

# Estimating the Financial Resources Needed for Local Public Health Departments in Minnesota: A Multimethod Approach

William Riley, PhD; Jill Briggs, RN, MS, MPH; Mac McCullough, MPH

**Objective:** This study presents a model for determining total funding needed for individual local health departments. The aim is to determine the financial resources needed to provide services for statewide local public health departments in Minnesota based on a gaps analysis done to estimate the funding needs. **Design:** We used a multimethod analysis consisting of 3 approaches to estimate gaps in local public health funding consisting of (1) interviews of selected local public health leaders, (2) a Delphi panel, and (3) a Nominal Group Technique. On the basis of these 3 approaches, a consensus estimate of funding gaps was generated for statewide projections. **Setting:** The study includes an analysis of cost, performance, and outcomes from 2005 to 2007 for all 87 local governmental health departments in Minnesota. **Participants:** For each of the methods, we selected a panel to represent a profile of Minnesota health departments. **Main Outcome Measures:** The 2 main outcome measures were local-level gaps in financial resources and total resources needed to provide public health services at the local level. **Results:** The total public health expenditure in Minnesota for local governmental public health departments was \$302 million in 2007 (\$58.92 per person). The consensus estimate of the financial gaps in local public health departments indicates that an additional \$32.5 million (a 10.7% increase or \$6.32 per person) is needed to adequately serve public health needs in the local communities. **Conclusions:** It is possible to make informed estimates of funding gaps for public health activities on the basis of a combination of quantitative methods. There is a wide variation in public health expenditure at the local levels, and methods are needed to establish minimum baseline expenditure levels to adequately treat a population. The gaps

analysis can be used by stakeholders to inform policy makers of the need for improved funding of the public health system.

**KEY WORDS:** financial gaps analysis for providing public health services, local public health funding, variation in public health spending

The difference between current and perceived public health spending requirements—a “gap analysis”—is a complicated issue. There is a strong belief that relatively small increases in public health expenditures and disease prevention can be associated with improvement in the health status of a population.<sup>1,2</sup> However, the optimal level of expenditure has not been examined and little progress has been made toward identifying how much public health spending is needed to adequately serve the public health needs of a population. A multiplicity of issues are associated with identifying optimal public health expenditure for a community including underlying morbidity, community resources available in the public health system,

**Author Affiliations:** Department of Health Policy and Management, University of Minnesota School of Public Health, Minneapolis, (Dr Riley and Mr McCullough); and Chisago County Department of Health, Chisago Lakes, Minnesota (Ms Briggs).

This study would not have been possible without the generous sharing of expertise and wisdom of local public health directors in Minnesota and their colleagues from the Minnesota Department of Health. The authors thank Kari Guida, MPH; Carmen Parrotta, MPH; Helen Parsons, MPH; and Niveta Giotra, MD, for their contributions to this study. We appreciate very much the suggestions and helpful comments from their peer reviewers.

Funding for this project was received from UCare Minnesota, and the Robert Wood Johnson Foundation. Important support was also provided by the Minnesota Department of Health. Sponsors were not involved in the design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript.

**Disclosure:** The authors report no conflicts of interest.

**Correspondence:** William Riley, PhD, 420 Delaware St SE, Mayo Mail Code 197, Minneapolis, MN 55455 (riley001@umn.edu).

DOI: 10.1097/PHH.0b013e3182053f04

barriers to access, population characteristics, and the social services of the region. A growing body of evidence indicates that availability and quality of public health services varies widely across communities,<sup>2,3</sup> but relatively little is known about what the expenditure should be to achieve desired health outcome goals. In this study, we used 3 different quantitative assessment tools to develop a cost model in order to estimate gaps of funding requirements based on community health needs.

