

# Government Health and Social Services Spending Show Evidence of Single-Sector Rather Than Multi-Sector Pursuit of Population Health

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## Abstract

Population health improvements can be achieved through work made possible by government spending on health care, public health, and social services. The extent to which spending allocations across these sectors is synergistic with or trade-off against one another is unknown. Achieving a balanced portfolio with multi-sector contributions is key to improving health outcomes. This study tested competing hypotheses regarding achievement of balanced multi-sector resources for health. County-level U.S. Census Bureau data on all local governmental spending measured each county's average per capita local government spending for public hospitals, public health, social services, and education. American Hospital Association (AHA) Annual Survey data on hospital community health service provision were used to calculate an index of hospital community service provision aggregated to county level by year. County Health Rankings data measured each county's health outcomes and health factors. Longitudinal mixed-effects regression models ( $n = 1877$  counties) predicted changes in spending for each government spending category based on two sets of predictors (*government spending vs community health services and needs*) from current and prior year. Models account for average spending in each category and county-, state-, and time-trends. Models showed that spending increases in each of the four spending categories examined (public hospitals, public health, social services, and education) were not associated with changes in spending across other categories in current or prior years. For all categories, an increase from baseline spending levels in Year 1 was always significantly associated with an increase from baseline spending level in that same category in Year 2 (ie, spending stayed above baseline in Year 2). Multi-sector initiatives to health outcomes require funding across sectors, yet there was little evidence to suggest that communities that invest in public hospitals, public health, or other social services see commensurate increases in other areas. Underlying funding decisions may reflect strategic decisions within a community to scale up single sectors, constrained resources for multi-sector scale up, or a host of additional factors not measured here.

## Keywords

local government spending, hospital community health services, multi-sector, isomorphism, resource dependency, social services

### What do we already know about this topic?

Contributions from multiple sectors including health care, public health, and social services is key for improving health outcomes but this requires funding across sectors.

### How does your research contribute to the field?

Leveraging a novel data source that enables annualized tracking of local government spending, there was little evidence to suggest that communities that invest in one category do so in others.

### What are your research's implications toward theory, practice, or policy?

There does not appear to be a natural tendency toward multi-sector investments by local governments in pursuit of multi-sector population health so identification of barriers and facilitators to multi-sector investments is a key priority.



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## Introduction

A substantial portion of population health outcomes are driven by factors other than health care services.<sup>1,2</sup> Investigation of non-medical contributions to improving health is therefore a critical element of the health literature.<sup>3</sup> Empirical research has investigated the impacts of governmental investments in public health<sup>4-6</sup> and upstream social services<sup>7,8</sup> on health outcomes, with findings from these studies suggesting that higher spending at national, state, or local levels yields better health outcomes across corresponding populations.

Building off of an earlier focus on “sector-wide” pursuit of improved population health,<sup>9</sup> evidence has emerged regarding the potential for multiple sectors, including health care, public health, and social services, to contribute to population health improvement.<sup>10,11</sup> For example, recent work highlighted Vermont’s “balanced portfolio approach.”<sup>12</sup> Based on frameworks developed by the Centers for Disease Control and Prevention (CDC), a balanced portfolio approach seeks to improve population health through a purposeful selection process for system-wide prioritization, based on community needs, of upstream interventions for population health.<sup>12,13</sup> Evidence suggests that strong system-wide, multi-sector collaborative initiatives can reduce death rates and improve health outcomes in communities.<sup>14</sup> However, relatively little evidence has been found regarding specific types or strategies for community-level facilitators of collaboration for preventive health and education services.<sup>10</sup> So, while multi-sector approaches to improving health in the United States show promise,<sup>14-16</sup> challenges remain.<sup>12,17</sup>

In an approach that seeks to engage multiple sectors including health care, public health, and social services in pursuit of improved population health, it is reasonable to expect that the types and levels of activities that organizations undertake in support of improved population health may depend on the types and levels of activities performed by others. However, empirical evidence shows that investments in one area can result in a wide range of possible outcomes.

Some evidence suggests that additional resources may beget additional resources. When non-governmental organizations participate in a community’s public health system (either through public health service provision or partnership with governmental agencies), the total availability of public health services in a community increases significantly.<sup>18</sup> Yet, other evidence suggests that additional resources in one area do not result in changes in resources available. For example, the set of community health-oriented programs and policies

available at the state level show no uniform patterns with respect to benefit adequacy or inclusiveness.<sup>19</sup> Changes in governmental public health spending have not been found to affect the amounts hospitals spend on community health initiatives.<sup>20</sup> Public health departments have tended to eliminate more clinical services in areas with higher levels of community partner provision of these services.<sup>21</sup> In short, ambiguity exists with respect to how agencies aiming to improve the health of the community respond to changes in resources or contributions from other actors in the community. This is relevant as we consider multi-sector approaches to improve the health of a community.

