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Abstract: The US spends two times more than the OECD average in health expenditure but has a much smaller portion of public health spending to total health expenditure than other OECD countries. While it has been suggested that public health and social services spending is crucial to promoting health outcomes, less is known about what drives variations in public health expenditure across regions. This study aims to examine whether fragmented structure of local governance is associated with variations in public health and social services expenditures. Using the US Census of Governments, we constructed a panel dataset of political fragmentation and local government spending patterns (1997-2012) for 792 US counties (population > 60,882, top 25%) and employed Least Squares Dummy Variable (LSDV) and Generalized Estimating Equations (GEE) models. We found that per capita public health spending tended to be smaller in areas where the degree of political fragmentation was higher (Coef: -0.034; $p < 0.01$), particularly when general-purpose governments were more fragmented (Coef: -0.087; $p < 0.001$). The proportion of public health spending decreased when local governments were more fragmented (Coef: -0.012; $p<0.001$). Social services expenditures and their proportions to total government expenditure fell with an increase in the degree of political fragmentation. Our findings suggest that fragmented governance settings, in which localities are more likely to face competition with others, may lead to a reduction in public spending essential for population health and that political fragmentation can also have a deterrent effect on broader categories of health-related social services spending.

Keywords: Political Fragmentation, Health Expenditure, Social Services Expenditures, Leviathan Hypothesis, Public Finance

1. Introduction

Decades of research suggest that underinvestment in public health infrastructure can be a significant barrier to promoting population health [1]. Empirical studies provide evidence that health and social services expenditures in public sector have a beneficial impact on health outcomes among OECD countries [2–7]. The importance of public health expenditures in developing counties has also been underscored in the literature [8–10]. While economic development has been found to be closely associated with health spending increases, substantial variation exists in health spending patterns and financing systems among countries [8].

Similarly, a growing body of empirical studies has paid attention to local (e.g., county-level) public expenditure patterns to examine whether variations in public health spending are associated with health outcomes [11–13]. It has been suggested that public investment in community health should be considered a resource that can contribute to improving population health and shape variations in health outcomes and health disparities [14]. An increase in expenditure of Local Health Department (LHD) is associated with decreases in mortality from preventable causes of death such as cardiovascular diseases, diabetes, and cancers, and decreases in infectious disease morbidity [12, 15]. An increase in specific LHD spending such as Mother and Child Health (MCH) is negatively associated with low birth weight rates, particularly in the counties with high poverty concentrations, indicating the beneficial role of the investment [16]. Marton and colleagues analyzed per capita public health spending with a focus on General Grant-in-aid (GGIA) funds, which were allocated to county health departments in Georgia and found that an increase in public health expenditures was associated with decreases in deaths due to heart disease, cancer, diabetes, asthma, and early death [17].

A more recent study used longitudinal data from the US Census Bureau (2010-2015) and showed that increased health and social services expenditures were associated with the County Health Rankings (2012-2015) [13]. In other words, public investment in both health and non-health sectors can have a significant, positive impact on health outcome indicators. Furthermore, a beneficial association between non-health investment in public sector and health outcomes has been found in some state and county-level studies. Bradley and colleagues, for instance, used the ratio of social and public health spending to Medicare and Medicaid spending and reported that the states with a higher ratio of public health and social services expenditures had better health outcomes in terms of mortality rates, asthma, adult obesity, and type 2 diabetes [3].

Yet, little is known about what drives variations in public health and social services expenditures across US counties. A handful of studies gauged the extent of the variation in public spending and reported more than twofold differences in health spending across the country [18–21]. A limited number of studies attempted to identify potential determinants of variations in the expenditure of LHD. Gordon and colleagues found a non-linear relationship between population size and health spending by LHD [21]. They showed that the spending size is largest when county population is between 190,000 and 250,000. Other determinants may include political dynamics, economic conditions, and population characteristics [22, 23]. Communities with more vulnerable populations such as low socioeconomic groups or racial/ethnic minorities may allocate more financial resources to health promotion and disease prevention [18, 22].