## ● Background

There are persistent questions, but few answers, about whether current spending levels are adequate to achieve the expected performance of a public health department in the community. A study exploring the relationship between local public health spending and preventable mortality over a 12-year timeframe (1993-2005) found that mortality falls 1.1% to 6.9% for every 10% increase in local public health spending.<sup>3</sup> However, there has been little standardization regarding the financing of public health departments<sup>4</sup> and current funding mechanisms are described as a patchwork of arrangements that vary widely across state and community.<sup>5,6</sup> This lack of consistent financial data severely limits the ability to set standards,<sup>4</sup> and models are urgently needed by policy makers and public health leaders to measure agency performance, demonstrate public health outcomes, and create a basis to ensure adequate health department funding.<sup>7</sup>

Differences in public health spending have important implications for the type of public health activities within communities,<sup>3</sup> and studies have found positive associations between public health spending and the scope of public health activities within communities.<sup>8</sup> However, specific evidence regarding the sources and uses of public health funding is not readily available to relate programs with outcomes.<sup>7</sup> For example, the highest per capita expenditures have been found among smaller county health departments<sup>4</sup> and nonlocal revenues are amplified at the local level, with each \$1 increase in federal and state funding associated with a \$0.50 increase in local funding.<sup>9</sup> This funding patchwork is further compounded by unstable funding at the federal and state levels.<sup>8,10,11</sup>

Studies have also shown cause and effect of spending for preventing specific health outcomes,<sup>12-16</sup> yet there has been little attention paid to the value of investments in the public health system as a whole.<sup>3</sup> Furthermore, the public health system infrastructure cannot be fully understood without examining the contributions made by organizations other than official governmental health agencies and the roles played by community-based organizations.<sup>9</sup> Moreover, the rela-

tive underfunding of public health activities has been identified as a leading explanation for the gap between population health outcomes in the United States compared with other countries.<sup>5</sup> In the United States, higher public health spending levels are associated with communities that have relatively poor health status.<sup>17</sup>

Previous efforts to determine the optimal public health funding rate have been based on a normative approach, which involves bringing all jurisdictions to a median per capita expenditure rate.<sup>2,18</sup> Consequently, accurate formulas to determine the amount of expenditure needed to adequately serve the public health needs of a population are not available and it is a challenge to find consistent funding models.

## ● Methods

### Measuring local public health expenditures

We used a multimethod analysis consisting of 3 approaches (individual county health department financial analysis/cost study, Delphi panel technique, and Nominal Group Technique [NGT]) for the design of this study. First, we gathered information for every local public health jurisdiction in Minnesota, using the Minnesota Department of Health (MDH) Planning and Performance Measurement Reporting System, a comprehensive database maintained by the MDH.<sup>19</sup> The Planning and Performance Measurement Reporting System collects information annually regarding spending, staffing, and performance from all local health departments in Minnesota. *Local spending* is defined as all funding available to the local health department from all sources including local, state, and federal sources, as well as private funding. Performance, financial, and staffing data from 2005 to 2007 are classified according to 6 areas of responsibility (AORs).

Table 1 describes the 6 AORs and the total dollars expenditures in Minnesota in 2007. To make standardized comparisons of expenditure data, we adjusted the dollars in each county to the total county population. The findings in column 4 show that the mean county expenditure per person in Minnesota in 2007 was \$58.92. There is a substantial range in mean expenditures according to the 6 AORs, ranging from a low of \$2.57 per person for emergency preparedness to a high of \$24.29 per person for ensuring quality and accessibility to health services.

The Figure shows a comparison of statewide mean per capita expenditure from 2005 to 2007 for the 6 AORs. This comparison shows that per capita funding grew in all 6 AORs. For local health department expenditures in 2007, 62.5% of funding was from local sources, 17.7% was from state sources, and 19.8% was from federal sources.<sup>19</sup>

TAB1  
...

