

# Local Public Health Department Funding: Trends Over Time and Relationship to Health Outcomes

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## ABSTRACT

*Background:* Local health departments contribute to population health improvement through the core functions of assessment, policy development, and assurance. Their capacity to perform these functions may be affected by funding and staffing.

*Objective:* To describe local health department funding and staffing levels and determine the relationship between these measures and county-level health outcomes.

*Methods:* Ten years of total funding, funding by revenue source, and staffing data from local health departments in all 72 Wisconsin counties were collected from the Department of Health and Family Services and analyzed. Summary measures for county health outcomes were obtained from the 2006 Wisconsin County Health Rankings, and a correlation matrix was created to determine associations between outcomes and measures of health department capacity.

*Results:* On average, Wisconsin local health departments spend \$20.60 per capita, ranging from \$7.50 to \$68.30 among counties. While total per capita funding in the state (adjusted for inflation) increased \$0.82 per year, a closer look reveals 3 distinct periods: increases of \$0.20 per year during 1995-1997 and \$1.33 per year during 1997-2001; but a decrease of \$0.27 during 2001-2004. Local health departments in counties with worse health outcomes had only slightly higher average funding and staffing levels during 2002-2004.

*Conclusion:* Levels of health department funding in Wisconsin, already low by US standards, declined slightly in the past 3 years. Although counties with

the worst health outcomes had slightly higher levels of public health funding, considerable disparities exist. State policymakers might consider investing more resources in counties with the greatest need, to support evidence-based public health programs and reduce existing geographic health disparities in Wisconsin.

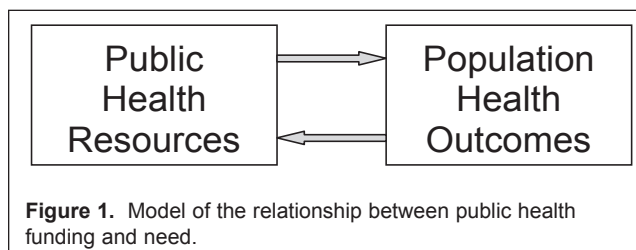
## BACKGROUND

Significant disparities in health outcomes exist between Wisconsin's 72 counties. Premature mortality ranges from a low of 4135 years of potential life lost under age 75 (per 100,000) in Waukesha County to a high of 12,492 in Menominee County.<sup>1</sup> The percent of the population who reported their health as "fair" or "poor" ranges from a low of 5.6% in Florence County to a high of 19.6% in Juneau County.<sup>2</sup>

One potential way to reduce these disparities may be to invest more public health resources in communities with the greatest need, where need is defined in terms of population health outcomes. Decades of population-based research suggests that implementing evidence-based public health programs in the counties with the greatest need will lead to improvements in health outcomes. In other words, counties with the poorest health outcomes may need more public health resources to improve population health. This direct relationship between need and funding is shown in Figure 1. Need should drive funding, and an increase in funding should improve health outcomes, thus reducing need.

Resource allocation decisions in public health have traditionally been based on population size, historical precedent, and competitive grants, whereas other health resources have been allocated according to evidence-based medicine, burden of disease, and cost-effectiveness.<sup>3-5</sup> While all local public health departments require some level of basic funding, connecting resource allocation with need offers a potential route to improved population health and reduced health disparities.

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In this ecologic study we describe measures of population health outcomes as reported in the *Wisconsin County Health Rankings* as a methodology for determining areas of the state with the greatest population health needs.<sup>6</sup> We compare these outcomes to measures of local health department capacity in Wisconsin, defined by levels of funding and staffing, to determine the relationship between need and public health resources.

## METHODS

### *Data Sources: Funding and Capacity*

Local health department capacity measures for the 72 Wisconsin counties were gathered, including funding and staffing levels. Data on health department expenditures per capita for 1995 to 2004 from local tax levies, total health department expenditures per capita (including local, state, and federal funds), and number of full-time equivalent (FTE) staff per 10,000 population were compiled from the Wisconsin Department of Health and Family Services (DHFS) County Public Health Profiles.<sup>7</sup> Expenditures were reported by calendar year rather than fiscal year. Some counties have multiple local health departments and no single county health department, while others have local health departments in addition to a county health department, and still others have only a single county health department. Therefore, we used the county-based Public Health Profiles, which combine all health departments in a county into a single county-wide measure of capacity. We refer to all departments as local health departments and report on their data aggregated to the county level.