Additional insights into the variations in public expenditure can be obtained from studies in other disciplines. Public choice scholars have suggested that the size of expenditure is largely shaped by the way local governance structure is organized, especially the degree of political

fragmentation. Building on the Leviathan hypothesis by Brennan and Buchanan [24], advocates of public choice theory underscore the importance of "competition" among governmental units which can be promoted in a less monopolistic setting. They claim that interjurisdictional competition can serve as a constraint on revenue-maximizing government agencies that otherwise tend to expand their revenue. In a more fragmented environment, for instance, a larger number of jurisdictions (e.g., cities and towns) within a county are more likely to lead to a higher level of fiscal efficiency and provide more alternatives for their taxpayers' residential location choice [25]. In contrast, a monolithic setting (with a fewer number of cities or towns) may allow a government entity to act as a Leviathan operating in a less efficient manner and use its dominant power to expand tax revenue and spending [26, 27].

The Leviathan hypothesis has been tested by a considerable number of empirical studies which are not unequivocal about the patterns of association between fragmented governance structure and public spending. Some studies have reported evidence supporting the hypothesis. For instance, Schneider counted the number of suburbs in a metropolitan area to measure political fragmentation and examined the relationship between fragmentation and growth of expenditure size by local governments during 1972 and 1977 [27]. He found a negative association between political fragmentation and expenditure size assumed to indicate an improved fiscal efficiency in a more fragmented setting. Eberts and Gronberg used similar count metrics and showed that more general-purpose governments were negatively associated with local government spending supporting the argument of a fiscal benefit that can arise with a larger number of government units [28, 29]. Other scholars have also reported such a relationship between governance structure and public expenditure using various analysis methods and data sources [25, 26, 30, 31].

However, some other studies suggest that political fragmentation may not necessarily increase fiscal efficiency [28, 30–32]. Rather, a more consolidated governance setting can be more advantageous, as it allows economies of scale through which more units of public service can be produced on a larger scale by reducing per unit cost. Moreover, overlapping local governments in a fragmented governance setting may provide the same services repeatedly, leading to potential inefficiencies in public service delivery [33, 34]. For instance, Zax applied the density of local government units (the number of government units per 1,000 residents) as a measure of political fragmentation and reported that the density of single-purpose governments was positively associated with local government spending [31]. Eberts and Gronberg also found some contradicting results when they used single-purpose governments to assess the association between fragmentation and spending [28]. Similar patterns of the relationship between the structure of single-purpose governments and public spending were detected in some subsequent studies [35–37].

The primary focus of this study is on the association between political fragmentation in local governance and public spending for population health. First, we examine the impact of political fragmentation on per capita public health expenditure and the proportion of public health expenditure to total expenditure to better understand the mechanisms behind the variations in public health spending. Then, we expand our analysis to investigate how fragmentation may influence social services expenditures, including housing and community development, parks and recreation, fire and police protection, and public welfare, as they reportedly have a substantial impact on population health.

2. Methods

2.1 Data

We retrieved the government census data from the government finance statistics. The data consist of the four census years 1997, 2002, 2007, and 2012. The US Census Bureau provides data files on historical finances of individual government units which include expenditures for detailed categories. The gross amount of public health expenditures for a county was calculated by summing up the amounts of relevant expenditures from the county government, cities/towns, and all other agencies within the county. These include spending on public health administration, general health activities, health related inspections, community health programs, treatment and immunization clinics, environmental health activities, and animal control, but do not contain hospital expenditures, such as financing, maintenance, hospital operation, and provision of hospital care. Government expenditure data comprise the amounts that each government entity spent in the fiscal year in current dollars, which are unadjusted for inflation. We converted these expenditure values from current dollars to constant dollars of 2012 using the Consumer Price Index (CPI) information provided by the US Bureau of Labor Statistics (BLS). Through the same procedure, we prepared county-level expenditure data for other categories, including housing and community development, parks and recreation, fire and police protection, and public welfare, to investigate how spending on these social services is associated with political fragmentation. For control variables, we employed demographic and socioeconomic variables that represent local characteristics and may contribute to variations in public expenditures such as median household income, poverty rates, population size, population density, percent of African Americans, percent of Hispanics, and the share of votes for

Republican candidates in presidential elections at the county level. The variables were extracted from the US Census Bureau, the US Bureau of Labor Statistics, and the Centers for Disease Control and Prevention (CDC).