AOR

1. /

ii

2. F

h

3. F

4. F

h

5. F

a

6. A

h

Tota

Abbreviations:  
Exam positions  
included and p

Mea

We

3 ap

a D

**TABLE 1** • Minnesota Statewide Per Capita Spending Totals and CHB Per Capita Expenditure by AOR (2007)

AOR	Total Statewide Expenditure (2007)		CHB Per Capita Expenditure (2007)		
	Current Spending Per Capita, \$	% of Total	Median of Counties, \$	Statewide Mean Expenditure, \$	Range of County Per Capita Spending, \$
1. Assure an adequate local public health infrastructure	25,208,062	8.3%	3.34	4.91	Min: 0.03 Max: 27.39
2. Promote healthy communities and healthy behavior	81,074,762	26.8%	15.23	15.80	Min: 4.12 Max: 54.24
3. Prevent the spread of infectious disease	15,766,104	5.2%	2.29	3.07	Min: 0.29 Max: 8.59
4. Protect against environmental health hazards	42,478,043	14.0%	1.07	8.28	Min: 0.00 Max: 43.15
5. Prepare for and respond to disasters and assist communities in recovery	13,211,403	4.4%	1.97	2.57	Min: 0.00 Max: 9.25
6. Assure the quality and accessibility of health services	124,681,057	41.2%	19.00	24.29	Min: 0.87 Max: 168.30
Total	302,419,431	100.0%	51.85	58.92	Min: 12.50 Max: 194.50

Abbreviations: AOR, area of responsibility; CHB, community health board.

Examples for areas of responsibility: (1) Infrastructure includes policy development and public health assessment and planning; (2) healthy communities includes promotion of positive health behaviors; (3) infectious disease includes the prevention of communicable diseases via mandatory reporting and public health clinics; (4) environmental Health includes the identification and reduction of foodborne diseases and hazardous contaminants; (5) emergency preparedness includes the development of disaster response systems and personnel; and (6) health services includes identifying and funding preventive and acute care service gaps or reducing barriers to quality healthcare services.

**Measuring gaps in local public health funding**

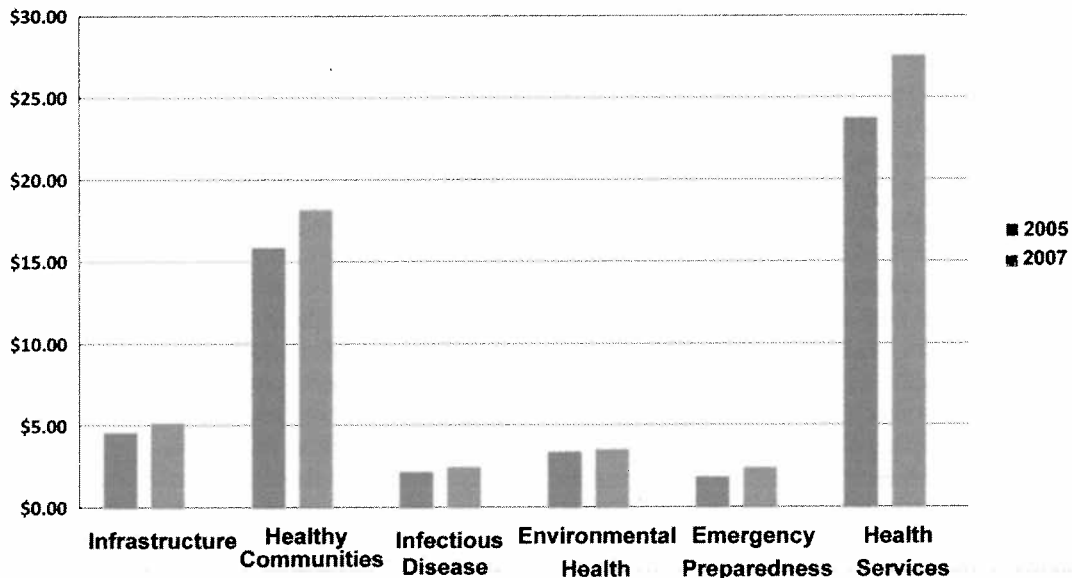
We measured gaps in local public health funding, using 3 approaches: interviews of local public health leaders, a Delphi panel technique, and an NGT.