Community health activities are delivered by organizations across numerous sectors, including governments, hospitals, health care providers, health insurers, employers, schools, community nonprofits, and others.<sup>22-24</sup> This study focuses on two especially important sets of organizations: governments and hospitals.

Governmental agencies play critical roles in community health,<sup>4,5</sup> and their contributions are especially relevant given the public’s interest in the responsible and effective use of taxpayer funds. Hospitals are also an increasingly important contributor to community health because, in addition to clinical care, many hospitals provide services aimed at improving the health of the community at large.<sup>25</sup> Nonprofit hospitals are required to provide services that benefit the health of their communities in return for their tax-exempt status,<sup>26</sup> though for-profit hospitals also provide community health services for a range of reasons.<sup>27</sup> Nonprofit hospitals are also required to regularly assess the health of the community,<sup>28</sup> although it is somewhat unclear how directly those assessments inform hospital strategy and delivery of community health services.<sup>29</sup>

So, while both governments and hospitals invest resources to support community health,<sup>8,20</sup> the extent to which these public and private community health resources are synergistic with or trade-off against one another is unknown. Several potential scenarios could be envisioned.

Specifically, if governments do not employ a coordinated, multi-sector perspective for pursuing improved population health, we would not expect that changes in governmental spending for a given category (eg, public health) would have any observable impacts on other categories of government spending (eg, social services). Likewise, if governments and hospitals do not coordinate relative levels of resources and activities, changes made by one actor (eg, hospitals’ community service provision) would not have immediately observable impacts on the

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activities of the other (eg, governmental spending). To the extent that there is coordination between governments and hospitals, we may observe trade-offs where one actor opts to reduce activity following additional activity by the other. Alternatively, one actor may opt to follow the lead of the other, “doubling down” to increase activity following additional activity by the other. It is also possible that government and non-governmental investments are complementary, that governmental and non-governmental resources across communities may make independent or supplementary contributions toward improved population health.

The range of organizations’ plausible responses to changes in the types and levels of similar or complementary services available in their communities is of central importance to understand the system-wide contributions of organizations from multiple sectors. The purpose of this study was to empirically test two hypotheses related to how changes in governmental spending for health and social services and changes in community health services and needs are related to changes in governmental spending for other health and social service categories.

## Methods

### *Theory and Hypothesis*

This study seeks to improve our understanding of how organizations working to improve the health of the community respond to changes in resources or contributions from other actors in the community. This may help clarify some of the uncertainty regarding expected outcomes within a community when one organization changes its community health spending or service provisions. To this end, consideration of the theoretical bases for interagency collaboration<sup>30</sup> and community health partnerships<sup>10,31-34</sup> is warranted. This study’s research question of interest is whether changes in local government spending on public hospitals, public health, and other social services are accompanied by simultaneous or near-term changes in local government spending across other categories.

A main motivating conceptual framework used in this study was institutional isomorphism. Institutional theory posits that organizations model themselves after other successful organizations through mimetic isomorphism.<sup>35,36</sup> This means that organizations will model their own structures and approaches based off of those found in organizations that are otherwise perceived to be successful organizations.<sup>35,36</sup> In addition to impacting organizational structure,<sup>37,38</sup> isomorphism has been observed to impact organizations’ program and service offerings.<sup>39,40</sup> Under institutional isomorphic theory, governmental health and social service agencies within a community will—through formal or informal mechanisms and networks<sup>12,41</sup>—seek to emulate the service and investment portfolios of other governmental agencies within the community. This should be reflected on local governmental budgets through shared

priorities, strategies, and/or service portfolios that should be accompanied by visible increases in spending across multiple sectors at the nearly the same time. Therefore, the study’s main hypothesis (Hypothesis 1) is that increases in local government spending on public hospitals, public health, and social services stem from commensurate and synergistic increases across other categories of government spending, rather than independently or from clearly observable changes in community health services and needs. A roughly analogous expression to this hypothesis would be that “a rising tide lifts all boats.”