2.2. Metrics of Political Fragmentation

In order to measure the extent of political fragmentation, we utilized a count metric, which has been widely used in the literature concerning local and regional governance structure and its implications [30, 31, 35, 38]. More specifically, our main governance indicator is the number of government units per 1,000 residents in each county [37]. Although no single metric can enable us to consider the full extent and details of complex governance systems, this measurement approach is expected to capture how the degree of political fragmentation varies across counties and allow us to examine the association between fragmented structure of local governance and health-related public spending patterns. Additionally, we measured fragmentation of general-purpose governments, single-purpose governments, and their ratios to analyze how different patterns of political fragmentation are associated with public health spending. We analyzed the trend of these fragmentation metrics from 1997 to 2012 and found little increase in the number of local government units as the incorporation of new government entities mainly occurred in the 1970s and 1980s due to rapid government restructuring, population growth, and urban sprawl at that time [39]. However, we found that rural areas with smaller populations tended to exhibit a higher level of fragmentation than urban counties due to low population density. In order to focus on urban areas, our sample includes 792 counties that had at least 60,882 residents in 2012 (e.g., the top 25% in terms of population size).

2.3 Statistical Methods

We employed the Least Squares Dummy Variable (LSDV) regression model to assess how political fragmentation is associated with county-level spending patterns, using SAS Enterprise Guide (ver. 7.1). In the model, we included state indicators to control for substantial inter-state variation in spending patterns which has been reported in the literature. In addition, we applied Generalized Estimating Equations (GEE) with an exchangeable correlation structure that showed the smallest QIC statistics in our test. GEE allowed us to check the robustness of the LSDV regression results, as it accounts for unidentified community characteristics that would be correlated [40].

3. Results

3.1 Per Capita Public Health Expenditure

In our sample counties, the mean value of public health expenditure per capita was $119 over the four government census years (Table 1) increasing from $102 in 1997, to $124 in 2002 and $126 in 2007, but declining to $122 in 2012 perhaps due to the economic recession after 2008. If all other counties with small populations were included, per capita public health spending would decrease to $94, implying higher per capita spending in more populated and urbanized counties. On average, counties in Michigan spent the largest amount in per capita public health spending ($328) followed by California ($271) and Wisconsin ($225).

[Table 1] – Here

The results of LSDV models showed that per capita public health spending tended to be smaller in areas with a higher degree of political fragmentation (Coef: -0.034, $p<0.01$) (Table 2). When consideration was given to general-purpose and single-purpose governments separately, we found that per capita public health spending dropped further if general-purpose governments were more fragmented (Coef: -0.087, $p<0.001$), while the structure of single-purpose governments showed an insignificant effect (Coef: 0.0004, not significant). The coefficient of -0.087 implies that per capita public health spending falls approximately by $87 on average if the number of general-purpose governments per 1,000 residents in the county increases by one unit, controlling for median household income, unemployment, poverty, and other covariates. This result indicates an individual in a more fragmented setting of local governance would benefit less from public health expenditures.

The estimated effects of control variables provide valuable insights into what drives variations in local public health spending. In particular, we found that unemployment rates (Coef: -0.005, $p <0.001$) and poverty rates (Coef: 0.002, $p<0.05$) were significantly associated with per capita public health spending. These findings suggest that local economic conditions, captured by these two variables, can shape the expenditure patterns substantially. Per capita public health expenditure was larger in central counties (Coef: 0.024, $p <0.01$) than in outlying ones. In contrast, the share of votes for Republican candidates in presidential elections was negatively associated with per capita public health spending (Coef: -0.106, $p<0.01$). We used population size and population density to examine whether or not public health spending varies with the extent of urbanization but found no significant linear relation.

3.2 Proportion of Public Health Expenditure to Total Expenditure

On average, the proportion of public health expenditure to total expenditure is the highest in Michigan (7.3%), followed by North Carolina (5.3%) and Ohio (4.7%). For all our sample counties, the average proportion is 2.6%, which is smaller than police protection (4.6%), and public welfare (2.9%), but larger than fire protection (2.4%), parks and recreation (1.9%), and housing and community development (1.8%) (Table1). Consistent with the results for per capita public health spending, our statistical analyses indicate that the proportion of public health spending decreases if all local governments are more fragmented (Coef: -.0.012, $p<0.001$) and decreases further with fragmentation of general-purpose governments (Coef:-0.018, $p<0.01$) (Table 2). These findings suggest that localities in a more fragmented setting tend to allocate relatively fewer financial resources to public health spending.