*Local health department director interviews*

We started the gaps analysis by conducting an in-depth interview of 6 county health departments selected to be representative of all 53 community health boards

**FIGURE** • Statewide Mean per Capita Expenditure by Area of Responsibility

Minnesota Per Capita Public Health Spending by Area of Responsibility (2005 & 2007)



been  
been  
higher  
com-  
public  
ative  
ns to  
ently,  
endi-  
needs  
age to  
  
3 ap-  
finan-  
, and  
gn of  
ry lo-  
g the  
g and  
com-  
9 The  
orting  
pend-  
th de-  
as all  
: from  
urces,  
l, and  
ording  
  
dollars  
dard-  
ed the  
ation.  
ty ex-  
58.92.  
es ac-  
\$2.57  
igh of  
ibility  
  
mean  
AORs.  
rew in  
res in  
17.7%  
ederal

(CHBs) in Minnesota. First, we prepared a profile of the total expenditures for each of the 6 jurisdictions. Next, we prepared a 9-item interview guide used to probe the respondents regarding the public health resources available in their own agency based on 5 specific conditions in their community including the populations at risk, the current stakeholder support, the health board, the balance with other governmental program priorities, and the range of services available from outside the governmental public health agency. The purpose of the interview was 2-fold: to evaluate whether the current funding stream was adequate for the AOR and to provide a stage for the health department informant to make an estimate of the funding need. For each AOR identified by the respondent as having inadequate resources, the respondent was requested to estimate the resources needed for that specific AOR in order to provide the level of service judged to be needed in that AOR for their community. Level of service was a subjective expert judgment made by the respondent based on knowledge of the 5 specific conditions in his or her community.

#### *Delphi panel*

The second method was a Delphi panel technique, comprising a panel of state and local public health experts to review the detailed information derived from interviews with the 6 county health departments and deliver estimates on the basis of the results from the public health director in-depth interviews. The Delphi technique is a means of extracting opinions from a group of experts<sup>20</sup> and is based on a structured process for collecting and distilling expert knowledge for answering only a specific, single-dimension question.<sup>21</sup> The 11 participants in the Delphi panel included the 6 local health directors from the initial interviews, an MDH assistant commissioner of health, 3 directors/staff from the MDH, and an academic public health expert. No incentives were provided to participants. The Delphi panel was facilitated by the researchers and was presented with information regarding total dollar expenditures from the 6 representative counties, an estimate of additional resources needed, and a projected estimate of the current costs per person with an estimate of the additional cost needed (the gap) to yield an estimate of total cost per person. This analysis was conducted separately for each of the 6 counties and an iterative process was done to conduct the same analysis for each of the 6 AORs. The Delphi panel prepared its estimates on the basis of their view of health priorities for the state of Minnesota within each of the 6 AORs. The purpose was to elicit a consensus based on individual, subjective expert opinion.

#### *Nominal group technique*

The third method to estimate the gaps analysis was conducted by the same participants as the Delphi panel using a different method with different data parameters. The public health outcomes data were included to provide an empirical basis underlying the relationship between the local health spending and a population health metric upon which a judgment could be based. For 5 of the 6 AORs, a metric was identified, which showed a relationship between local public health funding and the community outcome. The Delphi technique participants were presented with an analysis of population health status data and spending patterns for Minnesota counties to examine the relationship between the CHB expenditures and county health status indexes. Five outcome measures (adult obesity, adult smoking, very low-birth-weight infants, chlamydial infection, and proportion of pregnant women receiving prenatal care in the first trimester) were analyzed according to the per capita dollars spent in each county and the outcomes measure for the most recent year available (2007). The data did not show any consistent relationship between public health spending and population health status metrics. The NGT was deployed by randomly dividing the panelists into 3 subgroups, with each subgroup studying the relationship between expenditures for the relevant AOR in the 87 Minnesota counties and the selected health status index. The subgroups recommended the optimal expenditure for the AOR based on review and discussion of the spending data and outcomes metrics. The purpose was to arrive at a consensus on funding gap estimates, if any, to achieve a combination of optimal population health status outcomes balanced with optimal funding. The NGT is a quick decision-making method for groups of various sizes, which takes all opinions into account<sup>22</sup> and which results in a set of prioritized solutions or recommendations based on a rating and ranking procedure.<sup>23</sup>

#### **Consensus estimations**

The final step in the gaps analysis was to compare the estimates derived from the 3 study methods (key informant interviews, Delphi technique, and NGT) to create a consensus estimate on the gaps in financial resources for each of the 6 AORs. This comparison was conducted with a facilitated review panel discussion led by the researchers. The review panel consisted of the same participants from the NGT. This approach provided continuity as well as a different perspective to make the gaps estimate. However, it also creates potential bias discussed in the "Limitations" section. For each AOR, the panel examined the 3 estimates to create a final

