT framework was not used in this review because the goal was to develop research questions that would be relevant to multiple types of public health problems and interventions operating over multiple time periods.) For these items, reviewers revised the text in order to create clearly specified empirical research questions that offer guidance regarding directions for future research.

Where possible, reviewers transformed original items in the inventory from descriptive questions into inferential questions that seek a deeper understanding of cause-and-effect relationships within the public health system. Additionally, broad and generic information needs articulated in the original inventory were enhanced by adding specificity regarding contexts, mechanisms of action, and/or outcomes within the public health system that require further study. To accomplish these revisions, reviewers compared items on the inventory with items included on earlier research agendas developed for the PHSSR field[9–13] and with recently conducted research syntheses developed to inform the PHSSR agenda-setting process.

Items in the PHSSR inventory of information needs were divided into the four domains used to organize the research agenda-setting process, and groups of three or four people reviewed and revised the items in each domain. As part of the revision process, reviewers combined items containing similar content and classified items into thematic subgroups based on their revised content. Revised items then were distributed to the full research team to review and discuss areas of disagreement and lack of clarity. A second cycle of review and revision was used to further improve item language, ending when team consensus was achieved on the revised item wording.

Several important concepts related to PHSSR were used as guides in developing research questions from the identified inventory of information needs. First, consistent with the IOM definition,[14] the concept of the *public health delivery system* was used to refer to the full array of organizations and actors that contribute to strategies designed to promote health and prevent disease and injury at the local, state, or national level. These systems include governmental public health agencies as well as their many counterparts in the public and private sectors. In most cases, the research questions developed through this process were specified to produce information about how systems operate at local, state, and national levels; therefore, the populations and outcomes of interest were defined at all three levels of aggregation.

Second, the concept of *public health strategies* was used to refer to the full array of actions undertaken by delivery system actors to promote health and prevent disease and injury, including prevention programs and interventions; public health laws, policies, and regulations; environmental modifications; and instrumental activities and administrative functions such as community health assessments, surveillance activities, strategic planning, and community mobilization efforts.

Third, the concept of the *performance* of a public health delivery system was defined to encompass the *effectiveness*, *efficiency*, and *equity* of the public health strategies delivered by the system, including especially the health and economic *outcomes* that result from these strategies. This concept is consistent with the *Framework for Quality in Public Health* recently developed by the DHHS.[15] Correspondingly, the research questions developed through this process were specified to identify attributes of the public health system that influence the effectiveness, efficiency, and outcomes of public health strategies. Also in keeping with the federal quality framework, the concept of *equity* in public health delivery system performance was incorporated into research questions by emphasizing the need to identify mechanisms for reducing disparities in the effectiveness, efficiency, and outcomes of public health strategies delivered to racial and ethnic minorities, low-income populations, and other groups who are at elevated risk for preventable diseases and injuries.

Results

A total of 72 research questions were developed from the 113 items in the PHSSR inventory of information needs. Twenty-five research questions were developed from items in the public health workforce domain, grouped into six thematic areas (Table 1). By definition, the two research questions in the thematic area of workforce enumeration were descriptive in nature, whereas most of the remaining 23 research questions addressed cause-and-effect relationships related to workforce characteristics. A total of 20 research questions were developed from items in the public health structure and performance domain, grouped into five thematic areas (Table 2). One of these thematic areas, social determinants of health and health disparities, contained a core set of questions related to equity in the performance of public health delivery systems. However, equity-related research questions also emerged in the workforce, finance, and information and technology domains. Twelve research questions were identified from items in the public health financing domain, grouped into three thematic areas (Table 3), whereas 15 research questions in three thematic areas were identified in the information and technology domain (Table 4).

