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Research Article

Improving Health System Performance in a Decentralized Health System: Capacity Building in Pakistan

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CONTENTS

Abstract—Key policy questions on decentralization in health relate to whether and in which ways health sector decentralization can improve health outcomes. Focusing on a maternal, neonatal, and child health program in Pakistan, this study examines relationships between three dimensions of decentralization: the degree of local decision-making choice ("decision space"), individual and institutional capacities, and local accountability. Additionally, these relationships are examined at two points in time to assess whether "capacity building" interventions, as well as any changes in decision space, are related to improvements in health sector performance as measured by improved administrative processes and indicators of health coverage in important primary care services. The study is based on surveys administered in 2006 and 2009 to local health sector decision-makers in 15 districts in Pakistan—ten of which received capacity-building assistance from the US government–funded maternal and child health project (PAIMAN), and five control districts not receiving capacity-building interventions. Findings indicate that while local authorities in both districts reported using wider decision space by 2009, institutional capacities in PAIMAN districts improved to a higher degree than in comparison districts. Officials in neither set of districts reported significant changes in their accountability to local elected officials, although those districts with more decision space and institutional capacities mobilized greater local support for health programs. Extending findings from an earlier study focused on similar questions, there were strong synergies among the dimensions of decentralization for different health sector functions, as well as some evidence of associations between stronger institutional capacities/wider decision-space and improvements in health coverage and in better administration of the health system. Findings suggest that targeted capacity-building activities at the district level may contribute to improved decision-making abilities and, in turn, improved health system performance.

Keywords: decentralization; Pakistan; capacity building; maternal, neonatal, and child health; accountability

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Decentralization is often seen as a complicated context in which to improve health system performance. Advocates for health system reform often fear that the variation in implementation by the choices made by local officials will weaken the effectiveness of their reform efforts.[1,2] Advocates for decentralization, on the other hand, see local authorities as having the ability to make better choices, largely because they have better information on local conditions, and therefore are able to adjust central policies to those local conditions.[3,4] In addition, they argue that local officials are more likely to be responsive to the priorities of the local population, fulfilling an objective of citizen satisfaction.[5]

The literature is unclear about how to sort out these different perspectives on the effects of decentralization on health system performance. In part, this is a result of the conflicting objectives used to define health system performance, but it is also due to the complexity in defining the types and degrees of decentralization. At a minimum, there are different institutional arrangements that receive additional decision-making authority, what the authors call "decision space," over different functions that they make choices about. There are also different degrees of choice they are allowed to make for each of those functions. In addition, and equally important, there are differences in the capacities, skills, and knowledge of the local authorities, as well as differences in their accountability to the local population. All of these differences—and the way that they interact—are likely to have an impact on whether decentralization improves health system performance.

In this article we focus on the effects of capacity building in a decentralized health system in Pakistan on the use of decision space and on the impact of the changes in capacity, decision space, and accountability on some indicators of health system performance. The central research question is to assess whether capacity building interventions, as well as any changes in decision space, are related to improvements in health sector performance as measured by improved administrative processes and indicators of health coverage in important primary care services. The study uses a 2006 survey as a baseline, a simple set of interventions to improve local capacity in selected districts, and a follow-up survey in 2009 after a period of implementation of the selective capacity-building activities.

CHARACTERISTICS OF DECENTRALIZATION

Following the first author's conceptual framework, decentralization can be characterized principally in terms of who gets more decision-making authority, and how much choice about those functions they are allowed. The "who" is often described by a public administration typology that distinguishes between "deconcentration," in which local offices of central agencies get more authority to make decisions, and "devolution," in which local governments with responsibilities for several sectors are granted authority to make decisions.[6,7] The range of choice about different functions is described by a "decision space map," which characterizes local choice as "narrow" (or centralized), "moderate," or "wide" (highly decentralized) for a series of functions about planning, budgeting, service delivery, and human resources. Often there is a difference between the *de jure* decision space in laws and regulations and the *de facto* decision space that local officials actually exercise. While these are the core characteristics of decentralization, they are likely to be conditioned by at least two other structural characteristics: the capacities of the local authorities and the accountability those authorities have toward the local beneficiaries and their elected representatives.

Much of the literature on health system strengthening and implementation considers capacities to be crucial to the effectiveness of any policies. Capacities are related to the staffing makeup and their skills and knowledge, as well as institutional capacities including funding, administrative routines, and information and logistics systems. Previous research from developing countries suggests that strengthening management and leadership skills, such as priority setting and problem solving, can be important in improving performance of facilities and health systems more generally.[8-10] In the case of decentralization, it is likely that variation in the funding and administrative institutional capacities among the local administrations would be a condition that could affect the performance of the choices made at local levels.

