The Association of Changes in Local Health Department Resources with Changes in State-Level Health Outcomes

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Background

"Performance measurement in the public health system must be able to measure inputs, processes, outputs, and outcomes in ways that allow for *changes* (emphasis added) in one to be linked with another"

B. Turnock, 1997

The Research Question

Are changes in Local Health Department characteristics - inputs, outputs, processes - associated with improvements in health outcomes at the state level?

Literature Review

LHDs/Local Public Health Systems and Health Outcomes:

1. Schenck *et al* , 1995
2. Kennedy, 2003
3. Honore' *et al*, 2004
4. Kanarek *et al*, 2006
5. Mays and Smith (in press 2009)

Methods

Data

1. NACCHO Profile of Local Health Departments
2. America's Health Rankings

Results

Description of final dataset for source of Independent Variables

Number of LHDs surveyed, completing surveys, and in the final dataset, by survey year

Year	LHDs surveyed	LHDs completing surveys	LHDs completing surveys both years	LHDs with expenditure data	LHDs in the final dataset, after excluding 8 states *
1997	2,832	2,492	1,924	1,852	1,843
2005	2,864	2,300	1,924	1,856	1,845

* AK, HI, RI, MS, ME, NH, NM, SD

Methods: Independent Variables

Independent Variables

NACCHO Survey Variables	Variable type
LHD expenditures	Continuous
LHD staff, in full-time equivalents (FTE)	Continuous
(Presence of a) Governing Board of Health	Nominal
Jurisdictional population	Continuous
Computed variables	
LHD expenditures per capita	Continuous
LHD FTEs per capita	Continuous
Percent of total state jurisdictional population covered by a LHD with a governing Board of Health	Continuous

Methods: Data

America's Health Rankings

Dependent variables

1. Smoking Prevalence
2. Obesity Prevalence
3. Infectious Diseases
4. Infant Mortality
5. Cardiovascular Deaths
6. Cancer Deaths
7. Years of Potential Life Lost

Methods: Data Management and Analysis

Independent Variables:

- Match LHDs reporting in 1997 and 2005
- Aggregate county-level data to produce state-level independent variables
- Produce measures for both 1997 and 2005

Dependent Variables:

- Select report years 1998 and 2008 based on matching of source year(s) of data with 1997 and 2005 NACCHO Profiles

For both Independent and Dependent Variables: measuring change between 1997 and 2005

- Relative (percent) change = $\frac{\text{(2005 figure – 1997 figure)}}{\text{1997 figure}} \times 100$
- Absolute change = 2005 figure – 1997 figure

Methods: Data Management and Analysis

Determining the association between changes in dependent variables with changes in independent variables:

1. Dichotomous categories of (1) an increase or (2) a decrease in value over time - chi-square testing.
2. Pairwise correlations - using Spearman's rank correlation.
3. Multiple linear regression

Data were analyzed using Stata, version 10

Multiple Linear Regression

Control Variables:

- High school graduation (%)
- Health insurance (% with health insurance)
- Poverty (% below Federal poverty line)
- Racial composition (% of population nonwhite)
- Age structure (percent of the population over age 65 years)
- State population, 1996

•Data for these control variables were all for 1996 only

Results – Multiple Linear Regression

Changes in Infectious Diseases with changes in Expenditures per capita

Variable	Coefficient	Std. Err.	t	p	95% Conf. Interval	
Expenditures per capita	-0.18226	0.08384	-2.17	0.037	-0.3524	-0.01206

Adjusted R2 = 0.3873, F (6,35) = 5.32, p = 0.0005

Changes in Cardiovascular Disease deaths with changes in FTEs per capita

Variable	Coefficient	Std. Err.	t	p	95% Conf. Interval	
FTEs per capita	-0.06504	0.02515	-2.59	0.014	-0.1161	-0.01398

Adjusted R2 = 0.3612, F (6,35) = 4.86, p = 0.0010

Results – Multiple Linear Regression

Infectious Diseases Morbidity:

- 10 % point increase in ExpCap → ID morbidity declined by 1.82 % points
- In states with increase in ExpCap → a 7.0% reduction in ID attributable to the increase in LHD spending

Cardiovascular Disease Mortality:

- 10 % point increase in FTEs per capita → CVD mortality declined by 0.65% points
- In states with increase in FTEs per capita → a 6.6% reduction in CVD mortality attributable to the increase in LHD staffing

Discussion

MAIN FINDING: An increase in Expenditures per capita was associated with a decrease in Infectious Disease cases

- Consistent with cross-sectional studies
- Consistent with Mays and Smith
- Strong supporting evidence for a pathway that goes through a change in LHD outputs/processes

Discussion

MAIN FINDING: An increase in FTEs per capita was associated with a decrease in CVD mortality

- Consistent with cross-sectional studies
- Evidence supporting a pathway that goes through LHD services or activities is limited and indirect
- Changes in LHD services and activities over same time period provide inconsistent evidence

Discussion - Limitations

1. Cause and effect, simultaneity, and endogeneity
2. Measures of change
3. Potential Ecologic Fallacy
4. Timeframe too short
5. Potential spurious associations
6. Consideration of Federal and State Public Health spending
7. Providing empirical evidence for *what* LHDs should be funded to do

Conclusion

The findings of this study suggest that improvements in public health resources at the local level may contribute to improved health outcomes at the state level. While it was not possible to identify changes in LHD outputs which could provide a clear pathway between inputs and outcomes there are opportunities to use the findings from this study to further strengthen the empirical base for what LHDs should be funded to do.

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