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Julia F. Costich

Dana J. Patton

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Julia F. Costich, JD, PhD, and Dana J. Patton, PhD

To understand law's contribution to community health, we must identify the association between legal structures and population health indicators. This study addresses the broad legal foundations for public health improvement known as infrastructural public health law, those "laws that create and empower public health agencies and jurisdictions."^{1(p17)}

The observation that public health systems vary in legal infrastructure and its expression is not new. In 1981, DeFries et al. classified local public health systems as centralized, decentralized, or shared-control and observed that "statutes could not be relied upon to provide accurate indications of actual health department organization."^{2(p1114)} This insight foreshadowed a fundamental tenet of public health law research: the text of a statute or regulation alone cannot account for the full effect of law on population health.³⁻⁵ Authority granted by state law to local agencies is a necessary but not sufficient condition of local decisional autonomy.⁶

The Institute of Medicine's 2003 report *The Future of the Public's Health in the 21st Century* pointed to the need for research in this area by characterizing the legal foundation of public health as "replete with obsolete and inconsistent laws and regulations," a "state of affairs [that] sometimes complicates rather than facilitates governmental contributions to the public health system."^{7(p26)} Likewise, Mays et al. noted,

Empirical studies are needed to describe the range of legal structures currently used for distributing governmental public health powers among state and local agencies and to compare the effectiveness of these structures.^{8(p263)}

Examinations of the nature, extent, and mechanisms of local public health systems' impact on population health were infrequent until the emergence of public health systems and services research as a focused area of inquiry.^{9,10} Public health systems research has now identified typological models that can support comparative studies to identify variation in performance.^{11,12} A stronger evidence base for change can inform health law reform

Objectives. We explored the association between the legal infrastructure of local public health, as expressed in the exercise of local fiscal and legislative authority, and local population health outcomes.

Methods. Our unit of analysis was public health jurisdictions with at least 100 000 residents. The dependent variable was jurisdiction premature mortality rates obtained from the Mobilize Action Toward Community Health (MATCH) database. Our primary independent variables represented local public health's legal infrastructure: home rule status, board of health power, county government structure, and type of public health delivery system. Several control variables were included. We used a regression model to test the relationship between the varieties of local public health legal infrastructure identified and population health status.

Results. The analyses suggested that public health legal infrastructure, particularly reformed county government, had a significant effect on population health status as a mediator of social determinants of health.

Conclusions. Because states shape the legal infrastructure of local public health through power-sharing arrangements, our findings suggested recommendations for state legislation that positions local public health systems for optimal impact. Much more research is needed to elucidate the complex relationships among law, social capital, and population health status. (*Am J Public Health.* 2012;102:1936–1941. doi:10.2105/AJPH.2012.300656)

initiatives and improve their likelihood of success.

THEORETICAL FOUNDATION

The US federal system creates tension between centralized and decentralized governance. On one hand, devolution of authority to those closest to the people at the state and local level would appear to foster more responsive government. On the other hand, centralized authority may be more effective at ensuring equitable distribution of services.¹³ Local governments are not even mentioned in the US constitution: they are "creatures of the state" that may only act as authorized by state statute, a doctrine known as Dillon's Rule. However, other writings (e.g., Federalist Papers No. 17¹⁴) by the constitution's framers clearly indicate their awareness that the reservation of non-enumerated powers to the states in the tenth amendment gave authority and importance to local governance. Some states grant local jurisdictions home rule, which allows broad

governing authority by county officials over local issues.¹⁵⁻¹⁸

Advocates for enhanced local control argue that citizens can hold elected representatives responsible for their actions, local officials are more familiar with local needs,¹⁹⁻²¹ and public health policy innovation can be fostered at the local level.⁴ Historically, as county populations grew, and citizens began demanding increased services, enhanced local control could "make it easier for county officials to raise taxes and fees and increase expenditures and, therefore, expand county services."^{22(p859)} The expanded role of county governments began with increases in the counties' proportion of local government spending and employment in the early 1960s.²³

Proponents of greater centralization at the state or intrastate regional level typically make efficiency, effectiveness, and equity arguments.²⁴⁻²⁶ As Mays et al. noted, however, the empirical evidence on this issue remains limited and mixed.⁸

We hypothesized that the legal infrastructure of local public health, as expressed in the

exercise of local fiscal and legislative authority, affects local population health outcomes. Our logic model, shown in Figure 1, assumed that local public health systems have measurable impact on population health status in their jurisdictions.

Because states shape the legal infrastructure of local public health through power-sharing arrangements with local governments, associations of infrastructural law with population health status may support recommendations for state legislation to position local public health systems for optimal impact.