TA  
..  
At  
—  
In:  
He  
  
Inf  
En  
Di:  
  
Qu  
  
To  
—  
Abt  
  
co  
rea  
frc  
inf  
stu  
all  
of  
we  
me  
AC  
wh  
by  
do  
of  
the  
out  
  
Sal  
Mi  
cor  
sin  
def  
itie  
The  
aut  
def  
sior  
me  
3 fa  
mu  
pro  
and  
tion  
agr  
Nor

**TABLE 2** • Six-County Gaps Analysis by AOR

AOR	Current Spending (2007), \$	% of Total Spending	Mean Current Spending (by County), \$	Additional Resources Needed		New Dollar Ongoing, \$	% Change	Current Per Capita Spending (2007), \$	Additional Spending Needed Per Capita, \$	Total Estimated Funding Needed, \$
				Ongoing, \$	FTE					
Infrastructure	3,557,035	11.4	592,839	804,636	9.9	4,361,671	22.6	5.82	1.32	7.13
Healthy communities and behaviors	9,777,916	31.4	1,629,653	841,000	10.2	10,618,916	8.6	15.98	1.37	17.36
Infectious disease	1,068,295	3.4	178,049	303,000	3.9	1,371,295	28.4	1.75	0.50	2.24
Environmental health hazards	2,369,065	7.6	394,844	233,000	4.3	2,602,065	9.8	3.87	0.38	4.25
Disaster preparedness and response	917,380	2.9	152,897	309,600	3.7	1,226,980	33.7	1.50	0.51	2.01
Quality and accessibility of health services	13,479,263	43.2	2,246,544	739,200	9.9	14,218,463	5.5	22.04	1.21	23.24
Total	31,168,954	100.0	5,194,826	3,230,436	41.9	34,399,390	10.4	50.93	5.28	56.24

Abbreviations: FTE, full-time equivalent.

consensus estimate. Consensus on the estimates was reached using the following sequence: (1) a subgroup from the panel was selected to review the 3 sources of information for each of the 6 AORs; (2) the subgroup study method made a recommendation to the overall panel for a consensus estimate; (3) after discussion of the subgroup recommendation, a further discussion was held by the overall panel and unanimous agreement was achieved for 5 of the 6 AORs; and (4) for 1 AOR, the subgroup changed the consensus estimate, which was then subsequently approved unanimously by the larger panel. The consensus estimate was revised downward on the basis of an analysis on the amount of expenditures in the AOR and the relationship of the health department programming with population outcomes.

**Sample selection**

Minnesota has a decentralized public health system consisting of 53 locally governed CHBs, of which 28 are single-county, 21 are multicounty, and 4 are city health departments. The CHBs have public health responsibilities including the provision of services in all 6 AORs. There are 87 counties in Minnesota, with 2 primary authorities responsible to approve local public health department budgets: the individual county commission and the 53 CHBs. We selected the 6 health departments for in-depth interviews by creating a profile of 3 factors: urban-rural, small-large, and single-county-multicounty health department structures. From this profile, we arbitrarily selected 6 health departments and directly contacted each to invite their participation in the study. All 6 directors who were contacted agreed to participate. Members of the Delphi panel and Nominal Group participants included the 6 health de-

partment directors and public health experts recruited from the state level, local level, and an academic perspective. The cost-model work group met over a 2-day workshop to develop and endorse the gaps estimate for local public health agencies.

**Results**

We began with an extensive analysis of the 6 county health departments. Table 2 shows that the total public health expenditure in these 6 counties was \$31 168 954 in 2007 (the combined population of the 6 counties is 612 000). The mean per person public health expenditure at the 6 county health departments was \$50.93. The informants estimated an additional annual need of \$3.2 million of ongoing support, representing an additional 41.9 full-time equivalents. On a consolidated basis, estimates for the 6 counties indicate a need for an additional \$5.28 per person to fulfill the public health responsibilities in their communities.