### *Data Sources: County Health Status*

The county health outcomes index was obtained from the University of Wisconsin-Madison Population Health Institute Web site.<sup>2</sup> The 2 equally weighted components used to represent health outcomes in the *2006 Wisconsin County Health Rankings* are premature mortality and self-reported health status. Years of potential life lost before age 75 were used to measure premature mortality in each county. We used 2002-2004

data, age-adjusted to the 2000 US population, that was obtained from the Wisconsin Department of Health and Family Services' Wisconsin Interactive Statistics on Health (WISH) system. General health status, a measure of self-reported health-related quality of life, was used to determine the percent of the population in each county reported as "fair" or "poor" health. Data for this indicator were obtained from 2 sources: 1999-2005 data from the Behavioral Risk Factor Surveillance System and 1998-2004 data from the Wisconsin Family Health Survey. For each measure, a Z-score was created representing the number of standard deviation units that the place was from the mean of all the counties. Averages of these Z-scores were used to calculate the outcomes summary measure. The health outcomes index is based on an inverse of this summary measure, so that a positive score represents better health outcomes.

### *Statistical Analysis*

The health outcomes index from the *2006 Wisconsin County Health Rankings* was entered into a Microsoft Excel spreadsheet. Data on each county's health departments including total funding per capita from all sources, funding per capita from local taxes, non-local funding, and number of FTE staff per 10,000 population, were then added. For each capacity variable, 10-year averages for 1995-2004 and 3-year averages for 2002-2004 were calculated, as well as standard deviations. Regression coefficients were calculated for the 10-year trends for each variable. Non-local funding was calculated by subtracting local funding from total funding for each health department. Also, the percent of total funding from local taxes was calculated. Missing data were imputed using an average of the value for the previous year and the value for the next year.

The health outcomes index was correlated with the 3-year averages of total, state, and local funding and staffing, and with the 10-year trends in total, state, and local funding using SPSS. Pearson correlation coefficients and *P*-values were calculated for each capacity variable.

## RESULTS

### *Local Health Department Capacity in Wisconsin*

To show the distribution of sources of revenue, total local public health department revenues for 2001<sup>8</sup> are presented in Table 1. The mean, range, standard deviation, and regression coefficient for each local health department capacity variable are presented in Table 2. On average in Wisconsin, local health departments spend a total \$20.70 per capita, ranging from a low of

\$7.50 in Waukesha County to a high of \$68.30 in Pepin County. Likewise, local health department funding from non-local sources averages \$10.20, ranging from \$2.70 in Waukesha County to \$47.60 in Pepin County. Total health department funding per capita increased roughly \$0.82 over the period of 1995-2004 after adjusting for inflation. Funding per capita from local taxes averaged about 52% of total funding, ranging from 28% in Rusk County to 77% in Menominee County. Average local health department funding per capita from local taxes was \$10.40 in the state, ranging from \$4.00 in Green County to \$21.20 in Iron County (Table 3).

The average full-time equivalent (FTE) local health department staff per 10,000 population was 4 FTE per 10,000 residents, ranging from a low of 1 person in Menominee, Waukesha, and Washington Counties to a high of 14 per 10,000 residents in Pepin County (Table 2).

### *Trends in Public Health Funding*

An analysis of the trend in total local health department funding per capita in Wisconsin from 1995 to 2004 reveals 3 distinct time periods. Total per capita funding increased \$0.20 per year during 1995-1997 and \$1.33 per year during 1997-2001; but decreased \$0.27 per year during 2001-2004 (Figure 2). Comparable analyses of the trend in funding per capita from local taxes and the trend in funding from non-local sources revealed similar patterns. Staffing trends showed a gradual increase from an average of 3.7 FTE staff per 10,000 residents in 1995 to 5.3 in 2002. The average dropped back to 3.8 in 2003, then remained unchanged through 2004.