METHODS

Our unit of analysis was public health jurisdictions with at least 100 000 residents. Our sample (n = 231) was drawn from the survey of Mays et al.⁸ whose respondents were represented in both 1998 and 2006 surveys, thus allowing us to focus on jurisdictions with documented expression of public health activity over 8 years. Forty-one states were represented in the sample, and the median population of the sample jurisdictions was 232 347. We used a cross-sectional research design because reliable multi-year data were not available for several key variables in the model.

Dependent Variable

The dependent variable was premature mortality rates at the jurisdiction level from the Mobilize Action Toward Community Health (MATCH) database (<http://www.countyhealthrankings.org>), as reported from state vital statistics registries to the National Center for

Health Statistics. Premature death was measured as years of potential life lost before age 75 years, presented as a rate per 100 000 population, age-adjusted to the 2000 US population, and averaged for 2004 to 2006 to create a more robust measure.

Independent Variables

Four variables represented local public health’s legal infrastructure: home rule, county government structure, board of health power, and type of public health delivery system.

Home rule. Home rule states permit local governments to act on matters of local concern without legislative approval, allowing local officials to respond to constituent needs and be held accountable.²⁰ We expected home rule to be associated with a decrease in premature mortality rates. Home rule was measured as a dichotomous variable.

County government structure. Reformed local governments have an elected mayor or county executive, and may also have an elected or appointed city manager. Studies examining reformed city government structure reported mixed impact on services, tax rates and expenditures, and professionalism.^{27–29} Findings in studies of county government structure were more consistent. Reformed county governments tended to spend more on public services and were more capable of meeting the demands of a growing citizenry.^{21,30,31} We thus expected that reformed county governments would be associated with a decline in premature death. Reformed county government was defined as having an elected executive, measured as a dichotomous variable.

Local board of health power. States differ dramatically concerning the legal power afforded local boards of health. We created a 3-point index of local board of health power based on self-reported powers (authority to adopt public health regulations, set and impose fees, and impose taxes). Mays and Smith¹¹ found that decentralized state-local structures and local boards of health had a positive relationship with higher public health spending levels and fewer spending reductions. We thus expected that as the power of local boards of health increased, premature mortality rates would decrease.

Public health delivery system. Mays et al.⁸ classified local public health delivery systems into 7 organizational categories. The 3 primary categories were comprehensive systems, which perform a broad scope of public health activities; conventional systems, which have an average activity scope; and limited systems, with the narrowest activity range. Self-rated effectiveness was highest for comprehensive systems. Interestingly, limited systems were self-rated as more effective than conventional systems. We thus expected both comprehensive and limited systems would have a greater effect on premature mortality rates than conventional systems, and limited systems would have a greater effect on premature mortality rates than conventional systems.

Control Variables

Local tax dollars spent on public health. Fiscal authority was measured as the proportion of public health budget attributable to locally generated revenue.³² We expected as local tax dollars for public health increased, premature mortality rates would decrease. Local tax dollars spent was coded as dollars spent per 100 000 population.

Uninsured adults. Uninsured adults typically lack access to regular preventive care, are less likely to have a primary care provider, and more likely to wait longer to seek treatment when ill.³³ These findings would suggest an increase in the percentage of uninsured adults would be associated with an increase in premature death. However, younger adults are much more likely to be uninsured and in good health, so the association could be in the opposite direction. Uninsured adults were measured as the percentage of adults younger

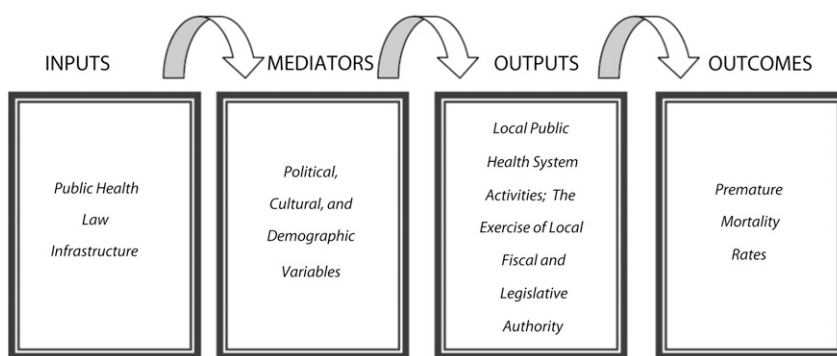


FIGURE 1—Logic model of primary and mediating effects on premature mortality rates: Local Legal Infrastructure and Population Health, United States.

than 65 years without health insurance coverage.