Table 1. The public health workforce

Enumeration
1. What is the size and composition of the public health workforce, including the mix of training and experience, occupational responsibilities, institutional practice settings, and sociodemographic characteristics of workers?
2. How do the size and composition of the public health workforce vary across states and communities, and change over time?
Demand, supply, and shortages
3. What factors influence the supply of, demand for, and geographic and organizational distribution of workers within the public health workforce?
4. How does the size and composition of the public health workforce affect the volume, mix, quality, and outcomes of public health strategies delivered at local, state, and national levels?
5. What analytic methods provide the most valid and reliable estimates of public health workforce shortages and surpluses based on population characteristics, preventable disease burdens and risks, and economic conditions?
Diversity and disparities
6. How do supply-side and demand-side factors affect the racial, ethnic, socioeconomic, and cultural diversity of the public health workforce?
7. How does public health workforce diversity affect the volume, mix, quality, and outcomes of public health strategies delivered at local, state, and national levels?
8. How does public health workforce diversity affect health disparities?
9. What recruitment and retention strategies are most effective in enhancing racial, ethnic, socioeconomic, and cultural diversity in the public health workforce?
Recruitment and retention
10. What models are most effective in recruiting qualified workers into public health jobs?
11. How do the components of compensation packages affect the recruitment and retention of qualified workers in public health jobs?
12. What factors beyond compensation affect worker decisions to pursue public health careers?
13. How do formal and informal mentoring strategies affect recruitment and retention of qualified workers in public health jobs?
14. How does staff turnover influence the effectiveness and efficiency of public health strategies delivered at local, state, and national levels?
15. How do human resource policies, including civil service systems and collective bargaining agreements, affect the recruitment and retention of qualified workers in public health jobs?
(continued)

Table 1. *(continued)*

Workforce competencies
16. What standardized assessment methods are most effective in producing valid and reliable measures of the skills and competencies attained by public health students and practicing professionals?
17. How do the skills and competencies of the public health workforce impact the effectiveness, efficiency, and outcomes of public health strategies delivered by this workforce?
18. How do different types of staffing models (i.e., allocation of tasks and responsibilities to different types of public health workers based on their competencies) impact the effectiveness, efficiency, and outcomes of public health strategies delivered by these workers?
19. How do certification programs for public health professionals impact the effectiveness, efficiency, and outcomes of public health strategies delivered by these professionals?
Educational methods and curricula
20. What impact do existing education and training programs have on the skills and competencies of the public health workforce?
21. What models of education and training are most effective in producing the volume and mix of qualified public health professionals needed to meet future demand?
22. What models of education and training are most effective in improving the skills and competencies needed by the existing public health workforce to practice effectively and efficiently?
23. What are the benefits, costs, and return-on-investment estimates associated with acquiring different levels of education and training in public health?
24. What models of education and training are most effective in improving cultural competency among public health professionals?
25. What models of education and training are most effective in improving the financial management skills of public health professionals?

Methodologic research questions were identified in each of the four domains of the research agenda. These questions reflected current uncertainties in how best to measure and analyze important attributes, mechanisms of action, outcomes, and causal relationships related to public health delivery systems. Examples include Question 5 in the workforce domain (Table 1); Question 12 in the system structure and performance domain (Table 2); and Question 1 in the finance domain (Table 3). These methodologic questions were considered to be important prerequisites for pursuing more fundamental research questions about the causes and effects of public health delivery system characteristics.

