

# Delivery of Core Functions in Public Health Systems: System Characteristics and Effectiveness Over Time

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# Background and Aims

- Limited prior studies that evaluate the role of public health network (system) characteristics on effectiveness measures
  - Published findings from 1998 survey analysis
    - Just two thirds of 20 core functions performed in local jurisdictions
    - Perceived effectiveness rating was 35% of maximum possible rating
    - Local health agencies contributed an average of 67% of total effort devoted to the 20 public health activities
    - Poverty rates, racial composition, and presence of local boards of health were significant factors in perceived effectiveness
  - Research Aims: To assess the role of health department contribution to effort and density of the public health system on the effectiveness of core public health functions.
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# Data Sources

## *National Longitudinal Survey of Local Public Health Systems*

- Administered in 1998 and 2006
- HD directors from local jurisdictions with population > 100,000 identified in 1997 NACCHO Profile Survey
- 20 core functions comprising 3 categories of activities: assessment, policy and assurance
- For each core function:
  - Whether the service was provided in the community
  - How well the community was performing the function
  - What types of organizations contributed to providing the service
  - The proportion of contribution from the health department

## *NACCHO Health Department Profiles*

- 1997 and 2005 data linked to Longitudinal Survey data
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# Statistical Models

- SAS Proc Mixed
  - Repeated measure: Health Departments
  - Clustering variable: State
  - Dependent variables: 3 continuous measures of perceived effectiveness
    - *Assessment activities*
    - *Policy activities*
    - *Assurance activities*
  - Dependent variables and main independent variables standardized by their std. dev.
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# Statistical Models

- **Independent variables:**

- ❑ *LHD contribution percentage*
  - ❑ *Percent of types of organizations contributing*
  - ❑ Board of Health characteristics
  - ❑ FTEs per capita
  - ❑ Unemployment rate
  - ❑ Metro- or micropolitan area (from rural/urban continuum)
  - ❑ % population non-White
  - ❑ % population below poverty level
  - ❑ Jurisdiction is centralized, mixed or other
  - ❑ Population density
  - ❑ LHD adjusted expenditures
  - ❑ Percent of population with college education
  - ❑ Year of survey
  - ❑ State
  - ❑ LHD contribution x Percent of organizations contributing
  - ❑ LHD contribution x Year of survey
  - ❑ Percent of organizations x Year of survey
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# Survey Responses

	Sample Size	Survey Responses	Responded to NACCHO survey*
1998	497	354	334
2006	354	236	213
Total	851	590	547

\*NACCHO 1997 and 2005 Profile survey years.

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# Descriptive Statistics

	Time 1: 1998/1997 (n=334)	Time 2: 2006/2005 (n=213)	Percent change
Dependent variables:			
Effectiveness-Assessment	0.41 (0.15)	0.53 (0.17)	+29%
Effectiveness-Policy	0.27 (0.17)	0.42 (0.20)	+56%
Effectiveness-Assurance	0.38 (0.16)	0.41 (0.20)	+8%
Independent variables:			
LHD Contribution-Assessment	0.38 (0.18)	0.40 (0.16)	+5%
LHD Contribution- Policy	0.34 (0.19)	0.40 (0.18)	+18%
LHD Contribution- Assurance	0.40 (0.21)	0.40 (0.20)	--
Percent of organizations contributing to Assessment	0.22 (0.12)	0.28 (0.14)	+27%
Percent of organizations contributing to Policy	0.24 (0.16)	0.31 (0.17)	+29%
Percent of organizations contributing to Assurance	0.17 (0.12)	0.24 (0.13)	+41%

Note: Response sizes slightly vary for individual measures.