Poverty. Mays et al.³⁴ reported poorer communities were more likely to have inadequate public health services. This finding reinforced the well-known relationship between socioeconomic status and population health.³² We expected that as poverty increased, premature mortality rates would increase. Poverty was measured as the population percentage below the US poverty threshold.

Education level. The relationship between low education levels and poor health is well documented.³² Education was measured as the percentage of the population with a high school degree or higher in 2000. We expected as education increased, premature mortality would decrease.

Race. Race remains an important predictor of health outcomes in the United States.³⁴ Mays et al.³⁵ found that minority-dominated communities were vulnerable to inadequate public health service provision. We measured race as 2 variables, African American and Latino, allowing for distinct effects of these 2 minority populations. We expected a positive relationship between African American population proportion and premature mortality rates. Following the “healthy immigrant” thesis, we expected as Latino population proportion increased, premature mortality rates would decrease.

Lifestyle factors. We included 2 variables, smoking and obesity, to control for lifestyle factors known to impact health and longevity. Both were measured as the population percentage who smoke and are obese, per the County Health Rankings database.

RESULTS

We examined 4 variables representing local legal infrastructure: home rule, county government structure, local board of health power, and public health delivery system. The findings were mixed. Home rule had no statistically significant effect on premature death ($P = .74$). We also ran the model with home rule measured as a 4-category variable, with no change in the outcome. The strong and statistically significant effect of county government structure, however, suggested reformed government, with the ability to hold a clearly

identified local elected executive accountable for decisions, may be more important than the diffuse decision-making autonomy of home rule, which might not be exercised by local government officials. Public health jurisdictions with reformed county governments enjoyed a decrease of 259 years of potential life lost per 100 000 population compared with other jurisdictions, holding other variables constant (Table 1).

We tested the hypothesis that public health jurisdictions with greater local board of health power will have lower premature mortality rates. Although local board of health power had a statistically significant effect ($P = .006$) on premature death, the unstandardized coefficient indicated a decline of only 4 years per 100 000 population, holding all other variables constant (Table 1).

We expected comprehensive public health delivery systems to have the strongest effect on premature mortality rates, followed by limited systems (Table 1). Both were statistically significant predictors of reduced premature death rates, but limited public health delivery systems had a slightly larger coefficient

(−308). Compared with public health jurisdictions with conventional systems, jurisdictions with comprehensive systems had 243 fewer years of potential life lost per 100 000 population, holding other variables constant.

Among the control variables, the strongest association was with poverty: a 1% increase in poverty ($P < .001$) was associated with an increase of 142 years of potential life lost per 100 000 population, holding all other variables constant. Education and Latino were both highly statistically significant ($P < .001$) and in the expected direction. A 1% increase in high school graduates was associated with a decrease of 74 years of potential life lost per 100 000 population. The effect of Latino was smaller at −32, holding all other variables constant, whereas a 1% increase in African American was associated with a statistically significant ($P < .001$) but small (37 years) increase in premature death. A 1% increase in smoking ($P < .001$) was associated with an increase of 122 years of potential life lost per 100 000 population. Three of the control variables, local tax dollars on public health, uninsured adults, and obesity were not

TABLE 1—Cross-Section Regression Assessing the Effect of Legal Infrastructure on Premature Mortality (Years of Potential Life Lost per 100 000 Population): Local Legal Infrastructure and Population Health, United States, 2006

Independent Variables	b (Robust SE)	P
Home rule	32.99 (100.69)	.74
Local board of health power	−4.21 (1.51)	.006
Comprehensive PH delivery system	−242.68 (113.18)	.03
Limited PH delivery system	−307.97 (136.29)	.03
Conventional PH delivery system	(Ref)	
Reformed county government	−258.62 (128.17)	.05
Tax dollars on PH	0.000013 (0.000011)	.24
Uninsured Adults	30.79 (18.89)	.11
Education	−73.87 (14.78)	< .001
Latino	−31.65 (7.49)	< .001
African American	37.34 (4.87)	< .001
Poverty	141.59 (19.89)	< .001
Smoke	121.57 (19.33)	< .001
Obese	36.30 (20.36)	.08
Constant	8,030.54 (1732.50)	
R-squared	0.85	
No.	194	

Note. PH = public health.

statistically significant predictors of difference in premature death rates.