Similar to the patterns of per capita public health spending, the proportion of public health expenditure to total expenditure appears to be higher in the counties with lower unemployment rates (Coef: -0.001, $p<0.001$) and higher poverty rates (Coef: 0.0005, $p<0.05$). Unlike per capita health spending, we found a significant negative association between median household income and the proportion (Coef: -0.012, $p<0.01$). The result may imply that economically distressed communities tend to allocate more financial resources to health promotion perhaps due to an increase in the demand for public health services, while more affluent communities tend to reduce the share of health expenditure relative to total expenditure given their residents' better access to private healthcare [18]. As in the case of per capita expenditure, the proportion of public health expenditure was larger in central counties (Coef: 0.003, $p<0.05$) and areas where the share of votes for Republican candidates in presidential elections was lower (Coef: -0.114, $p <0.01$). This result corresponds to a recent study that

reported a significant association between the allocation of government expenditures and the party affiliation of governors [41].

[Table 2] – Here

3.3 Social Services Expenditures

We examined whether fragmentation is associated with other types of expenditures that may contribute to population health, including housing and community development, parks and recreation, fire and police protection, and public welfare (Table 3). The results showed that most of these social services expenditures decreased if the structure of local governance was more fragmented. Furthermore, consistent with public health expenditure patterns, the proportions of these expenditures, except public welfare, had negative associations with political fragmentation. These findings suggest that individuals residing in a more fragmented county may not receive the same benefit from the social services spending, as well as public health expenditure, and the reduced spending may be associated with interjurisdictional competition that is likely to arise in a fragmented setting [42].

[Table 3] - Here

4. Discussion

This study examined whether a more fragmented governance setting promotes a reduction in health and social services expenditures. With a focus on public health expenditure patterns among the US counties with a population ≥ 60,882, our analysis showed that both public health expenditure per capita and the proportion of public health expenditure to total expenditure fell with an increase in the metric of fragmentation. We also found evidence that a higher degree of political fragmentation can have a deterrent effect on some other health-related categories of public spending, such as those for fire/police protection and housing and community development.

The negative association between fragmentation and health and social services expenditures deserves attention, as it highlights the importance of institutional settings. One could view less expenditure as a sign of fiscal efficiency due to competition among jurisdictions which is the focus of the Leviathan hypothesis. From a social justice perspective, however, such an expenditure reduction can pose significant challenges. Political fragmentation may motivate local governments to focus on development projects rather than expanding their spending on health and social services [43]. This trend can put public health at risk and further deteriorate the well-being of residents, particularly those who have limited resources.

A reduction of government spending in public health would limit the ability of local public agencies to effectively perform its fundamental services such as monitoring health status among residents, identifying health problems, facilitating health education and collective actions on public health issues, providing community-wide health activities and programs, and enforcing public health laws and regulations [18]. This is particularly true for some targeted health and social services by local health agencies that are crucial to taking care of marginalized groups, especially in counties with high poverty concentrations [14]. Thus, a reduction in health and

social expenditures can provoke significant adverse effects on health status of the disadvantaged population, who would have been most likely to benefit from public expenditures [12, 16, 44, 45]. Some recent studies provide evidence that increased fragmentation of governance is associated with racial segregation and widening mortality disparities between African Americans and whites [46–48].

Equally important is public spending on broader social services, which is found to be associated with political fragmentation. Public investment in education can bring a positive effect on health promotion [49–51]. Likewise, spending on parks and recreation may positively influence health status among residents by improving walkability and other dimensions of the built environment [52]. More so, spending on police protection or correction is essential for reducing crime rates (e.g., assault and homicide), which substantially contribute to improving neighborhood health, while more attention should be paid to the issues of police brutality and excessive use of force[53–58]. Public spending is also essential for family planning, nutrition support, and treatment program for pregnant women and infants. [16].

Building on the findings of this study, future research may adopt a more holistic framework connecting governance structure, public spending patterns, and detailed health outcomes altogether. In addition to the count and ratio metrics, future studies may employ other indicators of governance structure to better capture the multi-dimensional, scale-dependent nature of local and regional governance [29, 59]. Case studies would also enable one to gain a more nuanced understanding of the connections by narrowing the scope down to some states or regions with a high level of political fragmentation or limited health spending. In addition, it would be of great interest to examine how various forms of fragmentation in the domain of public health may influence the ability of local agencies to respond to public health risks.

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