The \$31.1 million in current expenditures is distributed unevenly (shown in column 2) among the 6 AORs, ranging from a high of 43% for quality and accessibility of health services to a low of 2.9% for emergency preparedness. The table shows that the greatest area of gaps in terms of dollar amount (column 4) is in the area of healthy communities and behaviors, with an additional \$841 000 needed, and the lowest dollar gap is in environmental health hazards, with an additional \$233 000 required. However, in terms of percentage (column 7), the gaps appear differently. The highest percentage increase needed is in the area of disaster preparedness (33.7% increase needed to meet the public health needs of the population) and the lowest percentage increase needed is in the area of quality and accessibility (5.5%).

**TABLE 3 • Current Expenditure and Consensus Estimated for Statewide Expenditures**

AOR	Statewide Mean Expenditure (2007), \$	% Change Based on County Interviews	% Change Based on Delphi Technique	% Change Based on Empirical Analysis and NGT	% Change Based on Consensus Estimate	Current Spending (Per capita in 2007), \$	Additional Resources Needed (Per capita), \$
Infrastructure	4.91	22.6	23.0	23.0	23	25 208 062 (4.91)	5 697 022 (1.11)
Healthy communities and behaviors	15.80	8.6	10.0	10.0	10	81 074 762 (15.80)	7 783 177 (1.52)
Infectious disease	3.07	28.4	24.1	21.0	23	15 766 104 (3.07)	3 578 906 (0.70)
Environmental health hazards	8.28	9.8	18.0	23.0	17	42 478 043 (8.28)	7 051 355 (1.37)
Disaster preparedness and response	2.57	33.7	16.0	16.0	16	13 211 403 (2.57)	2 113 824 (0.41)
Quality and accessibility of health services	24.29	5.5	5.0	5.0	5	124 681 057 (24.29)	6 234 053 (1.21)
Total	58.92					302 419 431 (58.92)	32 458 337 (6.32)

Abbreviations: AOR, area of responsibility; NGT, Nominal Group Technique.

### Delphi panel technique

The Delphi panel analysis of the gaps estimate was based on a review of the expenditures according to the AOR in each of the 6 counties. The Delphi panel conducted 6 rounds of review to derive the optimal resources needed on the basis of the gaps analysis estimated by the informants. Table 3 (column 3) shows the Delphi panel gaps estimates derived from the interview respondents for the 6 AORs.

### Nominal group technique

Our third approach to determining funding gaps is the NGT based on an analysis of 5 selected health metrics by the per capita expenditures in 87 counties. The participants were provided information showing the relationship between total public health expenditure and 5 health status metrics. Table 3 (column 4) shows the gaps estimate based on the NGT.

### Consensus estimates

A consensus estimate of the financial gaps for the 6 AORs in local public health departments is shown in Table 3. Column 1, in Table 3, indicates the average per capita expenditure for the entire state of Minnesota and each of the 6 AORs with the total expenditure of \$58.92 per person in 2007. Columns 2, 3, and 4 show the result of the 3 methods for determining the resource gap. Column 6 shows the total dollar expenditure for each of the AORs, totaling \$302.4 million in 2007. Based on the consensus methodology, column 7 shows that the additional resources needed are approximately \$5.7 million for infrastructure, \$7.8 million for healthy communities and behaviors, \$3.6 million for infectious diseases, \$7 million for environmental health hazards, \$2.1 million for disaster preparedness and response, and \$6.2 mil-

lion for quality and accessibility of health services. The total gaps estimate is \$32.4 million or \$6.32 per person, a 10.7% increase over current expenditures.

## Discussion

The findings from this study suggest that it is possible to make informed projections of how much funding is needed to serve local and state populations using a variety of quantitative approaches that combine both empirical information and expert input from public health leaders with frontline responsibility for health department operations. The study indicates that \$58.92 per person is spent on governmental public health efforts in Minnesota and it is estimated that an additional \$6.32 per person (10.7%) is needed to properly serve and protect the community. This finding applies to a statewide estimate of funding gaps for local health departments based on an extensive analysis of local expenditures and outcome metrics. Specifically, gaps were estimated for 6 AORs for the 6 health departments in this study and the findings were extrapolated to estimate funding gaps for all local health departments throughout Minnesota.