The interaction model tested whether reformed county governments mediated the effect of poverty on premature death. Previous studies found that reformed county governments spend more on services than nonreformed governments.^{21,29,30} If this finding was generalizable to public health services, and if we assumed that increased provision of public health services had a positive effect on health, we hypothesized that the effect of poverty on premature death was smaller in counties with a reformed government than in counties with a traditional county government. We used county government structure in the interaction model because it could be enacted at the county level, whereas the other 3 legal infrastructure variables would require state action. In this model, we excluded the variables from the first model that failed to achieve statistical significance and added an interaction term called reformed*poverty. Our hypothesis was supported (Table 2). There was a statistically significant difference in the effect of poverty on premature death based on the structure of county government.

Based on the computations from the interaction results, a 1% increase in poverty in a

county without reformed government was associated with 168 years of potential life lost per 100 000 population ($b = 168.17$; $SE = 21.23$; $P = .001$). By contrast, a 1% increase in poverty in counties with reformed government was associated with 111 years of potential life lost per 100 000 population, holding all other variables constant ($b = 111.51$; $SE = 28.27$; $P = .001$).

Our final analysis examined the effect of reformed county government on premature death rates by jurisdiction poverty rate to determine whether the effect of reformed county government was significant across all levels of poverty. The results are displayed in Figure 2.

The mean jurisdiction poverty rate in our sample was slightly over 10%, as illustrated by the vertical line in the graph. County government structure had a statistically significant association with premature death slightly before that point, at around 9% poverty. At lower levels of poverty, premature mortality rates were not significantly affected by the structure of the county government. In this sample, however, the figure shows that above a poverty threshold of about 9%, reformed county government was associated with a statistically significant decrease in premature death rates.

DISCUSSION

This examination of the relationship between longstanding legal infrastructure and premature death rates led to 3 observations. First, neither home rule nor board of health power was more than marginally related to population health status. This unexpected finding might be explained by the fact that although home rule and board of health power granted authority to make decisions at the local level, they did not necessarily translate into effective local action.

Both home rule and board of health power are determined by state statute, whereas county government reform arises at the local level. Counties, particularly those with higher levels of poverty, might benefit more from reformed county government structure than from state-granted home rule status or board of health power. Local government reform requires local action and thus points to greater community engagement, local leadership, and support for the difficult work of governmental change. The same consensus- and coalition-building activities that promote local government reform are familiar precursors to local public health initiatives, suggesting common ground for both government and population health improvement.

Second, the effect of poverty on premature death appeared to be mediated by county government structure, which is within the power of citizens to modify. This finding suggested that advocates for low-income populations might see long-term positive outcomes by lobbying for change in county governance structure. Again, building support for reform and constituencies for health requires long-term commitments with much potential synergy.

Third, public health delivery systems that offered limited or comprehensive services had a more significant impact on premature death rates than those offering a conventional level of services.

Fourth, when investigation of the relationship between public health funding and population health was limited to local tax revenue, increased funding had no impact on jurisdiction health. This finding did not conflict with that of Mays and Smith,³⁶ who found statistically significant reductions in preventable

TABLE 2—Cross Section Regression Assessing the Interaction Effect of Reformed Government and Poverty on Premature Mortality (Years of Potential Life Lost per 100 000 Population): Local Legal Infrastructure and Population Health, United States, 2006

Independent Variables	b (Robust SE)	P
Local board of health power	-4.47 (1.57)	.005
Comprehensive PH delivery system	-270.67 (112.27)	.02
Limited PH delivery system	-345.34 (130.89)	.009
Conventional PH delivery system	(Ref)	
Reformed county government	309.39 (300.32)	.3
Education	-82.10 (14.11)	< .001
Latino	-32.17 (7.20)	< .001
African American	38.98 (4.49)	< .001
Smoke	123.93 (18.31)	< .001
Poverty	168.17 (21.23)	.001
Reformed*poverty ^a	-56.67 (28.22)	.05
Constant	9956.01 (1501.80)	
R-squared	0.85	
No.	194	

Note. PH = public health.

^aReformed*poverty measures the interaction between the variables of Reformed County Government and Poverty.