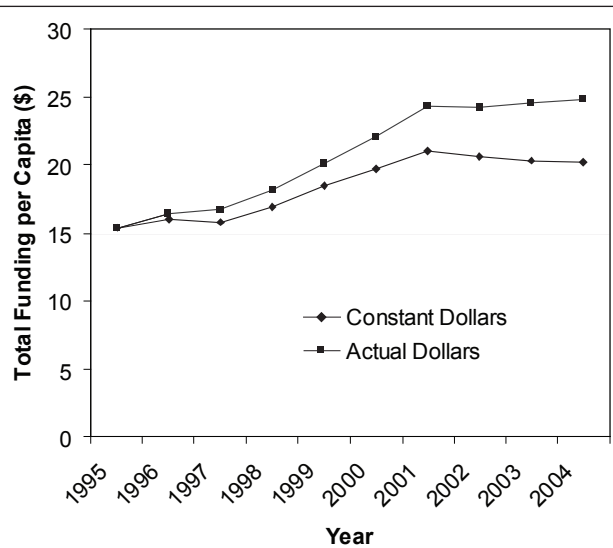
### *Trends by County*

A quartile distribution of trend in total per capita health department funding from 1995 to 2004 is shown in Figure 3. The counties with no shading have seen the greatest increase in funding over the 10-year period—more than \$1.50 per year. The lightest gray counties experienced an increase in funding of about \$1.00-\$1.50 per year. The next darkest counties saw a modest increase in total funding of about \$0.50-\$1.00 per year. The counties shaded the darkest gray experienced little to no increase in total funding, with 2 counties, Menominee and Racine, actually seeing a decrease.

The trend in total local health department funding during 1995-2004 is negatively correlated (-0.41) with the percent of funding from local taxes. That is, health departments receiving the highest percentage of funding from local sources saw the least increase in total funding over time.

**Table 1.** Total Local Health Department Revenues in Wisconsin, 2001

<b>Total Revenues (\$121,409,767)</b>	
<b>Local tax levies</b>	53%
<b>Direct or pass-through federal dollars—</b> Maternal and Child Health block grants, CDC tobacco funds, Preventive Health and Health Services block grants, CDC breast and cervical cancer funds, and the Special Supplemental Nutrition Program for Women, Infants, Children (WIC)	22%
<b>Fees for services—</b> license fees, insurance payments, Medicare/Medicaid	17%
<b>State dollars—</b> consisting of childhood lead funds, Well Woman funds, Prevention of Child Abuse and Neglect funds	6%
<b>Grants from non-governmental sources—</b> CAP funds, United Way funds, Robert Wood Johnson Foundation funds, Kellogg Foundation funds	0.7%
<b>Donations</b>	0.3%



**Figure 2.** Wisconsin state average of total county health department funding per capita, 1995-2004. Annual total county health department funding as reported by calendar year.

### *County Health Outcomes*

Health outcomes and capacity measures for each Wisconsin county are displayed in Table 3. Health outcomes index scores range from a high of 1.683 (healthiest) in Florence County in 2006, and a low of -1.806 (least healthy) in Juneau County.

### *Associations Between Capacity and Health Measures*

Pearson correlation coefficients are a measure of the

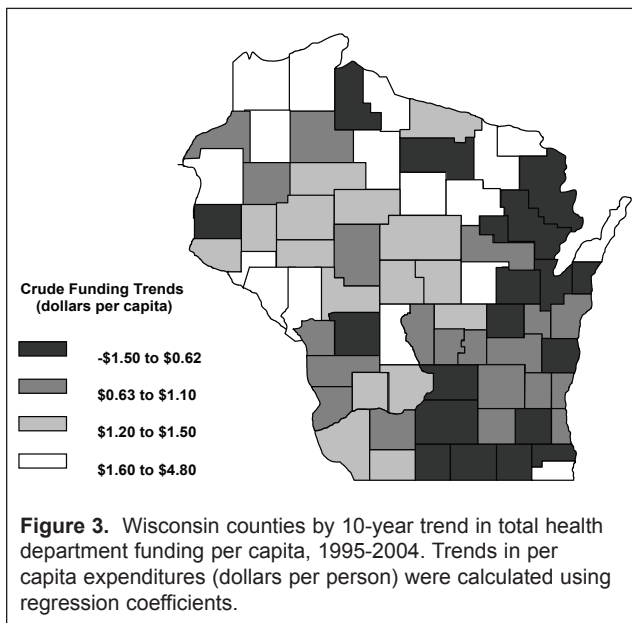
**Table 2.** Wisconsin State Capacity Measures: Funding and Staffing, 1995-2004