Table 2. Public health system structure and performance

System boundaries and size
1. What methods provide the most valid, reliable, and relevant means of defining the geographic and organizational boundaries of public health delivery systems at local, state, and national levels?
2. What methods provide the most valid, reliable, and relevant measures of the effectiveness, efficiency, and outcomes of public health strategies delivered by public health delivery systems at local, state, and national levels?
3. How do the scale of operations and the scope of activity within public health delivery systems influence the effectiveness, efficiency, and outcomes of public health strategies delivered at local and state levels (e.g., economies and diseconomies of scale and scope)?
4. How do cross-jurisdictional models of public health service provision impact the effectiveness, efficiency, and outcomes of public health strategies delivered at local and state levels?
Public health agency organization and governance
5. How do the structures, powers, and functions of local and state boards of health influence the effectiveness, efficiency, and outcomes of public health strategies delivered at local and state levels?
6. How do public health agency leadership strategies and characteristics influence the effectiveness, efficiency, and outcomes of public health strategies delivered at local, state, and national levels?
7. How do the legal powers and duties of governmental public health agencies influence the effectiveness, efficiency, and outcomes of public health strategies delivered at local and state levels?
8. How do the organizational characteristics of governmental public health agencies, including decision-making structures and administrative relationships with other government agencies, influence the effectiveness, efficiency, and outcomes of public health strategies delivered at local and state levels?
9. What forms of decision support, guidance, and technical assistance for governmental public health agencies are most effective in improving the effectiveness, efficiency, and outcomes of public health strategies delivered at local, state, and national levels?
Interorganizational relationships and partnerships
10. How do interorganizational relationships and patterns of interaction within public health delivery systems impact the effectiveness, efficiency, and outcomes of public health strategies delivered at local, state, and national levels?
11. What conditions and strategies facilitate productive interorganizational relationships and patterns of interaction among organizations that contribute to public health strategies at local, state, and national levels?
(continued)

Table 2. *(continued)*

Performance measurement, quality improvement, and accreditation
12. What measures provide the most valid and reliable indicators of the implementation and impact of quality improvement strategies in public health settings?
13. What types of quality improvement strategies have the largest effects on the effectiveness, efficiency, and outcomes of public health strategies delivered at local, state, and national levels?
14. How do public health agency accreditation programs influence the effectiveness, efficiency, and outcomes of public health strategies delivered at local, state, and national levels?
15. What impact do performance measurement systems, public reporting initiatives, and performance management tools have on the effectiveness, efficiency, and outcomes of public health strategies delivered at local, state, and national levels?
16. How do accreditation, quality improvement, performance measurement, and public reporting initiatives impact disparities in the effectiveness, efficiency, and outcomes of public health strategies delivered to racial and ethnic minority and low-income populations?
Social determinants of health and health disparities
17. What public health strategies are most effective in addressing health disparities and/or social determinants of health at local, state, and national levels?
18. How do the organizational, financial, and workforce characteristics of public health agencies and their partners influence the implementation and effectiveness of strategies to address health disparities and/or social determinants of health at local, state, and national levels?
19. How do disparities in access to information and communication technologies among public health practitioners and the communities they serve affect the effectiveness, efficiency, and outcomes of public health strategies, particularly for racial and ethnic minority and low-income populations?
20. What policy, system, and administrative strategies are most effective in reducing disparities in the effectiveness, efficiency, and outcomes of public health strategies delivered to racial and ethnic minority and low-income populations?

Discussion

The research questions identified through this agenda-setting process include areas of similarity with previously developed PHSSR research agendas as well as important differences, reflecting both persistent uncertainties and newly emerging information needs in the public health practice and policy communities.[9–13] Questions that address how structural features and workforce characteristics of the public health system influence performance