In addition, as one of the arguments about decentralization is that local authorities can be more responsive to local beneficiaries and their representatives, the variation in the accountability of health officials to local elected officials is also likely to have an impact on performance.[11] A model of the relationships is **Figure 1**, reproduced from the authors' earlier article.

To evaluate the performance of a health system, there are many different measures. Roberts et al. suggest a complex set of objectives including ultimate objectives of improved health status, citizen satisfaction with the services, and financial protection to cover costs of care.[5] These objectives all contain an equity concern. Intermediate objectives of improved access, efficiency, and quality of services are also considered performance measures that, in empirical studies, have been found to be related to the ultimate objectives. In this study we were only able to measure access to critical services in maternal, child, and neonatal care and health

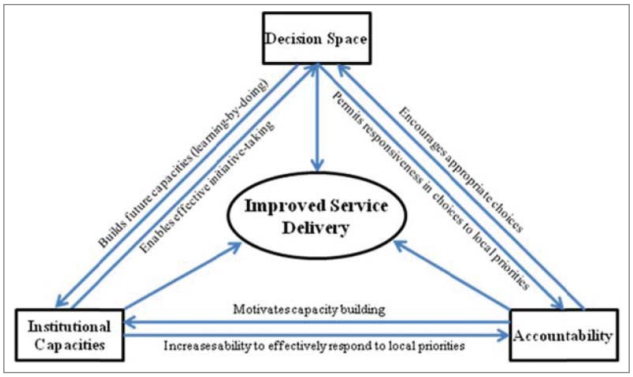

FIGURE 1. Model of Decision Space, Institutional Capacities, and Accountability. Source: Ref. 16. © 2011 Elsevier. Reproduced by permission of Elsevier. Permission to reuse must be obtained from the rightsholder.

system measures related to efficiency and quality of service in terms of budgetary and human resources measures.

DECENTRALIZATION IN PAKISTAN: LEGAL AND ADMINISTRATIVE CHARACTERISTICS

Civil service administration of public services in Pakistan has been historically highly centralized at the national or at the provincial level (i.e., Balochistan, the Northwest Frontier Province, Punjab, and Sindh).[12] When the study was conducted, the representation of popular will by elected officials was similarly limited, with district (*Zila*) governments headed by indirectly elected district councilors (*Nazims*) and assemblies.

On August 14, 2001, the government of Pakistan embarked on decentralization-oriented reforms to devolve more decision making power to the districts with the introduction of a management and organization plan to establish local governments in all districts of the country. After 2001, some health sector decision-making roles were devolved to elected officials at the district level and at the same time the local health administrators were also given greater powers in a deconcentration process within the civil service of the health sector. Districts were made responsible for some choices in the functions of planning, financing, management and services organization. The devolved and deconcentrated system was intended to provide the choices to the districts for utilization of allocated budgets according to their needs and to exercise the managerial authority over human resources to improve the efficiency of the services and to encourage more community participation.

Provincial Departments of Health continued to be responsible for overall policy-making and regulation while operational decisions about service provision were devolved and deconcentrated, with some restrictions, to district administrative officials in the Pakistan civil service.[13,14,a]

Civil service administrators—both those involved in general governance and assigned to the health sector—had significant roles in district-level health sector decision-making. Civil service generalists involved in decision-making included district coordination officers (DCOs) and executive district officers (EDOs). District health departments were organized similarly across provinces, and health sector officials included the EDO for Health (EDOH), District Officers for Health (DOHs), and superintendents of secondary district and municipal (*Tehsil*) hospitals (MS-DHQs and MS-THQs, respectively).[b]

The baseline study in 2006 was a survey of these officials in ten districts that were selected for The Pakistan Initiatives for Mothers and Newborns (PAIMAN) project—a maternal and child health project funded by the United States Agency for International Development and implemented by John Snow, Inc. The PAIMAN districts were to receive capacity building interventions after the baseline study was completed. The study also included five control districts that were selected to be similar on the demographic and socio-economic dimensions on which PAIMAN districts were selected.

In a prior article the authors reported the findings of the baseline survey which demonstrated in Pakistan that there was considerable variation in the decision space that officials actually exercised (*de facto* decision space) and that the districts that had greater capacities and more accountability to local elected officials were more likely to exercise greater choice. In other words, there appeared to be synergies among decision space, capacity, and accountability.[c]

CAPACITY-BUILDING INTERVENTIONS

The PAIMAN project worked with communities and health facilities to strengthen clinical and system capacities in ten districts. These interventions were designed to expand access to and improve the quality of maternal, newborn, and child health care.[15] In addition to providing specific clinical training and other public health activities between 2005 and 2009, the PAIMAN project worked with ten districts to strengthen institutional health system capacities related to district-level decision-making on maternal, neonatal, and child health programs. Related activities, which were relatively consistent in all PAIMAN districts, included seven workshops and trainings on the use of information,

leadership, planning, target-setting, management of finances and logistics, and supervision. The program also facilitated the formation of and provided ongoing assistance to District Health Management Teams—a body with representation from the health sector, civil service, district government, and communities designed to facilitate intersectoral coordination, promote community ownership of decisions and stimulate public–private collaboration.[d] A detailed description of the workshops is provided in **Table 1**.