*A rival hypothesis also considered in this study (Hypothesis 2) is that governmental agencies will tend toward less collaborative approaches to coordinating resources across services, with agencies working independently to maximize their individual resources. This hypothesis is driven by rational resource dependency theory.<sup>36,42</sup> Under this reasoning, collaborative action between organizations depends on the perceived need for collaboration, organizations’ willingness, and organizations’ ability to collaborate,<sup>43</sup> environmental context, organizational structures, and nature of the activities may directly affect collaboration.<sup>10</sup> Therefore, changes in community health or social service conditions could prompt changes to the collaborative environment within a community and thereby cause changes to the spending or services provided by other agencies in the community.<sup>10</sup> Therefore, increases in government spending on public hospitals, public health, and other social services will take place independently from increases across other categories of government spending, resulting in part from clearly observable changes in community health services and needs. A roughly analogous concept to this hypothesis would be that of a zero-sum game, where gains accruing to one actor necessarily stem from losses incurred by another.*

### *Data and Measures*

We employed three main sources of data for this analysis. First, to measure *governmental spending*, we used the U.S. Census Bureau’s Local Finance data for 2007 through 2012 for 15 health and social service categories. These data have previously only been available every 5 years (2012, 2007, 2002, 1997, etc) through the U.S. Census Bureau’s Census of State and Local Governments data reports. Each of the nearly 90 000 governmental entities in the United States is surveyed on its expenditures, revenues, and debts every 5 years, yielding a rich longitudinal dataset of governmental spending, albeit with gaps for years not ending in 2 or 7.<sup>6</sup> We leveraged an additional data source to complete the dataset and generate annual spending estimates. The Census Bureau publishes annual governmental spending estimates from a limited sample of governments under its annual State and Local Finance Snapshot data reports. Because larger governments are oversampled in this annual dataset, the large majority of total spending by local governments in a county area is captured for most years in most large areas.

We previously developed a linear interpolation algorithm to leverage these two data sources to create annual spending estimates. Additional detail regarding this dataset is available in the Supplemental Appendix to this manuscript and elsewhere.<sup>8,44,45</sup> The resulting dataset contains spending totals at the county-area level dating back several decades for the more than 3100 counties and county equivalents in the United States. All governmental health and social services expenditure data came from this dataset.

These datasets include spending performed by all local governments (counties, cities, municipalities, etc). These local sources are aggregated to the county level, so all spending from all local sources within a county area is reflected in the dataset. The dataset reflects all spending made by local governments using their own funding sources (eg, local revenues generated from taxes or other revenue generating activities) and transfer spending from federal or state sources to local governments. Inclusion of transfer spending is relevant since some local government spending comes via transfer spending, which are funds that come via another level of government (eg, from federal to state or from state to local governments).<sup>6,46</sup> The dataset used for this analysis includes transfer spending from state and federal sources to local governments (eg, grants from federal agencies to local governments). However, state and federal spending that is routed directly to individual beneficiaries is not. One notable type of spending that is not captured in this dataset is state-level health care insurance such as Medicaid. Definitions for all spending categories are available in the Supplemental Appendix. Spending categories are pre-defined by the Census Bureau, and no further disaggregation was possible.

Our spending predictors of interest were government spending as classified by the U.S. Census Bureau<sup>47</sup> for county-area spending related to four “sectors” defined here as follows:

1. Public hospitals;
2. Public health (all non-hospital spending including public health, behavioral health, and other local community health care);
3. Social services (fire and ambulance services, housing and community development, libraries, natural resources, parks and recreation, protective inspections, public welfare, sewerage, waste management, and transportation);
4. Education (K-12 elementary and higher education—while conceptually similar in its hypothesized impacts on population health to many of the social services listed above, education was classified separately from other social services since it constituted such a major portion of many county areas’ total spending and caused collinearity issues in models if incorporated into the social services measure listed above).

We measured spending across these four sectors in two ways: (1) spending per capita (dollars spent for a given category per person living within a county) was used in descriptive statistics and bivariate tables and (2) yearly deviation from county mean (difference in dollars between spending for a given category in a given county in a given year and the mean spending for that category for that county across all years in the sample) was used in regression models.

Second, in addition to government spending, *community health service availability was measured* using data from the American Hospital Association’s (AHA) Annual Survey from 2007 to 2012 to generate an index of the total number community health services provided by each hospital for each year. In its annual survey, the AHA asks respondents to indicate the specific health care services provided by their facility. Previous research has defined a set of 17 “community health services” that benefit the health of the community at large.<sup>25,37,48-51</sup> We used hospitals’ responses to questions to define a set of 17 community health services. Hospitals responded whether each service was or was not provided; no data were available regarding the scale, scope, or efficiency of the services provided. The 17 community health services used were as follows:

1. Child wellness program
2. Community outreach program
3. Crisis prevention program
4. Emergency department
5. Fitness center
6. Health fair
7. Health information center
8. Health screening program
9. Nutrition program
10. Occupational health program
11. Patient education program
12. Patient representative services
13. Social work program
14. Support groups
15. Teen outreach program
16. Transportation services
17. Volunteer services