# Descriptive Statistics

	Time 1: 1998/1997 (n=334)	Time 2: 2006/2005 (n=213)	Percent change
Characteristics:			
BOH exists	76.4	72.3	-5%
BOH has policymaking authority	40.7	53.1	+31%
BOH is governing board	36.2	48.4	+34%
Unemployment rate (SD)	5.4 (2.7)	5.4 (2.1)	--
FTEs per capita (SD)	60.8 (41.5)	54.2 (35.0)	-11%
% pop < poverty level (SD)	12.5 (5.6)	10.7 (3.9)	-14%
Population density (SD)	1027.1 (3871.4)	1103.3 (4764.4)	+7%
LHD adj. expenditures (SD)	274 (1668)	267 (1153)	-3%
Percent college education (SD)	24.7 (8.8)	24.7 (9.1)	--

# Multivariate Model Results: Assessment Functions

<b>Table 1. Effectiveness of Assessment Core Functions.</b>		
	<b>Full Model</b>	<b>Reduced Model</b>
Effect	Estimate (SE)	Estimate (SE)
LHD contribution-Assessment	0.7135 *** (0.0940)	0.6587 *** (0.0543)
Pct of organizations-Assessment	0.4546 *** (0.1026)	0.4950 *** (0.0971)
Board of Health (ref=no BOH)		
Is governing board	0.2005 * (0.1197)	
Has policymaking power	-0.0215 (0.1170)	
Both functions	0.1258 (0.0923)	
BOH exists, but neither function	0.0499 (0.0865)	
County metro/micro (ref=micro)		
Metropolitan area	-0.0980 (0.1071)	
Jurisdiction type (ref=other)		
Centralized	0.3525 (0.2192)	0.4330 ** (0.1934)
Mixed	-0.0618 (0.2317)	-0.0636 (0.2033)
Population density (log)	0.0589 (0.0368)	0.0646 ** (0.0265)
LHD adjusted expenditures (log)	0.0188 (0.0336)	

# Assessment Functions, *continued*

	Estimate (SE)	Estimate (SE)
LHD FTEs per capita (log)	0.0164 (0.0516)	
% of pop nonwhite	-0.1855 *** (0.0693)	-0.1834 *** (0.0485)
% of pop < poverty level (log)	0.0129 (0.1053)	
% of pop with college ed. (log)	0.0461 (0.1037)	
Year of Mays' survey (Ref=2006)	-0.1222 (0.1796)	-0.1797 (0.1307)
LHD contribution*Percent of orgs	-0.0593 ** (0.0285)	-0.0591 ** (0.0264)
LHD contribution*year of survey (ref=2006)	-0.0698 (0.0832)	
Percent of orgs*year of survey (ref=2006)	-0.1559 ** (0.0728)	-0.2005 *** (0.0601)
Intercept	0.4649 (0.5525)	0.9086 (0.2786)
Model rows and fit:		
N (rows)	520	544
Subjects	328	336
Null model Likelihood Ratio test	p=0.0377	p=0.0206
AIC	1022	1034
BIC	1033	1045

# Multivariate Model Results: Policy Functions

<b>Table 2. Effectiveness of Policy Core Functions.</b>		
	<b>Full Model</b>	<b>Reduced Model</b>
Effect	Estimate (SE)	Estimate (SE)
LHD contribution-Policy	0.6605 *** (0.0580)	0.6038 *** (0.0304)
Pct of organizations-Policy	0.3942 *** (0.0644)	0.4147 *** (0.0428)
Board of Health (ref=no BOH)		
Is governing board	-0.0692 (0.0892)	
Has policymaking power	-0.0702 (0.0898)	
Both functions	-0.0082 (0.0704)	
BOH exists, but neither function	-0.0684 (0.0571)	
County metro/micro (ref=micro)		
Metropolitan area	-0.0268 (0.0865)	
Jurisdiction type (ref=decentralized)		
Centralized	-0.0856 (0.1489)	
Mixed	-0.1109 (0.1554)	
Population density (log)	0.0172 (0.0296)	
LHD adjusted expenditures (log)	-0.0196 (0.0232)	