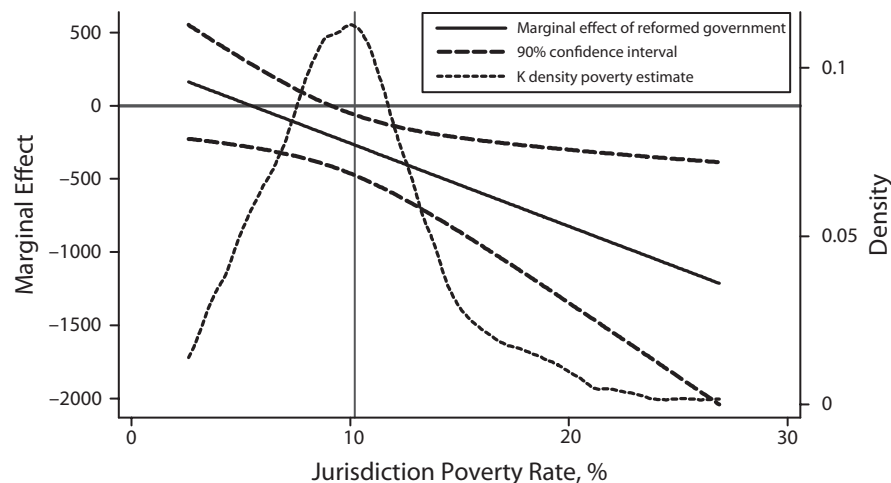


FIGURE 2—Predicted marginal effect of reformed government on premature mortality by jurisdiction poverty rate: Local Legal Infrastructure and Population Health, United States, 2006.

deaths were associated with increased total public health funding. We focused solely on local tax funding because of its relationship with the underlying investigation of local legal infrastructure, but nationally, locally generated revenue accounted for only 26% of the average local health agency's revenue.

A final consideration in examining devolution of public health authority is the possibility of disagreement on how to address the public health needs of the community. Elected officials and boards of health members are likely to experience widespread support for public health public goods, such as enhanced water treatment. Programs targeting vulnerable populations, however, may not garner commensurate support or resource allocation. Hence, decentralized public health authority could lead elected decision-makers to expend fewer tax dollars on populations with traditionally low voter turnout (e.g., minorities and the poor). Future studies could examine this possibility by using dependent variables, such as birth outcomes, that are targeted by short-term public health programs.

Limitations

This study encountered the limitations that continue to challenge the broader field of public health systems and services research, including incomplete understanding of several critical elements: composition and function of

local public health systems, decisions and implementation strategies of local leadership that mediate the effect of legal infrastructure on public health practice, and the willingness and capacity of local agency staff to translate policy directives into practice. Our analysis allowed us to postulate mechanisms of action and test their relationship with population health outcomes, but we are still far from the goal of identifying characteristics of model systems that perform in a predictable, replicable manner.

A more specific limitation characteristic of longitudinal population outcome metrics was the unknown influence of migration on population composition. The 2010 Census data indicated that some areas of the United States experienced significant in- and out-migration over the past decades.³⁷ The population whose outcomes we observed in the MATCH data might not reflect the same demographic composition as the baseline population whose long-term health status was the target of earlier public health interventions. However, setting the lower bound for population at 100 000 eliminated rural areas that experienced significant depopulation.

A third important category of limitations arose from the jurisdiction sample we borrowed from Mays et al.⁸ The sample was structured to be nationally representative at the outset, but the present analysis was limited to jurisdictions that fell within the same typology

classifications in the 2 survey iterations. Selection of this subset might have led us to overlook distinctions and relationships in the jurisdictions that changed types. A separate study of the group that changed types might be warranted.

Finally, reformed local government and better population health might both be produced by the community's level of social capital. For this purpose, social capital comprises "the resources – for example, trust, norms, and the exercise of sanctions – available to members of social groups."^{38(p3)} The subtype called bridging social capital, which facilitates cohesion across racial, ethnic, political, or socioeconomic divisions, seems reasonably related to the level of community consensus that would be required for local government reform. As Kawachi et al.³⁸ caution, analysis at the ecological level, within which we would place the present study, risks conflating group characteristics with intervention effects. In the context of the present study, we must therefore account for the possibility that healthier communities have superior bridging social capital and generate local government reforms, although our analysis took the reverse perspective.

Recommendations for Future Research

Our most important finding was that one specific feature of legal infrastructure, reformed local government, appeared to mitigate the classic association between poverty and low population health status. This finding was based on broad categories of input data, so case studies exploring community-specific historical, political, and health services data might shed light on the generative elements within public health system types that combine to produce population health effects. The social capital that gives rise to both community health initiatives and local government reform could be investigated with widely used tools such as the World Bank's Social Capital Assessment Tool to construct actionable models and test them in other settings.³⁹ ■

About the Authors

Julia F. Costich is with the Department of Health Services Management, University of Kentucky College of Public Health, Lexington. Dana J. Patton is with the Department of Political Science, University of Alabama, Tuscaloosa.

Correspondence should be sent to Julia F. Costich, UK College of Public Health, 111 Washington Ave., Lexington, KY 40536-0003 (e-mail: julia.costich@uky.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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Contributors

J. F. Costich contributed project oversight, article preparation, and legal research. D. J. Patton contributed statistical analysis, political science research, and article preparation.

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Human Participant Protection

No protocol approval was needed for this study because no human subjects were involved.

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