A number of important studies have been conducted in recent years to help elucidate the wide variation of governmental spending in public health departments across the nation and its association with the performance of public health responsibilities,<sup>8</sup> the impact of public health spending on mortality,<sup>24</sup> and the effect of geographic variation in public health spending.<sup>3</sup> However, these studies do not suggest what additional spending is needed or how increased spending should be allocated among the many programs and services maintained at the local level. The findings in this study begin to capture such information and provide a

ba  
ga  
re  
he  
ab  
de  
hc  
ga  
be

mo  
loc  
tic  
ac  
tw  
wi  
he  
be  
ste

Th  
Th  
tiv  
ap  
ce  
ou  
tie  
pr  
ref  
est  
no  
ma  
the  
we  
dic  
anc  
ten  
pa  
to  
tin  
dec  
tec  
res  
cor  
risk  
cos  
ere  
ing  
Th  
fur  
Thi  
am

basis from which to determine public health funding gaps. Expert opinion on the public health funding gaps reflects a multiplicity of factors including population health needs, the public health system's services available in the community, the success of the local health department to secure funding sources, and local stakeholder influences. Ultimately, the size of local funding gaps is tempered by the awareness of local pressures to be navigated for local funding.

New approaches are required to answer the fundamental question of how many resources are needed for local public health departments. This is an elusive question because there is no accepted definition of which activities constitute governmental public health and no two studies use the same operational definition.<sup>25</sup> Likewise, discussion regarding the right amount of public health funding to reduce disease rates nationally must be based on the burden of disease<sup>2</sup> and a greater understanding of public health finance.<sup>26</sup>

### ● Limitations

There are several sources of potential bias in this study. This study is a qualitative design to derive quantitative estimates used in the analysis. The next step is to apply more rigorous quantitative research to this conceptual model, which also includes participants from outside the public health sector. Although the 6 counties selected for extensive study were chosen from a profile of relevant factors, they cannot be considered representative of all 87 counties in the state. Also, these estimates would only apply to Minnesota and they may not be generalizable to other states. Although our estimates included both the public health department and the public health system, the participants in this study were limited to public health experts. The expert panels did not include representatives from hospitals, clinics, and other organizations central to the public health system. The 6 health department interviewees were also part of the NGT and Delphi technique. This was done to achieve continuity in the analysis, but at the same time it is a potential source of bias in an expert-driven decision-making process. The NGT, the Delphi panel technique, and consensus estimation projects were all researcher led. Our study standardized the expenditure comparison; however, we did not adjust for population risk factors or the burden of illness in the preliminary cost model. The burden-of-illness factors were considered by the expert informants in their estimates. Findings are based on expert opinion and group consensus. The findings show that the gap was highest in less-funded services and lowest in more-funded services. This may reflect biases due to the additional dollar amount rather than the percentage amount.

### ● Conclusions

Although it is widely agreed that there is not adequate funding in the current public health system, the amount of funding necessary has never been determined. Although \$58.92 per person is spent in local health departments, this study found evidence that a funding gap exists for public health services in local health departments throughout Minnesota, but with a relatively modest additional investment (approximately \$6.32 per person per year) it might be closed. Application of these estimates addresses the amount of funding that is needed from all sources but not the source of funding. Local governmental public health department leaders must be prepared to make the case for adequate funding and be prepared to show the magnitude of change in funding necessary. While the specific results of this study are unique to Minnesota, the conceptual model can provide direction for public health funding needs both locally and nationally.