We aggregated hospital-level community service provision data (count of services provided, ranging from 0 to 17 for each hospital) to the county level. A county-level index of community health service provision was calculated using hospital bed-size weighted averages for the number of community health services provided by each hospital to estimate county-level hospital provision of community health services. While a hospital’s county may not perfectly align with the community of patients it serves, many previous studies have used this level of analysis.<sup>50,52,53</sup>

Because the study included local government spending on public hospitals as a key outcome and predictor of interest, we excluded public hospitals from the main analytic

sample prior to calculating the county-level community health service index. Given that public hospital spending may directly support community health services whereas public health or social services spending would not, different relationships between spending and service provision may exist for public county hospitals versus non-public county hospitals. Therefore, we opted to conceptually streamline by excluding public hospitals from the main analytic sample. Separate sensitivity analyses were performed that re-calculated the index including public county hospitals and re-ran models; findings were not sensitive to the inclusion or exclusion of these hospitals.

Third, as a proxy for *community health needs*, we obtained County Health Rankings & Roadmaps (CHRR) data from 2010 (earliest year available) through 2012.<sup>54,55</sup> Each year a new set of CHRR are released that rank each county within each state on its Health Outcomes and separately on its Health Factors (health behaviors, clinical care, social and economic factors, and physical environment in a county). These rankings are important as both direct measures of the health and wellbeing of a community (as the rankings themselves reflect just that) and for their potential to generate media and popular attention toward community health needs and status.<sup>56</sup> A change in rank for either health outcomes or health factors would indicate a change in community health needs for that county. A negative change in ranking indicates an improvement (relative to other counties in its state), while a positive change in ranking indicates a decline.

We also obtained county-level socioeconomic data from the County Health Rankings including county-level median household income, population size, rurality, race/ethnicity, age distribution, unemployment, uninsurance, and availability of primary care providers (PCPs). As a proxy for total per capita health care spending within each county, we obtained from the Dartmouth Atlas per enrollee Medicare spending adjusted for age, sex, and race.

### Statistical Analyses

We examined univariate distributions of variables and bivariate relationships between local governmental spending, availability of hospital-provided community health services, county health outcomes, and county socioeconomic variables.

Longitudinal regression models were run to test the study's hypotheses. The outcomes of interest (government spending for a specific health or social service category) were regressed against a complete set of predictor variables for government spending, community health services and needs, and controls. All government spending outcome and predictor variables described above were entered into regression models as year-specific deviation from county's mean spending for each of the four categories (public hospitals, public health, social services, and education). County's mean spending for each category was entered into models as a control variable for baseline spending levels. This was done in

part because raw per capita spending totals may be more reflective of county's socioeconomic status or tax base than community priorities. All models included annual spending deviations and baseline spending levels; additional models were run as sensitivity analyses that included annual spending deviation-squared terms to test for potential non-linearities in relationships and decreasing returns to scale for additional spending. A community's health services and needs were proxied through the county-level index of hospital community health service provision and county's health outcomes and health factors rankings.

Because the county health factors ranking variable is constructed using a broad array of dozens of community socioeconomic and health measures, we sought to avoid double-counting the impacts of individual socioeconomic or health measures in models. The only control additional variables included in the main model were population and presence of for-profit hospital in the county. Additional models were run that included additional direct controls for population age, race, household income, and PCPs, and health care spending. The statistical rationale for including these variables in a model is weak given that these measures are already included in the county health factors ranking. Therefore, this model was not used as the study's main model. Moreover, general magnitude/direction of relationships and overall findings of significance were not sensitive to the inclusion or exclusion of these additional control variables.

Regression models used a lag structure to allow for examination of relationships across years. For all government spending and community health services and needs variables, values for predictor variables from the current year plus 1 year prior were used. This lag was selected given the relatively large proportion of spending impacts that occur within the first year,<sup>5</sup> to promote model parsimony, and because CHRR and spending data only had 3 years of overlap (2010-2012) so longer lags would have reduced sample size. All models included year-fixed effects and state-random effects (fixed vs random effect selection performed using Hausman specification tests for consistency of coefficients)<sup>57</sup> to control for temporal factors and for state-level factors such as hospital community benefit reporting requirements, which have been shown to be associated with hospitals' provision of community health services.<sup>58,59</sup> Analyses were performed using Stata version 15.1. The Arizona State University Institutional Review Board determined this work to be exempt from human subjects review.