LHD Capacity Measure	Mean	Range	SD	Crude Trend*	Inflation-Adjusted Trend†
Total Funding per Capita	\$20.7	\$7.5-\$68.3	\$9.9	\$1.2	\$0.82
Local Funding per Capita	\$10.4	\$4.0-\$21.2	\$4.2	\$0.53	\$0.33
Non-Local Funding per Capita	\$10.2	\$2.7-\$47.6	\$6.7	\$0.69	\$0.41
Local Funding	52.4%	27.8%-77.0%	11.0	-0.39	N/A
Total FTE Staff per 10,000 Pop.	3.9	1.2-13.8	2.1	0.093	N/A

LHD=Local Health Department; SD=Standard Deviation; FTE=Full-Time Equivalent.

\*Using the regression coefficient.

†Adjusting for 2004 dollars.



degree of relationship between 2 variables and can range from -1 where 2 variables vary in exactly the same way but in a reverse direction, to +1 where the 2 variables vary exactly in the same direction. Correlation coefficients of 0 or close to 0 imply that there is no relationship between the 2 variables. The correlation matrix revealed small but statistically significant negative associations between health outcomes and local health department capacity measures (Table 4). That is, local health departments in the counties with worse health outcomes have had higher average funding and staffing levels during 2002-2004, and have seen a greater increase in funding from all sources over the past 10 years.

## DISCUSSION

One of the priorities of Wisconsin's 2010 State Health Plan is to improve public health infrastructure in Wisconsin through equitable, adequate, and stable financing.<sup>9</sup> However, this analysis revealed evidence of wide variation in local public health funding levels with

a decline in actual total funds after adjusting for inflation. These findings are consistent with similar findings from national studies. According to America's Health Rankings,<sup>10</sup> per capita spending for direct public health and community-based health services in the United States ranges from a high of \$499 per capita in Hawaii to a low of \$59 in Iowa (based on 2003 data from the National Association of State Budget Officers). Wisconsin was ranked 46th with per capita spending of \$79.

Health departments with higher percentages of their funding coming from local property taxes experienced the least increase in total funding over time. These local health departments tend to be smaller and more rural agencies. County fiscal policies designed to keep property tax increases down, and the lack of adequate state shared revenues back to counties, contribute to this trend. These agencies also have fewer staff resources to direct toward finding external funds through grant writing or fund raising. This pattern is likely to continue unless a different approach to funding local health departments, such as need-based or state per capita funding, is implemented. More technical support and training in grant writing and more links between academia and practice to support grant writing could also benefit local health department funding.

Despite increased state and federal funding for bio-terrorism and emergency preparedness since 2001, the total funding level for public health has not increased. While the focus on emergency preparedness planning has had positive consequences, including opportunities to develop relationships across health departments and system partners, raised awareness of public health functions, and improved infrastructure (generators, protective equipments, laptops with wireless capabilities, and cell phones), it has also had some negative consequences.<sup>12</sup> Emergency preparedness has not increased funding for additional staff and it has shifted time, resources, and attention away from traditional public health functions.<sup>12-13</sup>

