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# TECHNICAL REPORT

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## Mapping the Gaps

### Ideas for Using GIS to Enhance Local Health Department Priority Setting and Program Planning

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## Summary

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Local health departments (LHDs) play an important role in coordinating essential public health activities, such as monitoring community health, informing and educating the public about health issues, mobilizing community partnerships, and developing policies and plans that support individual and community health efforts (NACCHO, 2005). To determine whether these services are meeting local population needs, LHDs use a variety of formal and informal assessments, including community health assessments and communitywide health-improvement plans. Despite such efforts, the services offered by LHDs do not always meet local health needs. Mismatches can occur for many reasons, including competing funding priorities, political mandates, and natural shifts in population makeup and health concerns.

Geographic information system (GIS) mapping software provides a promising tool to enhance priority-setting and resource allocation. LHDs can use GIS technology to communicate complex geospatial information in an integrated and visual way, enabling staff to compare the geographic distribution of population health in a community (i.e., where services are *needed*) with the geographic distribution of LHD programs and expenditures (i.e., where services are *provided*). Using such an approach, LHDs can identify gaps between their program services and community health needs.

Although some LHDs have started using GIS, few have employed it for program planning and gap analysis, for a variety of reasons, including lack of data, resource constraints, and technological complexity. To address this need, the RAND Corporation worked with large health departments in four U.S. counties—Alameda County Health Department, Calif.; Los Angeles County Department of Public Health, Calif.; Palm Beach County Health Department, Fla.; and Duval County Health Department, Fla.—to explore options for expanding the use of GIS to display information that can assist LHDs with priority-setting, program planning, and resource allocation. Interviews were conducted with 65 key informants in the four LHDs, and case studies were made of three of them (excepting Duval County). We also reviewed relevant documentation provided by the LHDs, including data analysis reports, mapping reports, and examples of how GIS is currently being used for decision support and planning efforts. Each case study highlights a specific public health problem and presents a novel use of public health data for mapping.

### **Current Mapping Efforts Focus Mainly on Population Risk Factors**

Our interviews revealed a continuum of mapping and program efforts currently under way at the LHDs, all four of which use GIS to assess community health needs. We found many examples of mapping efforts focusing on population risk factors such as proximity to a known

toxin, sociodemographic characteristics (e.g., racial composition, poverty), or the distribution of diseases or health conditions across a geographic area. It was less common, however, for LHDs to map the services they provide. When the LHDs did map their services, they typically focused on the location of publicly run or funded medical clinics and hospitals. Few LHDs reported using GIS to better understand service delivery by *simultaneously* mapping services (e.g., health-education activities, community engagement, policy development, and linkages/referrals to healthcare services) and population health needs.

Barriers to mapping LHD services together with population health needs include problems with the quality and availability of data and limited access to mapping resources. Facilitators include having “champions” within the organization who call for using GIS mapping techniques and identify the data needed. Programs or LHDs that do more of this type of mapping also tend to have access to outside resources (e.g., foundation funding or academic partnerships) for this purpose.

## **Interviews Pointed to Factors Contributing to the Use of More-Advanced GIS Technology**

We used the findings from the interviews to develop a conceptual model of how maps can be used to address the gaps between public health needs and LHD services. This model, shown in Figure S.1, organizes themes from the interviews into discrete categories, focusing on the factors that contribute to the use of more-advanced GIS technology. We believe that these factors have the greatest impact on LHD use of GIS to map services and population needs together.

### **Priority-Setting and the Use of a Planning Process**

An established planning process aids in the use of GIS as a tool in planning and priority-setting.

### **Planning with a Geographic Focus**

GIS can be used to display the geographic reach of a problem and the extent to which LHD services are responding to it. Some issues are more likely than others to benefit from geographic display, especially those involving concepts that are difficult to understand in the abstract.