Several sensitivity analyses were also performed. There are a total of approximately 3130 counties and county-equivalents in the United States; complete data were available for  $n = 1877$  counties (study's analytic sample). Data on presence of for-profit hospital in a county and/or hospital provision of community health services were missing for 1104; data on county health ranking or county socioeconomic characteristics were missing for an additional 149 counties. In

**Table 1.** Local Government Spending for Public Hospitals, Public Health, Social Services, and Education (2012).

Category	Sub-category	Mean local government per capita spending for all counties (2012)	Mean local government per capita spending (2012) in:		
			Counties with hospitals	Counties without hospitals	
Public hospitals	N/A	\$373	\$464	\$68	
Public health	N/A	\$100	\$101	\$94	
Social services	Fire and ambulance services	\$81	\$85	\$65	
	Housing and community development	\$67	\$73	\$45	
	Libraries	\$28	\$29	\$23	
	Natural resources	\$42	\$40	\$51	
	Parks and recreation	\$66	\$70	\$50	
	Protective inspections	\$7	\$7	\$6	
	Public welfare	\$95	\$96	\$92	
	Sewerage	\$112	\$119	\$85	
	Waste management	\$64	\$66	\$56	
	Transportation	\$288	\$279	\$318	
	Education	K-12 education	\$1829	\$1808	\$1900
		Higher education	\$66	\$81	\$13

**Table 2.** Correlation Matrix for Baseline County Mean Levels of Government Spending and Hospital Community Health Service Provision.

	Public hospital per capita	Public health per capita	Social services per capita	Education per capita	Hospital community health service provision
Public hospital spending per capita	1.00				
Public health spending per capita	0.02*	1.00			
Social services spending per capita	0.11*	0.36*	1.00		
Education spending per capita	0.08*	0.15*	0.32*	1.00	
Hospital community health service provision	-0.12*	0.15*	0.12*	0.02*	1.00

\* $P < .05$ .

general, counties included in the analytic sample tended to be larger and more urban, with very similar Medicare spending and life expectancy (see Supplemental Appendix Tables A2 and A3). The study's main hypothesis specifically incorporated hospitals in its focus so main models focus only on the 1877 counties with complete data available. Sensitivity analyses removing hospital-related variables had larger sample sizes and found very similar results as main models presented below (see Supplemental Appendix Table A4). These models were not used as the study's main models as they exclusively examined governmental spending patterns in the absence of information on changes in resource provision by other non-governmental agencies in the county. An additional sensitivity analysis explored impacts of use of interpolated spending data in study's models. While these data have been used previously in multiple other peer-reviewed analyses,<sup>8,44,45</sup> it is nevertheless important to explore here as well. Briefly, since larger governments are more likely to report data more frequently, counties with large are far less commonly interpolated in the dataset. A sensitivity analysis limited regression models to only large counties (population greater than 100 000). Sample size was reduced from 1877 to

545. As shown in Supplemental Appendix Table A5, models removing smaller (and more commonly interpolated) counties found very similar results as main models presented below.

## Results

Local government spending for public hospitals, public health, social services, and education for the year 2012 is shown in Table 1. Spending was highest for education, largely due to K-12 education spending. Spending for certain categories and sub-categories was right-skewed. While the mean county spent \$373 per capita on public hospitals, the median county spent \$0 (ie, no public hospital in that county); mean spending for higher education was \$66, whereas the median county spent \$0 (ie, no higher educational institution in that county) (data not shown in table).

Correlation coefficients between government spending and hospital community health service provision variables are shown in Tables 2 and 3. Table 2 shows that baseline county mean levels of government spending are not highly correlated across the four spending categories examined.

**Table 3.** Correlation Matrix for Increase Above County Mean Levels of Government Spending and Hospital Community Health Service Provision.

	Public health per capita	Public hospitals per capita	Social services per capita	Education per capita	Hospital community health service provision
Public hospital spending per capita	1.00				
Public health spending per capita	0.01	1.00			
Social services spending per capita	0.04*	0.06*	1.00		
Education spending per capita	0.02*	0.03*	0.12*	1.00	
Hospital community health service provision	0.02*	-0.01	-0.03*	-0.01	1.00

\* $P < .05$ .**Table 4.** Government Spending and Hospital Community Health Service Provision by Quartiles.