This analysis revealed a small but significant rela-

**Table 3.** Wisconsin County Health Outcomes and Capacity Measures

County	3-Year Average (2002-2004)					10-Year Trend (1995-2004)		
	Health Outcome*	Total \$ per Capita	Non-local \$ per Capita	Local \$ per Capita	# FTE Staff per 10,000	Total \$ per Capita	Non-local \$ per Capita	Local \$
Adams	-1.395	20.3	10.1	10.2	3.2	0.87	0.54	0.32
Ashland	-0.564	14.8	6.2	8.6	4.7	0.16	0.014	0.12
Barron	-0.481	26.9	11.9	15.0	4.2	0.90	0.39	0.51
Bayfield	0.622	31.5	23.1	8.5	6.4	3.0	2.6	0.36
Brown	0.413	13.0	4.6	8.4	2.0	0.33	0.22	0.11
Buffalo	-0.392	33.1	20.9	12.2	5.3	3.0	1.8	1.2
Burnett	-0.478	37.0	16.6	20.4	5.2	1.1	0.23	0.86
Calumet	0.859	17.9	5.0	12.9	3.0	1.1	0.27	0.78
Chippewa	0.025	24.9	13.6	11.4	3.3	1.2	0.85	0.35
Clark	0.063	17.6	9.1	8.5	2.8	1.0	0.65	0.39
Columbia	-0.371	15.1	7.0	8.2	1.8	0.15	0.26	-0.11
Crawford	0.167	16.8	11	5.8	3.1	1.0	0.43	0.57
Dane	1.064	25.7	9.3	16.4	3.4	0.58	0.31	0.27
Dodge	0.366	11.3	5.4	5.9	2.0	0.63	0.27	0.36
Door	0.552	29.9	9.5	20.4	4.4	1.7	0.66	1.1
Douglas	-0.961	28.5	12.6	15.9	3.9	1.6	0.52	1.1
Dunn	0.248	24.3	14.2	10.1	4.4	1.5	1.1	0.39
Eau Claire	1.243	36.5	16.9	19.6	5.2	1.2	0.79	0.45
Florence	1.683	32.1	20.9	11.2	7.7	1.8	1.4	0.40
Fond du Lac	0.375	17.0	10.5	6.5	2.9	0.83	0.58	0.25
Forest	-1.302	33.3	18	15.4	9.0	2.6	1.4	1.2
Grant	0.389	21.4	13.4	7.9	2.6	1.4	1.1	0.30
Green	0.364	10.6	8.2	2.4	2.7	0.14	0.38	-0.24
Green Lake	-0.704	18.2	10.6	7.6	4.2	0.86	0.62	0.24
Iowa	0.653	14.2	9.1	5.1	2.4	1.0	0.85	0.20
Iron	-0.302	54.5	28.8	25.7	7.6	3.1	1.6	1.5
Jackson	-0.471	20.7	9.4	11.3	2.4	1.4	0.54	0.84
Jefferson	0.628	19.1	9.7	9.3	3.3	1.1	0.66	0.45
Juneau	-1.806	30.45	18	12.5	5.1	2.0	1.3	0.69
Kenosha	-0.705	27.9	16.2	11.7	3.2	1.7	1.4	0.32
Kewaunee	0.747	14.9	6.0	8.8	2.6	0.31	0.22	0.084
La Crosse	0.591	29.1	17.4	11.7	5.8	1.1	0.68	0.45
Lafayette	0.312	30.5	14.2	16.3	5.5	1.5	0.42	1.1
Langlade	-0.558	41.6	22.5	19.1	8.0	4.4	2.6	1.8
Lincoln	-0.020	26.5	8.6	17.9	4.2	1.7	0.63	1.0
Manitowoc	0.394	20.7	9.1	11.6	2.9	1.0	0.5	0.51
Marathon	0.854	26.8	9.4	17.4	3.3	1.5	0.38	1.1
Marinette	-1.020	17.5	7.3	10.2	3.3	0.44	0.26	0.18
Marquette	-1.111	21.5	8.6	13.0	4.7	0.69	0.55	0.14
Menominee	-1.531	9.0	-0.36	9.4	1.2	-1.5	-1	-0.49
Milwaukee	-1.427	36.2	18.4	17.8	4.5	1.1	1.2	-0.097
Monroe	-0.603	14.7	8.5	6.2	2.8	0.19	0.07	0.12
Oconto	0.327	16.5	6.9	9.6	3.1	0.53	0.07	0.46
Oneida	-0.380	25.4	17.1	8.3	4.2	0.54	0.38	0.15
Outagamie	0.979	14.0	6.3	7.6	2.3	0.45	0.27	0.17
Ozaukee	1.630	15.1	4.4	10.7	2.4	0.99	0.3	0.69
Pepin	-0.085	71.0	45.6	25.4	16.2	3.5	0.32	3.2
Pierce	0.211	37.3	23.6	13.7	7.6	1.4	1.4	-0.004
Polk	-0.105	46.8	28.6	18.2	8.4	3.1	1.8	1.3
Portage	1.165	24.9	13.9	10.9	3.7	1.4	0.58	0.86

