

## The Provision of Clinical and Non-Clinical Maternal and Child Health Services: Does Public Health Joint Production Matter

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### Research Article

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### Abstract

**Objectives:** To examine the association of public health delivery systems (PHDS) joint production and maternal and child health services (MCH).

**Methods:** We used a longitudinal retrospective cohort research design to examine the association of PHDS joint production and MCH services. We used social network measures, degree centrality, to characterize the PHDS in two categories of joint production. We also used a one-way analysis of variance to examine the association of PHDS joint production and clinical and non-clinical MCH services that promote healthy maternal behaviors. The study examined PHDS that experienced changes in joint production from 2006 to 2012.

**Results:** The findings suggest that changes in PHDS joint production are associated with MCH services. PHDS with high levels of joint production provided a broader scope of non-clinical MCH services (i.e. tobacco control, injury prevention, and adult immunizations) compared to PHDS with limited joint production.

**Conclusion:** We found that our method for identifying PHDS joint production was effective and that PHDS joint production is associated with the provision of clinical and non-clinical MCH services. PHDS with high levels of joint production are more likely to achieve the Healthy People 2020 goal to adopt healthy behaviors such as effective use of contraceptives to reduce the transmission of STDs, a reduction in injuries, and proper immunization.

**Keywords:** Maternal and Child health; Public health delivery systems; Social network analysis and Local health departments

### Background

Despite major advances in medical care, critical threats to maternal, infant, and child health exist in the United States [1]. Among the nation's most pressing challenges

are reducing infant mortality, which in 2015 was 5.82 deaths per 1,000 live births [1]. One approach for addressing the pressing challenge of reducing the infant mortality rate is optimizing the health of the mother prior to and during pregnancy to create the best opportunity

for a fetus to develop in a healthy manner [2]. When a woman can achieve wellness prior to and during pregnancy, the risk of infant mortality is reduced (Shapiro-Mendoza, et al., 2016). For many decades local health departments (LHD) have been instrumental in optimizing women's health by providing clinical and non-clinical maternal and child health (MCH) services. However, budget cuts to have forced 21 percent of LHDs reduced or eliminated maternal child health programs which limit their ability to address the health needs of vulnerable populations, women and children [3]. To minimize the effects of program and service cuts, LHDs have begun to develop public health delivery systems (PHDS) to enhance coordinated efforts aimed at improving maternal and child health. However, LHDs have faced many challenges in developing and sustaining collaborative capacity over the last decade [3].

A few challenges are how to develop and maintain collaborations in light of changes over time including changes in relationships through joint production, limited staff to provide clinical services, and the reduction in clinical MCH services. One possible approach to addressing the challenges may be to study the changes of LHD joint production (i.e. ability to perform services with other organizations) to enhance and coordinate services targeted at assuring healthy women, infants, and children through PHDS. PHDS include public and private organizations that contribute to the delivery of public health services for a given population. The inter-organizational theory is useful for studying collaborative efforts of PHDS by examining how organizations work together to provide MCH services [4,5]. It suggests that studying and understanding PHDS may lead to a more comprehensive and coordinated approach to addressing complex issues beyond a single organization's domain [4,6]. Additionally, the theory suggests that defining a useful foundation for understanding and mobilizing PHDS enhances the ability to address a range of public health issues, such as infant mortality. By working together, PHDS may be able to provide a comprehensive coordinated approach and useful foundation to increase the reach of clinical and non-clinical services to optimize the health of women prior to and during pregnancy.

The existing literature provides some evidence of the benefit of PHDS. For example, a recent study found that PHDS varied widely in organizational structure but offer a broader scope of services and engage with a wider range of organizations [7]. Another study found that partnerships among public health systems were a partial mediator between resources and service provision [8]. In

a mediating role, these partnerships reduce differences in service provision among rural, suburban, and urban LHDs [8]. Also, a few studies have suggested that joint production, or collaboration through PHDS, is motivated by cost reduction and resource scarcity [11,12]. Taken together, these studies suggest that joint production is a strategic way of acquiring the appropriate skills and resources needed to deliver maternal and child health services to vulnerable populations such as women and children. Research has focused mainly on collaboration processes, interactions, and health outcomes and less on how joint production over time may influence their ability to deliver superior maternal and child health (MCH) services. It is important to understand that PHDS joint production cannot be measured by partnerships alone but there is a need to understand the mutual responsibilities and benefits of working collaboratively to deliver both clinical and non-clinical MCH services.

We used a social network measure, degree of centrality, to understand the relationship between PHDS joint production and clinical and non-clinical maternal and child service provisions. Degree centrality is the number of organizations that jointly produce services. Therefore, we hypothesized that joint production is associated with a broader scope of maternal and child health services. The current study tests this hypothesis by examining PHDS joint production, defined by degree centrality, association with clinical and non-clinical MCH services.