			Counties grouped in quartiles according to:					
			Overall (national mean)	Public hospital spending <sup>a</sup>	Public health spending	Social service spending	Education spending	Hospital community health services
Mean county values for:	Public hospital spending (\$ per capita)	Quartile 1 (low spending)	\$0	0	353	313	329	473
		Quartile 2			330	359	310	328
		Quartile 3	\$33	33	386	332	357	354
		Quartile 4 (high spending)	\$1415	1415	333	390	403	233
Public health spending (\$ per capita)	Quartile 1 (low spending)	\$9	102	9	50	79	81	
	Quartile 2	\$38		38	85	90	99	
	Quartile 3	\$91	104	91	110	115	113	
	Quartile 4 (high spending)	\$254	106	254	155	124	124	
Social service spending (\$ per capita)	Quartile 1 (low spending)	\$639	843	639	372	700	813	
	Quartile 2	\$814		814	611	748	844	
	Quartile 3	\$883	886	883	890	940	863	
	Quartile 4 (high spending)	\$1079	908	1079	1484	1042	945	
Education spending (\$ per capita)	Quartile 1 (low spending)	\$1630	1878	1807	1630	1277	1901	
	Quartile 2	\$1816		1835	1816	1610	1853	
	Quartile 3	\$1932	1871	1884	1932	1938	1900	
	Quartile 4 (high spending)	\$2148	1955	2039	2148	2694	1939	
Hospital community health service provision (#, 0-17)	Quartile 1 (low # services)	9.7	10.3	9.4	8.6	9.7	5.6	
	Quartile 2	10.1		9.9	10.1	10.1	10.0	
	Quartile 3	10.1	10.1	9.9	10.7	10.1	11.8	
	Quartile 4 (high # services)	10.1	9.1	10.8	10.3	10.1	13.7	

<sup>a</sup>Approximately 50% of all counties do not have spending for public hospitals. Therefore, there are only three groups when counties are grouped according to public hospital spending (quartiles 1 and 2 are combined).

The highest correlations were among public health, social services, and education and while the correlations were significant ( $P < .05$ ), the strength of the association was low ( $r < 0.4$  for all). However, with the exception of public hospital spending and hospital community health service provision ( $r = -0.12$ ), the correlations were positive for all variable pairs. Thus, means that higher baseline spending values were associated with higher baseline spending values in other categories.

Table 3 shows the correlation coefficients for changes in government spending and same-year changes in hospital community health service provision. As with the findings in Table 2, while several variable pairs had statistically

significant correlations ( $P < .05$ ), the magnitude of the correlation coefficient was very small ( $r = 0.12$  or less).

Table 4 shows a comparison of mean governmental spending and hospital community health service provision levels across quartiles for each variable. For example, we can see that counties with the lowest quartile of public health spending (quartile 1) spent \$9 on public hospitals, whereas counties with the highest quartile of public health spending (quartile 4) spent \$254. We can also compare spending for other categories for counties with high versus low spending in a given category. So, counties with the lowest hospital community health services provision (quartile 1) spent an average of \$473 per person per year, whereas counties with

**Table 5.** Regression Results for Changes in Local Government Spending as Predicted by Changes in Local Government Spending, and Community Health Services and Needs.

		Model 1: Public hospital spending	Model 2: Public health spending	Model 3: Social services spending	Model 4: Education spending
Government spending variables		Additional public hospital spending (\$ per capita)			
	Current year	—	0.01	0.01	−0.02
	1-year prior	0.50***	0.00	0.00	0.05
		Additional public health spending (\$ per capita)			
	Current year	0.13	—	0.22	0.03
	1-year prior	−0.07	0.81***	−0.13	0.16
		Additional social services spending (\$ per capita)			
	Current year	0.02	0.03	—	0.12***
	1-year prior	0.02	0.00	0.47***	0.04
		Additional education spending (\$)			
	Current year	−0.02	0.00	0.03**	—
	1-year prior	0.00	0.00	0.03**	0.18***
Community health services and needs variables		Additional hospital services (#)			
	Current year	1.59	0.21	−2.52	1.54
	1-year prior	3.32	0.23	−2.72	4.54
		Improvement in county health outcomes ranking (# spots within state)			
	1-year prior	−0.37	0.02	−0.18	0.29
		Improvement in county health factors ranking (# spots within state)			
	1-year prior	−0.55	0.05	−0.09	0.05
Control variables		Population (thousands)			
	Current year	−0.10	0.02	−2.80***	−5.41***
	1-year prior	0.11	−0.02	2.80***	5.43***
	Baseline public hospital spending (\$ per capita)	0.00	0.00	0.00	−0.02***
	Baseline public health spending (\$ per capita)	0.01	−0.05**	0.00	−0.04
	Baseline social services spending (\$ per capita)	0.00	0.00	−0.02	0.03
	Baseline education spending (\$ per capita)	0.01	0.00	0.01	−0.03*
	Presence of for-profit hospital in county	−10.65	−1.68	−0.97	−21.06*

Note. Models also controlled for state random effects and year-fixed effects. All models contained  $n = 1877$  counties.