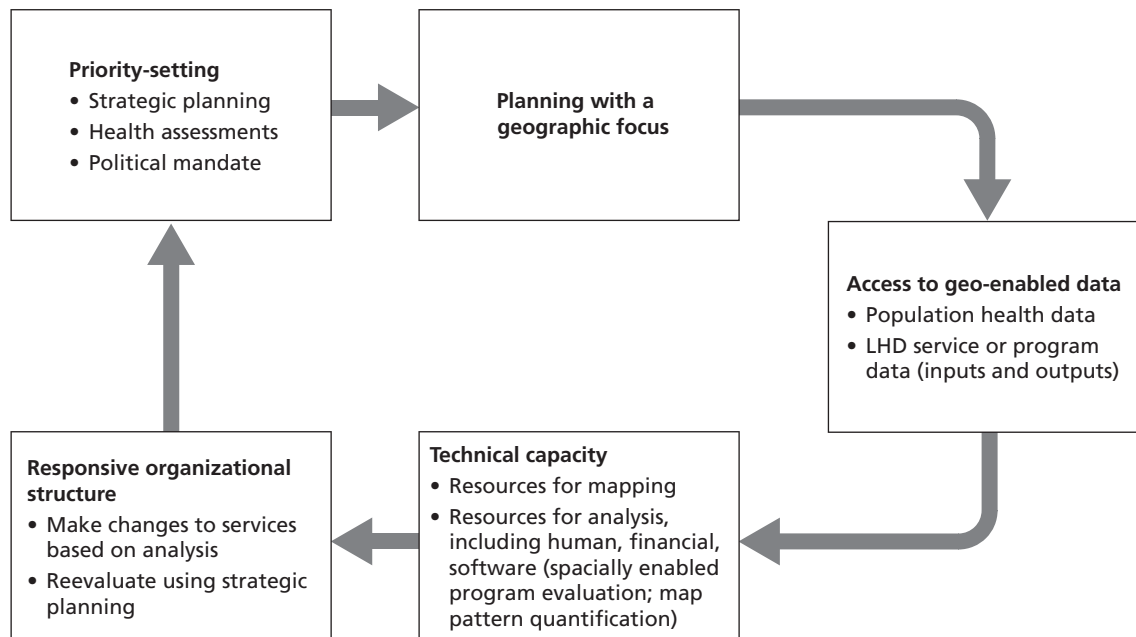
### **Access to Geo-Enabled Data**

Having sufficient data is fundamental to mapping. Geo-enabled data are needed to map sociodemographic and health factors, as well as the location and reach of LHD programs or services.

### **Resources and Technical Capacity at LHDs**

The resources possessed by an LHD, especially its technical capacity, will help determine whether and how it can use GIS and mapping in planning. Mapping involves use of specialized skills and tools such as mapping software, data management or statistical software, and trained staff. Free GIS software is available online, although financial resources are needed to support staff time required to access the necessary data, conduct analyses, and prepare maps.

**Figure S.1**  
**Factors Necessary for LHD Mapping of Population Health Needs and LHD Program Efforts**



SOURCE: Dubowitz et al., 2011.

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### Responsive Organizational Structures

LHDs require the organizational capacity to use the information generated through GIS analyses or mapping to improve service provision and program efforts, adjust services and programs, and possibly shift priorities in response to new data and analysis.

Our conceptual framework presents mapping as a tool to support priority-setting. It can help LHDs to identify where they may be weaker or stronger on the factors that facilitate mapping. Identifying the factors that pose specific barriers to enhancing the use of GIS to map services with needs can help LHDs organize their work and identify solutions.

We identified several factors that might encourage LHDs to make greater use of mapping, including roadmaps, tools, and training for staff in GIS; methods to overcome technical and organizational barriers to implementation (e.g., variation in technical capacity, access to geo-enabled data); and tools for integrating sub-county-level data on LHD services with data on local health and healthcare needs.

### Case Studies Highlighted Techniques for Expanding the Use of Mapping for LHD Planning and Priority-Setting

The case studies highlighted several techniques for helping LHDs expand the use of mapping for priority-setting, program planning, resource allocation, and visualizing community health issues. These techniques include identifying appropriate questions, utilizing available data, and finding the mapping approach that can best depict the data and questions of interest. We

found that allowing LHD staff to see the potential of concurrently visualizing services *and* needs was useful and, in many cases, eye-opening.