## Methods

We used a longitudinal retrospective cohort research design to examine the association of structural changes in PHDS and MCH services. We used a social network measure to characterize PHDS joint production in two categories of change, high levels of joint production and a limited joint production. We also used a one-way analysis of variance to examine the association of PHDS joint production and the provision of MCH preventive services.

## Data Sources and Samples

We used survey data from two waves (2006 and 2012) of the National Longitudinal Study of Public Health Agencies (NLSPHA), which was conducted to identify organizational and operational characteristics of PHDS [10]. The NLSPHA asked LHD directors to indicate the 20 public health activities performed in their jurisdiction and the type of organizations, other than the LHDs, that contributed to each of those activities. LHDs were members of the public health delivery system, serving populations of at least 100,000 people in all but four

states. We obtained additional data to further characterize the LHDs, the population they serve, and the communities in which they are located from the 2005 and 2013 National Association of County and City Health Officers Profile Studies [3] and the 2006 and 2011 Area Resource Files [11]. We included all LHDs that responded to both waves of the NLSPPA in the sample for this study (N=239).

## Measures

We used data from the 2006 and 2012 National Longitudinal Study of Public Health Agencies (NLSPPA) to examine the association of changes in PHDS joint production and MCH services. MCH services included clinical and non-clinical services that promote healthy maternal behaviors. The study examined the characteristics of PHDS that experienced changes joint production from 2006 to 2012.

Social network measure, degree centrality, was calculated for each of the 239 public health delivery systems. Degree centrality (i.e. joint production) describes the degree of PHDS coordination [12]. It is calculated by summing the number of connections that a particular organization has with all other organizations and dividing by the total number of organizations in the delivery system then subtracting one [28]. For this study, we used the number of organizations reported by LHDs on the NLSPPA to determine PHDS degree centrality. Degree centrality values can range from 0 to 1, with a higher value representing a more centralized PHDS [12]. First, PHDS degree centrality was calculated to identify the number of organizations in each PHDS and joint production in the PHDS. Next, we assessed the variation in PHDS joint production, each of the PHDS was classified according to two categories of change. The categories are high levels of joint production and limited joint production. Then, PHDS were stratified based on whether or not the system migrated from one category to another from 2006 and 2012. Next, statistical analysis was performed using SAS 9.2. Differences between groups were assessed by one-way analysis of variance (ANOVA) [13,14]. P values of <0.05 were considered significant. We examined changes in the provision of clinical and non-

clinical MCH services, local health department characteristics, and population characteristics.

## Results

### Similarities and Differences among PHDS

PHDS joint production decreased slightly in 2012 (14 percent) compared to 2006 (15 percent). Next, PHDS were more likely to have limited joint production and partners (n=131) than high levels of joint production (n=108) from 2006-2012. Delivery systems, among LHDs and other organizations, are essential for developing and promoting sustainable programs that target the needs of the community [15]. Last, (Table 1) shows clinical and non-clinical MCH services, population characteristics, and LHDs characteristics are very similar across the two categories. PHDS with high levels of joint production provided a larger number of clinical MCH services (i.e. primary care, obstetrics, and prenatal care) compared to PHDS with limited joint production. PHDS with limited joint production provided a statistically significantly higher amount of non clinical MCH services such as diabetes screenings, injury prevention, and STD screenings compared to PHDS with high levels of joint production. Also, PHDS with limited joint production serve a larger population with a lower income per capita than PHDS with high levels of joint production. PHDS with high levels of joint production offer a broader scope of clinical MCH services such as primary, obstetric, and prenatal care and immunizations compared to PHDS with limited joint production. The findings suggest joint production among PHDS is associated with an increase in the provision of clinical MCH services and these PHDS are more likely to optimize the health of the women prior to and during pregnancy. However, PHDS with limited joint production offered a broader range of non-clinical prevention MCH services that may improve women's health behaviors prior to and during pregnancy. These results demonstrate the importance of classifying PHDS joint production and examining clinical and non-clinical MCH services to highlight how changes in joint production are associated with the provision of clinical and non-clinical MCH services.