\* $P < .05$ . \*\* $P < .01$ . \*\*\* $P < .001$ .

the highest provision (quartile 4) spent an average of \$233 per person per year. Values that correspond to the mean value for each quartile for each category (ie, mean education spending for quartiles 1, 2, 3, and 4) can be seen in the bolded diagonal cells and are bolded for ease of reference.

Regression models shown in Table 5 found that spending increases in each of the four spending categories were not uniformly associated with spending increases (or decreases) in other categories in the current year or 1-year prior.

For example, Model 1 shows that after accounting for all other variables in the model, each additional \$1 of local government spending for public hospitals 1-year prior was associated with an additional \$0.50 of local government spending for public hospitals in the current year ( $P < .001$ ). Changes in current- or prior-year spending for public health, social services, and education were not significantly associated with changes in current-year spending for public hospitals. Model 2 shows that each additional \$1 of local government spending for public health 1-year prior was associated with an additional \$0.81 of local government spending for public

health in the current year ( $P < .001$ ). Changes in current- or prior-year spending for public hospitals, social services, and education were not significantly associated with changes in current-year spending for public health.

Model 3 shows that each additional \$1 of local government spending for social services 1-year prior was associated with an additional \$0.47 of local government spending for social services in the current year ( $P < .001$ ). Changes in current- or prior-year spending for public hospitals were not significantly associated with changes in current-year spending for social services. Each additional \$1 of current- and prior-year spending for education were both associated with increases of \$0.03 in current-year spending for social services ( $P < .01$ ). Model 4 shows that each additional \$1 of local government spending for social services 1-year prior was associated with an additional \$0.18 of local government spending for education in the current year ( $P < .001$ ). Changes in current- or prior-year spending for public hospitals and public health were not significantly associated with changes in current-year spending for



education. Each additional \$1 of current-year spending for social services was associated with increases of \$0.12 in current-year spending for education ( $P < .01$ ).

A notable finding from the regression model shown in Table 5 is the persistence of spending increases across years. Specifically, for all four spending categories examined, an increase from baseline spending levels in Year 1 was always significantly associated with an increase from baseline levels in spending in Year 2, suggesting that when an increase in spending occurs, it can be seen persisting for at least one additional year beyond the year in which it was made. It does not imply that an increase in 1 year is followed by an additional increase in Year 2 above and beyond the initial Year 1 increase.

## Discussion

Empirical evidence suggests that governmental spending on community health and hospital provision of community health services can each independently strengthen health outcomes. Movement toward an approach to improving the health of the United States through contributions from multiple sectors suggests that some level of public-private collaboration, cross-governmental sector collaboration, or centralized strategic community planning is necessary. To date, evidence is mixed regarding whether such inter-related work occurs within communities.<sup>10,14,37,49</sup> This study found evidence that can potentially add clarity to some of the unresolved questions at the nexus of resource allocations across U.S. counties.

Increases above baseline local government spending for hospitals, public health, and social services were not associated with concurrent or future increases in local governmental spending for other categories. Findings showed no evidence to support the hypothesis that governmental spending followed isomorphic patterns where agencies were able to successfully emulate spending increases enjoyed by other governmental agencies within their own community.

Rather, spending increases in each separate category were significantly associated with future increases in spending for that same category. Results showed that not only are spending increases in governmental spending (across all four categories examined) and hospital provision of community health services sustained over a period of multiple years but also an increase in any given year is associated with a higher likelihood of seeing another increase in subsequent years. In other words, funding increases in one area seem to persist in that same area in future years. Significant single-sector increases in 1 year were not found to be wiped away by decreases in subsequent years as would be the case if the single-year increase was due to things such as one-time payments or spending related to unforeseen events such as natural disasters.

Empirical findings were more in line with the study's hypothesis that government agencies will work independently

to maximize their resources under constrained/global budgets.<sup>36,42</sup> However, the second portion of this hypothesis posited that changes in changes in health market resources munificence of local resources would accompany changes in governmental spending.<sup>10,43</sup> Given that none of the community health services and needs variables were significant in any of the models, there was not uniformly clear evidence to support the entirety of Hypothesis 2.

There was no evidence that changes in public and private community and health care resources followed isomorphic patterns across sectors within a community (Hypothesis 1). Instead, communities tended to consistently increase spending for only a single sector. This may suggest various underlying mechanisms: "scale up" resources for additional public or private contributions toward community health tend not to be naturally allocated across multiple sectors; public and private actors may formally or informally align resources with community needs, scaling up strategically only in a single sector; public actors work under constrained global budgets that more commonly result in single-sector increases.