Table 3. Public health financing and economics

Fiscal analysis
1. What measures provide the most valid and reliable indicators of the financial performance of public health agencies at local, state, and national levels?
2. How does the financial performance of public health agencies affect the effectiveness, efficiency, and outcomes of public health strategies delivered at local, state, and national levels?
3. How does implementation of a uniform system for classifying, tracking, and reporting public health financial resources influence the effectiveness, efficiency, and outcomes of public health strategies delivered at local, state, and national levels?
Financing mechanisms
4. How do funding formulae, payment methods, policy decisions, and community health needs and risks influence the levels of investment made in public health strategies at local, state, and national levels?
5. How do the legal powers and duties of public health agencies and their governing boards (including taxing, spending, and fee-setting authorities) influence the levels of investment made in public health strategies at local, state, and national levels?
6. How do funding sources, financing mechanisms, and funding levels influence the scope of public health strategies delivered at local, state, and national levels and the effectiveness, efficiency, and outcomes of these strategies?
7. What impact do non-governmental investments in public health strategies have on overall levels of investment in these strategies and on the effectiveness, efficiency, and outcomes of these strategies?
8. What are the effects of the economic recession on the scope of public health strategies delivered at local and state levels, the levels of investment made in these strategies, and the effectiveness, efficiency, and outcomes of these strategies?
Costs, performance, and outcomes
9. Which investments in public health strategies have the largest effects on health outcomes (e.g., healthy life expectancy and quality of life), and what are the costs of delivering these strategies at local, state, and national levels?
10. How do investments in public health delivery systems and supports (infrastructure) impact the effectiveness, efficiency, and outcomes of public health strategies delivered at local, state, and national levels?
11. What characteristics of public health delivery systems influence the efficiency with which public health strategies are delivered at local, state, and national levels?
12. How do investments in public health strategies influence or offset the need for downstream spending on medical care and/or other social services?

and outcomes are notably similar to questions identified in previous research agendas, indicating that significant uncertainties and evidence gaps continue to surround these topics.

In contrast to previous agendas, this agenda-setting process identified a large volume and variety of research questions that address the public health delivery system issues surrounding quality improvement initiatives, health disparities and social determinants of health, and health information and communication technologies. These topics have grown in public visibility and attention in recent years and are areas where significant practice innovation and change are occurring, thereby creating new opportunities and needs for research. As such, the research questions identified herein provide a starting point for mobilizing the public health scientific enterprise around contemporary, high-priority uncertainties identified by broad cross-sections of public health stakeholders.

The research questions identified through this agenda-setting process focus on cross-cutting characteristics of public health delivery systems that are relevant for a wide variety of health threats, risk factors, prevention practices, and population groups within the U.S. These questions are intended to complement and enhance, rather than redirect or replace, the more targeted research agendas that have been developed for specific health threats and risks (e.g., HIV, obesity, food safety) and for high-priority population groups (e.g., maternal and child health, veterans, seniors). Researchers and public health officials working in targeted, categorical areas of public health practice can use the research agenda developed here to develop new or supplemental studies of how delivery system attributes and mechanisms influence specific prevention practices, target populations, and outcomes of interest. In a similar vein, the cross-cutting PHSSR research agenda developed here can be applied to address uncertainties in how best to implement specific public health frameworks and action plans such as the six Winnable Battle areas recently identified by the CDC,[16] the Framework for Quality in Public Health recently Developed by the DHHS,[15] and the National Prevention Strategy identified earlier this year by the National Prevention, Health Promotion, and Public Health Council and the U.S. Surgeon General.[17]

More than 10% of the research questions identified through this agenda-setting process were methodologic in nature, emphasizing the need to uncover improved strategies for measuring and analyzing important attributes and relationships within public health delivery systems. The need for research into new measurement and analytic approaches in PHSSR is not surprising given the field's relatively early stage of development and given the complex causal pathways involved in studying public health strategies and outcomes.

The methodologic research questions identified here respond directly to two important recommendations