METHODOLOGY

The baseline and follow-up surveys were similar. They used a semistructured survey instrument to interview district-level health sector decision-makers in 15 districts covering all four provinces of Pakistan. Research instruments were designed to assess variations in decision space, institutional capacities, and accountability over four health functions: strategic and operational planning, budgeting, human resources, and the organization of service delivery.[e] The combined survey sample included 155 respondents (81 respondents from 2007 and 74 respondents from 2009).

Additional data collected included primary qualitative and secondary quantitative data. Qualitative data, designed to gain additional insights not captured by the standardized questionnaire, were collected by an anthropologist in January 2010. In-depth interviews were conducted with four categories of respondents at the district level with the help of guidelines targeting specific respondents according to their roles and responsibilities. Sampled respondents were district *Nazims*, DCOs, EDOHs, and EDO-FPs in four districts.

Health systems performance data were collected through both district-level administrative data and household surveys that were implemented by third parties to evaluate the impact of the PAIMAN project. District-level administrative data in both PAIMAN and comparison districts were collected by survey administrators in each round related to a variety of process indicators, including those related to human resources (e.g., percent of various sanctioned posts that were filled at the time of the survey) and budgeting (e.g., district budget utilization rate for recurrent costs). Household-level indicators of maternal and child health were collected in 2006 and 2010 in PAIMAN districts only. Both sets of indicators were analyzed to relate changes in the various indicators of decentralization to changes in indicators of health systems performance.

FINDINGS

We were first interested in assessing the changes in decision space, capacity, and accountability since the baseline survey.

Name of intervention	Year(s)	Districts	Officials
■ Use of information workshops	■ 2005	■ Original 10 PAIMAN districts	■ EDOH, DOH, MS-DHQ/THQ hospitals and the concerned staff
■ Leadership Trainings	■ 2006 to 2007	■ Original 10 PAIMAN districts	■ EDOH, EDO-CD, MS-THQ/DHQ hospitals, elected representatives, other mid-level health/ population managers
■ Establishment of DHMTs	■ 2006 and 2007	■ Original 10 PAIMAN districts	■ DCO, EDOH, EDO-FP, DOH, EDO social welfare, other stakeholders
■ Health planning training workshops	■ 2006	■ Original 10 PAIMAN districts	■ DCO, EDOH, EDO-FP, DOH, MS-DHQ/ THQ hospitals and the concerned staff
■ Hands on support of DHMT during the district planning cycle	■ 2007 onward	■ Original 10 PAIMAN districts	■ Members of DHMTs
■ Financial Management trainings	■ 2007	■ All PAIMAN districts	■ EDOH, DOH, director DHDC, HMIS coordinator, account staff, computer operator
■ Logistic Management trainings	■ 2007	■ Original 10 PAIMAN districts	■ EDOH, In-charge store, DMS hospital and in-charge store and director DHDC
■ Supportive Supervision trainings	■ 2008	■ All PAIMAN districts	■ EDOH, DOH, MS DHQ/THQs, HMIS coordinators, DSV, and LHS
■ District health performance target-setting	■ 2009	■ All PAIMAN districts	■ EDOH and DOH

TABLE 1. PAIMAN Health Sector Capacity-Building Interventions. PAIMAN, Pakistan Initiatives for Mothers and Newborns project; EDOH, Executive District Officer for Health; DOH, District Officer for Health; MS-THQ, Superintendent of secondary municipal (*Tehsil*) hospital; MS-DHQ, Superintendent of secondary district hospital; EDO-CD, Executive District Officer - Coordinator for Development; EDO-FP, Executive District Officer for Family Planning; DCO, District Coordination Officer; DHMT, District Health Management Team; EDO, Executive District Officer; DHDC, District Health Development Committee; HMIS, Health Management Information System; DMS, District Medical Supervisor; DSV, District Superintendent Vaccination; LHS, Lady Health Supervisor