About the only thing that models found were consistently and significantly associated with changes in current-year government spending for specific health or social service categories were changes in prior year spending for that same category. It is reasonable to interpret that this may point to a persistent strategic focus from counties that emphasizes and prioritizes for funding only specific health or social services. This means that funding decisions for public hospitals, public health, and social services were made in more one-off fashion rather than through a multi-sector approach might suggest.

An optimistic interpretation of findings is that increases in one spending category are not accompanied by decreases in other categories. This is important given that previous research has shown that when funding streams change, trade-offs do occur that can lead to reductions in overall funding levels available.<sup>46,60</sup> A pessimistic interpretation of findings is that, to the extent that multi-sector approaches are optimal for efficiently improving the health of a community, local governments do not naturally tend to increase resources synergistically across multiple health and social service categories within a 1- to 2-year period. Multi-sector efforts where only one sector receives additional funding may not be ideal models for sustainable collaborative initiatives.<sup>32,61</sup> This short-term focus is especially relevant if short-term contributions are expected from multi-sectors at or near the same time.<sup>12</sup> Exploration of long-term changes in spending may be warranted to determine whether long-term changes occur beyond those observed in the first 1- to 2-year period. Given the difficulties in causally mapping long-term changes using nation-wide data such as that used here, alternative approaches such as case studies of selected communities or regions, qualitative methods, and or quasi-experimental study designs could make important contributions to this line of inquiry.

The study's hypotheses were based on an emerging body of evidence that links spending with outcomes and that suggests spending across a range of sectors is important for improving health.<sup>7,8,15</sup> A separate possibility not specifically examined here is the potential for achieving better health through multi-sector coordination and improved cross-sector efficiencies between sectors. Previous research has shown that multi-sector partnerships within communities can contribute to reductions in preventable mortality.<sup>14</sup> Yet, there currently are relatively few examples of robust, multi-sector partnerships that have emerged.<sup>17</sup> This study may suggest a reason for the infrequent emergence of such partnerships—that funding increases, at least at the local level, do not tend to occur simultaneously or strategically across sectors.

### Limitations

This study's findings should be viewed in light of several important limitations. First, data only reflect spending by local governments (ie, counties, cities, and municipalities). Unfortunately, state and federal data are notoriously difficult to disaggregate to the county level and were thus not available for this analysis.<sup>46</sup> One conceivable scenario would be that increases in local spending for one category complement increases in state or federal spending for other categories. However, this would be far less likely for education (given the large proportion of education spending, that is, from local sources), and models for education spending were largely consistent with other models. Second, AHA data measure only the presence or absence of services, not the intensity or quality of services. Community benefit spending data would be a valuable additional measure, but unfortunately, spending is often measured at the health system level and is not able to be disaggregated to specific hospital facilities and communities. Future work to explore whether changes in service quality or intensity is associated with spending changes may be warranted. Third, the study included data stretching through the Great Recession and American Recovery and Reinvestment Act (ARRA). Findings may not generalize to other periods, although the relationship of interest was principally related to whether spending changes occur alone or in tandem and it is unclear whether either of these would result in changes to that relationship. Fourth, due to limited overlap of datasets, exploration of longer lag periods was not feasible. It is possible that more or different patterns of covariance may appear across spending categories in subsequent years. As additional data years become available, further exploration of long-term trends may be valuable. Finally, this study used rich data sources to measure government spending and hospital provision of community health services, but similarly robust measures of the contributions of other organizations in a community were not available.

### Conclusions and Implications

Despite its limitations, this study presents important evidence regarding government and hospital resources that contribute to the health of a community. While there is increasing recognition that improving health outcomes requires concerted efforts—and therefore funding—across many sectors, there is little evidence to suggest that communities that invest in public hospitals, public health, or other social services will automatically see commensurate increases in the other area. Nor is there evidence that hospitals tend to scale up the provision of community-focused services following increases in government investments. Instead, communities tended to consistently see increases in only a single sector. The underlying causal mechanisms of allocation decisions are not clear but may reflect strategic decisions within a community to scale up single sectors, constrained resources for multi-sector scale up, or a host of additional factors not measured in the current study.

One important takeaway is that there does not appear to be a clear natural tendency toward concurrent increases in investments in multiple sectors by local governments. Multi-sector collaboration has proven effective at improving health outcomes and is, therefore, a desirable outcome. Yet, multi-sector initiatives to health outcomes require funding across sectors. Identification of barriers and facilitators to balanced investments is a key priority. Leveraging a novel data source that enables annualized tracking of local government spending, there was little evidence to suggest that communities that invest in one category do so in others. There does not appear to be a natural tendency toward multi-sector investments by local governments in pursuit of improved population health.

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