### **Palm Beach County**

The Palm Beach County Health Department (PBCHD) case study provided an opportunity to better examine the gaps between healthcare services and needs through maps that displayed the geographic distribution of medically underserved populations and the uninsured alongside locations of primary-care and specialty health centers. The locations of the healthcare clinics were depicted, as well as the *level* of services they provide (i.e., clinical staffing ratios and staffing expenditures were shown for each of the clinics). Although the initial maps suggested to PBCHD senior staff and the RAND team that there was potential justification for providing an additional Federally Qualified Health Care (FQHC) clinic in the county, further maps showing the level of services shed light on what PBCHD staff felt was the larger issue of understanding how well the existing health centers were serving the population. The staff used the maps for discussions of the staffing/spending mix at “role model” clinics that might be replicated in other clinics. PBCHD is working with a broad range of community stakeholders to develop a communitywide approach to planning health services for the uninsured.

The primary lesson learned from this case study is that local health departments often do not use administrative data, such as human resources or finance data, to assess the cost-effectiveness of their services. LHD personnel who want to map these types of data will need to work closely with administrative units to design systems that link population health-needs data with service data.

### **Los Angeles County**

The Los Angeles County Department of Public Health (LACDPH) case study provided an opportunity to explore a planning question in a novel area: health education. One important question for the LACDPH Nutrition Program was whether health-education outreach sites focusing on nutrition and physical activity were located in areas that matched population needs, as measured by income and/or race/ethnicity. We created maps that examined whether a better understanding of population health needs for nutrition services could be obtained by displaying program outreach activities along with differing cutoffs for income-based need for services and other population characteristics. These multidimensional maps, in which the geographic distribution of minority populations at different income levels was displayed in conjunction with information about obesity, highlighted areas in which multiple risk factors co-occurred, indicating that a greater number of communities could be reached if program guidelines were changed.

The primary lesson learned from this case study is that collecting and managing data on health-education outreach activities/services as completely and accurately as possible are important for many program evaluation activities, especially when employing a “mapping the gaps” approach.

### **Alameda County**

The Alameda County Department of Public Health (ACDPH) knew that there was a high number of Emergency Department (ED) users in the county; however, they had no specific information on who the users were, where they were located, or what caused them to seek care in the ED. With data provided by ACDPH, the RAND team helped create maps to show the



locations of individuals who currently use ED services, the severity of conditions that those individuals present to the ED, and the location of alternative sources of care, such as community or public health clinics.

The maps suggested that there were potentially higher concentrations of ED users in several census tracts, as well as concentrations of users of ED services for non-emergent and otherwise treatable conditions. By examining all of the maps together, ACDPH and the RAND team were able to conclude that the main issues might be the residents' lack of knowledge about when and why to seek care in an ED versus a clinic, rather than the relative accessibility of the facilities. Additional maps showed that communication strategies might be split geographically between uninsured and low-income insured patients.

The Alameda case-study maps provided a foundation for examining use of the ED for conditions that were treatable in primary care. Other initiatives could also come out of this exercise, including approaches for planning new clinic locations, improving accessibility of existing clinics, and marketing the clinic sites to populations who would most benefit from using them.

The primary lesson learned is that LHD staff and data analysts may be able to employ geocoded county-level data from large healthcare and population-health datasets, including addresses for facilities and patients/clients.

## **GIS Has Multiple Potential Uses in Public Health Planning**

The case studies we present here are intended to help LHD staff identify geographic questions that might inform their planning efforts and understand how maps might answer such questions. The case studies showed that GIS could be used internally as a management tool (i.e., to stimulate discussions about where efforts might best be allocated) and externally as a policy tool (i.e., to present the ways in which programs work within the confines of mandated guidelines). With the help of our partner LHDs, we were able to explore questions of interest; use novel sources of program activity or service data, such as financial data; map program activities or service data on the same maps with demographic or health data; and introduce mapping and analytical techniques. Creating visual pictures established a focal point for discussion of future programming and strategic directions.

At the same time, our study has several limitations. The work was undertaken with a small group of LHDs, so the data we present are only exemplary and the maps are current only as of the publication of this report. Further, the case studies are not meant to fully identify or analyze each problem; they are intended to serve as examples of novel approaches to summarizing data. Nonetheless, it is our hope that LHD program managers can learn from the examples and identify relevant options for using GIS to inform their own planning and resource-allocation efforts.