Table 4. Public health information and technology

Capabilities to assess and monitor health outcomes
1. How sensitive and specific are established health outcome measures (e.g., quality-adjusted life-years, healthy life expectancy) to the effects of public health strategies delivered at local, state, and national levels?
2. What established and new measures provide the most valid, reliable, and feasible indicators of the health outcomes attributable to public health strategies?
3. What measures provide the most valid, reliable, and feasible indicators of the appropriateness, fidelity, community-centeredness, and reach of public health strategies delivered at local, state, and federal levels?
4. What measures provide the most valid, reliable, and feasible indicators for monitoring health disparities and disparities in the delivery of public health strategies at local, state, and national levels?
5. How do the content, quality, and timeliness of public health surveillance systems and informatics capabilities influence the effectiveness, efficiency, and outcomes of public health strategies delivered at local, state, and national levels?
Translation and dissemination of research-tested public health strategies
6. What are the information-seeking behaviors of public health practitioners, and what factors influence these behaviors and the strategies used for addressing information needs?
7. What strategies are most effective in enhancing the adoption, implementation, and diffusion of research-tested public health strategies among public health practitioners and policy decision makers (e.g., academic detailing, practice-based research networks, public reporting, pay-for-performance, accreditation)?
8. What public health system strategies and characteristics are most effective in enhancing the adoption of and adherence to research-tested self-care and prevention practices among at-risk populations, particularly minority and low-income populations?
9. What public health system strategies and characteristics are most effective in enhancing the adoption of and adherence to research-tested prevention practices among health care providers, schools, work-sites, and other community settings?
Information and communication technologies
10. How do health information and communication technologies influence the effectiveness, efficiency, and outcomes of public health strategies delivered at local, state, and national levels (e.g., electronic health records, mobile health technologies, social media, electronic surveillance systems, geographic information systems, network analysis, predictive modeling)?
11. How do health information and communication technologies influence the effectiveness of public health system strategies to enhance the adoption, implementation, and diffusion of research-tested public health strategies among public health practitioners, at-risk populations, health care providers, and other community stakeholders?
(continued)

Table 4. *(continued)*

12. How do EHR and PHR data systems as well as health information exchanges affect the structure of public health delivery systems, particularly regarding integration and coordination with clinical health care providers?
13. How do EHR and PHR data systems as well as health information exchanges affect the content, quality, and timeliness of public health surveillance systems, and how do these changes in surveillance affect the quality of public health intervention strategies?
14. What informatics methods and applications (e.g., filtering, signal extraction, natural language processing) are most effective in helping public health practitioners make use of new data sources from EHR and PHR systems?
15. How do disparities in access to information and communication technologies among public health practitioners and the communities they serve affect the effectiveness, efficiency, and outcomes of public health strategies delivered at local, state, and national levels, particularly as it relates to racial and ethnic minority and low-income populations?

EHR, electronic health record; PHR, public health record

made by a recent IOM report[18] on the role of measurement in shaping public health action and accountability: (1) the development of predictive and system simulation modeling methods to assess intended and unintended outcomes associated with public health policy, funding, investment, and resource options; and (2) the development of a multilevel performance-measurement system that captures data on inputs, activities, and outcomes contributed by governmental and private-sector organizations that have responsibilities for protecting and improving population health. This report charges the federal government with coordinating the development of these important measurement and analytic advances, but the PHSSR scientific community will need to play leading roles in designing and implementing the methodologic studies that will generate these advances.

To be successful in mobilizing the production of more rigorous and relevant evidence, the national PHSSR research agenda should function as a work in progress subject to continual review, revision, and monitoring. New questions should be added as the information needs and uncertainties of new stakeholders are identified, as population needs and risks evolve, and as ongoing research studies answer existing questions and raise new ones.

One important limitation of the current agenda-setting process is the lack of formal methods for incorporating the perspectives and preferences of community members, particularly those that face disproportionate levels of risk from preventable diseases and injuries. These and other new stakeholder perspectives should be

elicited and incorporated into future iterations of the PHSSR research agenda, along with newly emerging information needs and uncertainties associated with changes in population health risk profiles and changes in the technologies available for public health practice. Equally importantly, the PHSSR research agenda developed here should be used as a framework for monitoring the progress of the scientific community in addressing the priority information needs of public health practice, policy, and community stakeholders. Such a monitoring system is needed to encourage continuous improvements in the strategies used to solicit, fund, implement, translate, and disseminate PHSSR research studies. Measured improvements in both the science and practice of public health promises to accelerate the nation's movement toward a more effective, efficient, and equitable health system.

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