*table continued on page 30*

**Table 3.** Wisconsin County Health Outcomes and Capacity Measures (continued from page 29)

County	3-Year Average (2002-2004)					10-Year Trend (1995-2004)		
	Health Outcome*	Total \$ per Capita	Non-local \$ per Capita	Local \$ per Capita	# FTE Staff per 10,000	Total \$ per Capita	Non-local \$ per Capita	Local \$
Price	-1.239	64.9	39.5	25.4	11.7	4.8	3.1	1.7
Racine	-0.324	19.3	9.1	10.1	3.2	-0.36	0.28	-0.64
Richland	0.376	21.3	8.9	12.4	3.2	1.5	0.64	0.83
Rock	-0.274	18.8	7.2	11.6	2.8	0.31	-0.14	0.45
Rusk	-0.099	32.3	20.3	12.0	7.3	1.2	0.4	0.78
Sauk	0.427	21.9	11.6	10.3	2.6	1.5	0.83	0.70
Sawyer	-0.540	26.8	16.4	10.4	5.7	0.69	0.52	0.18
Shawano	0.036	16.4	9.6	6.8	3.3	0.63	0.48	0.15
Sheboygan	0.182	20.4	7.8	12.7	5.1	0.069	-0.11	0.18
St. Croix	0.935	18.8	9.1	9.7	2.7	0.51	0.37	0.14
Taylor	0.387	20.5	11.9	8.6	4.5	1.5	0.91	0.60
Trempealeau	-0.200	22.8	11.5	11.3	4.8	1.6	0.86	0.73
Vernon	0.400	15.1	8.4	6.7	2.7	0.86	0.59	0.27
Vilas	-1.264	13.9	5.9	8.0	1.9	1.3	0.6	0.66
Walworth	0.586	10.4	4.7	5.7	1.7	0.30	-0.06	0.36
Washburn	-0.488	38.0	17.6	20.4	6.1	1.7	1.0	0.65
Washington	0.982	10.6	3.6	7.0	1.6	0.75	0.11	0.64
Waukesha	1.636	7.4	2.6	4.8	1.1	0.064	0.038	0.026
Waupaca	-0.897	23.7	15.1	8.6	4.6	2.2	1.6	0.55
Waushara	-0.753	32.7	13.2	19.5	5.5	1.4	0.85	0.58
Winnebago	0.332	19.1	11.1	8.0	3.9	0.48	0.42	0.061
Wood	0.587	24.1	10.8	13.3	3.8	1.3	0.7	0.58
Wisconsin		24.5	12.7	11.8	4.3	1.2	0.69	0.53

\*Based on the inverse of the health outcomes summary measure Z-score.

**Table 4.** Correlation of 2006 Rankings Health Outcomes Index with Local Health Department Capacity Measures, 1995-2004\*

	Pearson Correlation	P-Value
Total Funding per Capita (3-year average, 2002-2004)	-0.290†	0.014
Non-Local Funding per Capita (3-year average, 2002-2004)	-0.278†	0.019
Local Funding per Capita (3-year average, 2002-2004)	-0.247†	0.038
# FTE Staff per 10,000 Persons (3-year average, 2002-2004)	-0.266†	0.025
10-Year Trend in Total Funding Per Capita (1995-2004)	-0.246†	0.039
10-Year Trend in Non-Local Funding Per Capita (1995-2004)	-0.270†	0.023
10-Year Trend in Local Funding Per Capita (1995-2004)	-0.125	0.299

\*Menominee County was excluded from the correlation matrix as its public health system structure is notably different than in other Wisconsin Counties in that most public health services are provided by the Menominee Tribal Clinic.