## Policy Functions, *continued*

	Estimate (SE)	Estimate (SE)
LHD FTEs per capita (log)	0.0264 (0.0340)	
% of pop nonwhite	-0.0883 * (0.0501)	-0.0705 ** (0.0331)
% of pop < poverty level (log)	0.0642 (0.0812)	
% of pop with college ed. (log)	0.0056 (0.0817)	
Year of Mays' survey (Ref=2006)	-0.0587 (0.0968)	-0.1111 (0.0786)
LHD contribution*Percent of orgs	-0.0062 (0.0212)	
LHD contribution*year of survey (ref=2006)	-0.0753 (0.0614)	
Percent of orgs*year of survey (ref=2006)	-0.1345 ** (0.0632)	-0.2011 *** (0.0520)
Intercept	0.3071 (0.4294)	0.2978 (0.1358)
Model rows and fit:		
N (rows)	519	543
Subjects	328	336
Null model Likelihood Ratio test	p=0.1911	p=0.4909
AIC	775	770
BIC	787	781

# Multivariate Model Results: Assurance Functions

<b>Table 3. Effectiveness of Assurance Core Functions.</b>		
	<b>Full Model</b>	<b>Reduced Model</b>
Effect	Estimate (SE)	Estimate (SE)
LHD contribution-Assessment	0.8587 *** (0.0607)	0.8537 *** (0.0404)
Pct of organizations-Assessment	0.3128 *** (0.0654)	0.2706 *** (0.0429)
Board of Health (ref=no BOH)		
Is governing board	-0.0544 (0.1126)	
Has policymaking power	0.0218 (0.1067)	
Both functions	-0.0291 (0.0872)	
BOH exists, but neither function	-0.0645 (0.0793)	
County metro/micro (ref=micro)		
Metropolitan area	-0.0800 (0.1414)	
Jurisdiction type (ref=decentralized)		
Centralized	-0.0024 (0.2816)	
Mixed	0.0015 (0.2516)	
Population density (log)	0.0431 (0.0379)	0.0669 ** (0.0319)
LHD adjusted expenditures (log)	0.0111 (0.0349)	

# Assurance Functions, *continued*

	Estimate (SE)	Estimate (SE)
LHD FTEs per capita (log)	0.0116 (0.0469)	
% of pop nonwhite	-0.1456 ** (0.0661)	-0.1663 *** (0.0613)
% of pop < poverty level (log)	0.1471 (0.1032)	0.1679 ** (0.0848)
% of pop with college ed. (log)	0.0162 (0.0986)	
Year of Mays' survey (Ref=2006)	0.5446 *** (0.1126)	0.5009 *** (0.1024)
LHD contribution*Percent of orgs	-0.0145 (0.0266)	
LHD contribution*year of survey (ref=2006)	-0.2069 *** (0.0584)	-0.2156 *** (0.0536)
Percent of orgs*year of survey (ref=2006)	-0.1519 *** (0.0572)	-0.1353 ** (0.0585)
Intercept	-0.3818 (0.5129)	-0.3043 (0.2465)
Model rows and fit:		
N (rows)	518	542
Subjects	328	336
Null model Likelihood Ratio test	p=0.4092	p=0.7154
AIC	954	968
BIC	966	980

# Summary of Key Findings

- For all 3 types of core public health functions, the two factors of interest – LHD contribution and percent of organizations participating- were highly significant and in the positive direction either alone or as interaction terms.
- Interaction between the two was significant and negative for the assessment model. Not significant for policy and assurance.
- Percent nonwhite seems to be an important control variable, while poverty, college education and unemployment rate dropped out.

## *Limitations*

- Generalizable only to jurisdictions with 100,000+ population
  - *Perceived* effectiveness
  - Model fit for policy and assurance models
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# Conclusions and Next Steps

- LHD contribution and Percent of organizations participating are significant determinants of perceived effectiveness of core public health functions.
- As these factors increase, perceived effectiveness significantly increases.

## Next Steps

- Models that use measures of change for the 213 respondents to both surveys at both time periods.
  - Include health measures in the analysis.
  - Consider the types of organizations participating in the system.
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## Extra slides...

- Correlations
  - Separate models for LHD contribution and percent of other organizations participating (the two main independent variables)
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