Variables	Limited Joint Production (n=131)		levels of joint production (n=108)	
	Mean(SD)	P-Value	Mean(SD)	P-Value
Scope of Maternal and Child Preventive Services				
Clinical				
Primary Care	.01 (.10)	<.001	.26(.48)	<.001

Obstetrics	-	-	.01(.11)	0.32
Prenatal care	.02(.14)	<.001	.47(.53)	<.001
Childhood immunization		<.001	1(0)	<.001
Adult Immunizations	0.04	0.2	.96(.24)	<.001
Non-Clinical				
Well-Child Visit (WIC)	.02 (.14)	-	.03(.17)	0.083
Cardiovascular Disease screenings	.50 (.50)	<.001	.49(.53)	<.001
Diabetes screenings	0.74	<.001	.49(.50)	<.001
Tobacco Control	.59(.61)	0.182	0.8	0.36
Injury prevention	.97(.14)	<.001	.54(.53)	<.001
STD screenings	.24(.42)		0.15	0.22
Population Characteristics				
Percent of Non-White	.30(.19)	<.001	.31(.19)	<.001
Number of Uninsured	14.21	<.001	14.51(3.82)	<.001
Income Per Capita	\$34,255	<.001	\$49,338.50	<.001
Population	699,425	<.001	1,653,933	<.001
Local Health Departments Characteristics				
Full-Time Employee	49.22(28.19)	<.001	48.66(28.73)	<.001
Expenditures Per Capita (log)	3.67(.76)	<.001	3.84(.69)	<.001

Note: LHD = local health department.  
232 for 2006, and 239 for 2012.

\*P < .05; \*\*P < .01.

Table 1: Characteristics of Public Health Delivery Systems Joint Production and Maternal and Child Health Services.

## Discussion

There was a significant difference in the provision of clinical and non-clinical MCH services between groups. Specifically, PHDS with high levels of joint production were significantly more likely to offer a larger scope of clinical MCH services (i.e. primary care, prenatal care, and adult immunizations) compared to PHDS with limited joint production. Two of the top five causes of infant mortality are premature birth and low birth weight which is linked to prenatal care [20]. Primary care is very instrumental in improving maternal health and increasing awareness of birth spacing, which is directly linked to premature birth [20]. Adult vaccination during pregnancy likely provide direct fetal and infant benefits and prevent adverse outcomes such as congenital anomalies, preterm birth, and low birth weight [21]. Healthy People 2020 include the goal, "Increase the proportion of pregnant women who receive early and adequate prenatal care and

increase the proportion of women receiving preconception care services [1]. This goal is likely to be reached by PHDS with high levels of joint production. Additionally, PHDS with high levels of joint production offer a smaller scope of non-clinical MCH services, served a larger population with a larger income per capita compared to PHDS with limited joint production. The findings suggest PHDS with high levels of joint production may not have a high demand for non-clinical MCH services because they serve a population with a larger income per capita.

## Conclusions and Limitations

This study offers important contributions to the literature; however, there are important limitations that affected the external validity, particularly generalizability. First, the sample size is small. The quantitative data only examines 239 LHDs (<10%) across the nation's 2,565

LHDs that participate in the 2010 NACCHO profile study. However, the findings in this study are similar to those in a recent NACCHO report that indicated larger systems with full capacity offer a larger scope of clinical services [24]. Second, degree centrality is not the only social network measures that can be used to examine PHDS joint production. However, degree centrality measures the number of partners jointly working together. Degree centrality describes the extent to which the cohesion is organized (joint production) around a particular focus point (maternal and child health) [24]. Further research is needed to assess their use in the examination of PHDS and the systems' capacity or approaches to meeting population needs. Third, LHDs were members of the public health systems, serving populations of at least 100,000 people. The NLSPHA does not examine rural agencies where communities may depend more on clinical and non-clinical MCH services. However, rural LHDs face significant challenges in providing adequate maternal and infant health care due to unequal distribution of resources [18]. Lastly, the scope of non-clinical maternal and child services is limited to services that encourage healthy behaviors for maternal age and pregnant women. However, early identification of unhealthy behaviors, such as tobacco use, unsafe sex, and inadequate nutrition and unhealthy weight among women, may prevent infant death or disability and enable children to reach their full potential [19]. More research is needed to evaluate the effectiveness of these delivery systems on maternal and child health outcomes.

### Implications

The recent LHD budget cuts have resulted in a cut or elimination of essential public health services and programs [22]. A NACCHO study indicated that maternal and child services and programs are among the most vulnerable to LHD cuts [22]. Previous studies have suggested that public health partnerships put the well-being of a community into greater focus with overall goals to improve health outcomes despite budget cuts [4]. While previous studies have focused on the public health partnerships among PHDS and budget cuts, limited research has been done to characterize and examine changes in PHDS joint production, and determine how these factors are associated with the delivery of clinical and non-clinical services aim to improve the health of vulnerable populations such as women and children. The empirical method used in this study characterizes and examines PHDS joint production association with the provision of clinical and non-clinical MCH services. The study findings suggest that PHDS joint production is

associated with the provision of clinical and non-clinical MCH services. Our study's findings illustrate the complexities of PHDS joint production association with clinical and non-clinical MCH services. It is likely that the limited knowledge about PHDS joint production may limit the LHD's ability to provide essential clinical and non-clinical public health services and programs that improve population health. Research is needed to determine the level of joint production PHDS need to improve MCH outcomes and reduce variation in PHDS joint production overtime that may negatively impact MCH outcomes.

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