†Correlation is significant at the 0.05 level (2-tailed).

relationship between local health department funding and public health need, as measured by the population health outcomes measures from the *Wisconsin County Health Rankings*. On average, counties with the poorest health outcomes (or greatest need) demonstrated slightly higher total expenditures, had the greatest increase in funding, and had a higher number of FTE staff per 10,000 residents. While these findings seem counterintuitive, it is possible that when community needs are higher, the local health department responds by successfully advocating for more funding because their population health needs are greater. They may be able to justify more grant funding from external sources because of these greater needs. Since achieving health status improvement at a population level takes considerable time, it may be years before the increased investments this analysis revealed result in health outcome improvements. Continued regular and consistent monitoring of health outcomes and public health expenditures will be needed to test these assumptions.

A number of limitations should be considered when interpreting the results of this study. Comparing the

fiscal resources of county- and city-level local public health systems is limited by the same challenges as comparisons at the state and federal level: lack of consistent definitions of public health services, lack of standardized reporting, unequal distribution of funds, and cross-border provision of services. The quality of these results is directly related to the quality of the data available.

County-level data used in this study were only from each individual county's public health departments, not the entire "public health system" (eg, all the population-based efforts of local health care organizations, employers, schools, and social service agencies). Therefore, public health expenditures for services provided by hospitals, schools, social services, county extension offices, sheriffs' departments, etc. were not taken into account in the measurement of counties' capacity. In addition, some public health services are provided by agencies in other counties. For example, Adams County residents receive Special Supplemental Nutrition Program for Women, Infants, and Children services in Juneau County; consequently, Juneau County's health department expenditures appear higher because not all of the funds are being spent on residents of their county. Ideally, accurate and standardized financial allocations for each of the essential public health services (as performed by the local public health system) would be available for each jurisdiction. Until this is achieved, comparing capacity measures across jurisdictions is difficult.

Along these lines, studies that have attempted to link financial capacity with performance have been limited by non-standard fiscal reporting and by self-reported performance and perceived effectiveness. Honore and Schlechte<sup>14</sup> found no association between expenditures and performance, while Mays et al<sup>13</sup> did find a relationship. Misclassification of expenditures may bias any association between funding and health outcomes. The development of a common definition of "public health expenditures" for private, not-for-profit, voluntary, community-based, and government organizations would aid in the standardization of public health expenditure reporting. In addition, capacity to provide public health services is not the same thing as providing quality services. Some counties with less funding may be using their resources more efficiently and equitably than counties with more funding.

This ecologic study cannot demonstrate the effectiveness of local health department funding, staff, and programs on the health of the population. Carefully designed studies and an increasing literature on evi-

dence-based public health should be used to assess these relationships. Rather, we feel that the data on population health needs should inform state and local public health investments, in an effort to reduce geographic health disparities in Wisconsin.

## CONCLUSIONS

This study provided evidence that the Healthiest Wisconsin 2010 public health infrastructure financing priority has not been addressed, and in fact may be moving in the opposite direction. Despite research that links local public health system performance with local, state, and federal funding; staffing; number and breadth of partnerships; and local health department organizational structure;<sup>15-20</sup> and that shows evidence-based public health policies and programs make a difference in improving population health,<sup>21</sup> "equitable, adequate, and stable financing" for local public health remains an unmet goal. Future public health financing research should include an analysis of the impact of emergency preparedness funding on local public health funding and service provision. Standardized reporting of public health revenues and expenditures would greatly enhance the reliability of future research in this area. In addition to investigating ways to increase public health funding, state policy makers should place more emphasis on need in allocation decisions. The *Wisconsin County Health Rankings* may be a useful tool for determining need.

**Funding/Support:** Support for this project was provided to the UW Population Health Institute, from the UW School of Medicine and Public Health.

**Financial Disclosures:** None declared.

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