### REFERENCES

1. Breslow L. The future of public health: prospects in the United States for the 1990s. *Annu Rev Public Health*. 1990;11:1-29.
2. Trust for America's Health. *Shortchanging America's Health: A State-By-State Look at How Federal Public Health Dollars are Spent*. Washington, DC: Trust for America's Health; 2009. <http://healthyamericans.org/report/61/shortchanging09>. Accessed June 29, 2010.
3. Mays GP, Smith SA. Geographic variation in public health spending: correlates and consequences. *Health Serv Res*. 2009;44(5, pt 2):1796-1817.
4. Leviss PS, Novick LF. Examining public health financing in New York state: a methodology for evaluating local and national public health data. *J Public Health Manag Pract*. 2004;10(5):393-399.
5. Lee P, Paxman D. Reinventing public health. *Annu Rev Public Health*. 1997;18(1):1-35.
6. Gerzoff RB, Gordon RL, Richards TB. Recent changes in local health department spending. *J Public Health Policy*. 1996;17(2):170-180.
7. Honoré PA, Schlechte T. State public health agency expenditures: categorizing and comparing to performance levels. *J Public Health Manag Pract*. 2007;13(2):156-162.
8. Mays GP, McHugh MC, Shim K, et al. Getting what you pay for: public health spending and the performance of essential public health services. *J Public Health Manag Pract*. 2004;10(5):435-443.
9. Bernet PM. Local public health agency funding: money begets money. *J Public Health Manag Pract*. 2007;13(2):188-193.
10. Mays GP, Halverson PK, Baker EL, Stevens R, Vann JJ. Availability and perceived effectiveness of public health activities in the nation's most populous communities. *Am J Public Health*. 2004;94(6):1019-1026.
11. Levi J, Juliano C, Richardson M. Financing public health: diminished funding for core needs and state-by-state variation in support. *J Public Health Manag Pract*. 2007;13(2):97-102.

12. Chesson HW, Harrison P, Scotton CR, Varghese B. Does funding for HIV and sexually transmitted disease prevention matter? Evidence from panel data. *Eval Rev.* 2005;29(1):3-23.
13. Farrelly MC, Pechacek TF, Chaloupka FJ. The impact of tobacco control program expenditures on aggregate cigarette sales: 1981-2000. *J Health Econ.* 2003;22(5):843-859.
14. Holtgrave DR, Kates J. HIV incidence and CDC's HIV prevention budget: an exploratory correlational analysis. *Am J Prev Med.* 2007;32(1):63-67.
15. Linas BP, Zheng H, Losina E, Walensky RP, Freedberg KA. Assessing the impact of federal HIV prevention spending on HIV testing and awareness. *Am J Public Health.* 2006;96(6):1038-1043.
16. Tauras JA, Chaloupka FJ, Farrelly MC, et al. State tobacco control spending and youth smoking. *Am J Public Health.* 2005;95(2):338-344.
17. Boeke MC, Zahner SJ, Booske BC, Remington PL. Local public health department funding: trends over time and relationship to health outcomes. *Wis Med J.* 2008;107(1):25-32.
18. Washington State Association of Local Public Health Officials. *Creating a Stronger Public Health System: Statewide Priorities for Action.* Washington, DC: Washington State Association of Local Public Health Officials; 2006. <http://www.leg.wa.gov/JointCommittees/PHF/Documents/StatewidePriorities.pdf>. Accessed June 30, 2010.
19. Minnesota Department of Health. *Local Public Health Performance Measures: Analysis and Reports.* Minnesota, MN: Minnesota Department of Health; 2008. [www.health.state.mn.us/ppmrs/analysis.html](http://www.health.state.mn.us/ppmrs/analysis.html). Accessed July 3, 2010.
20. Dalkey NC. *The Delphi Method: An Experimental Study of Group Opinion.* Santa Monica, CA: Rand Corporation; 1969.
21. Gunaydin MH. *The Delphi Method: Definition and Historical Background.* <http://www.iyte.edu.tr/~muratgunaydin/delphi.htm>. Accessed July 1, 2010.
22. Sample JA. Nominal Group Technique: an alternative to brainstorming. *J Extension.* 1984;22(2):2-7.
23. Van de Ven AH, Delbecq AL. The effectiveness of nominal, Delphi, and interacting group decision making processes. *Acad Manage J.* 1974;17(4):605-621.
24. Mays GP, McHugh MC, Shim K, et al. Institutional and economic determinants of public health system performance. *Am J Public Health.* 2006;96(3):523-531.
25. Sensenig AL. Refining estimates of public health spending as measured in national health expenditures accounts: the United States experience. *J Public Health Manag Pract.* 2007;13(2):103-114.
26. Honoré P, Amy BW. Public health finance: fundamental theories, concepts, and definitions. *J Public Health Manag Pract.* 2007;13(2):89-92.