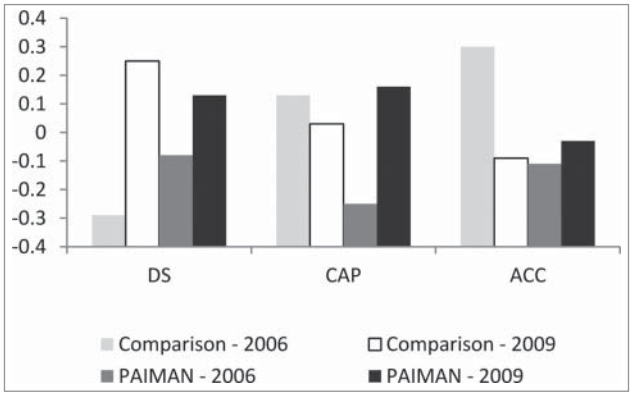

FIGURE 2. Changes in Levels of Decision Space, Institutional Capacities, and Accountability between 2006 and 2009. PAIMAN, Pakistan Initiatives for Mothers and Newborns project

As shown in **Figure 2**, both PAIMAN and control districts respondents reported generally higher levels of *de facto* decision space in 2009 compared to 2006/2007, surprisingly with a substantially higher increase among control districts. However, the synergy among the decision space, capacity, and accountability was retained: districts reporting higher use of decision space were those with greater capacity and more accountability.

The change in decision space varied according to different functions with increases in all dimensions except budgetary control in the PAIMAN districts and greater increases in decision space for human resources and service delivery in the control districts as shown in **Figure 3**.

We were then interested in assessing the impact in 2009 of the capacity-building interventions in the PAIMAN districts on the dimensions of decentralization assessed in the baseline study in 2006/2007. We tested whether changes in mean levels of each dimension of decentralization among PAIMAN districts between 2006/2007 and 2009 were different from changes in mean levels of each dimension of decentralization among control districts.[f] As anticipated, we found that capacity measures rose in the PAIMAN districts (with the increase in the overall indicator statistically significant at the 10% level of confidence) but fell in the control districts. In qualitative data, respondents in PAIMAN districts generally felt that the current system had in-built decision-making and capacity-building mechanisms that developed a culture of consensus building and productive processes of decision making. Nonetheless, qualitative data also suggested that resource capacity constraints continued to abound. For instance, almost all qualitative data respondents pointed to a lack of human resources as a major capacity constraint, with some DCOs feeling that most districts did not have adequate paramedical staff, and that many secondary hospitals were lying vacant because doctors were not willing to work in rural health facilities.

Levels of accountability experienced either little change (PAIMAN districts) or a reduction (comparison districts). Even though the oversight role of *Nazims* had been reduced by legal changes after 2008, qualitative interviews with *Nazims* in three intervention districts and one control district suggest that none of the four had any major changes concerning decision-making processes during their tenures.

Table 2 presents results from *t*-tests corresponding to the research question: how are interventions designed to strengthen institutional capacities related to decentralization? While the larger increase in decision space among comparison districts than PAIMAN districts is just shy of being statistically significant at the 10% level of confidence ($p = 0.11$), changes in the other dimensions between PAIMAN and comparison districts are nonsignificant.

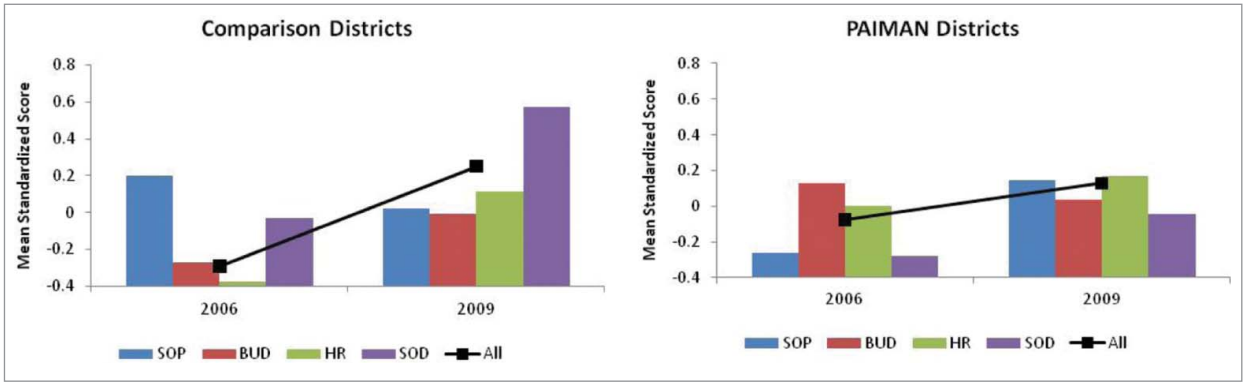

FIGURE 3. Growth of Decision Space Between 2006 and 2009*. *Health functions analyzed: Strategic and Operational Planning (SOP); Budgeting (BUD); Human Resources (HR); Service Organization and Delivery (SOD); unweighted average (ALL). PAIMAN, Pakistan Initiatives for Mothers and Newborns project

Change in levels between 2006/2007 and 2009	Change	*N*
Decision Space		
Control	+ 0.64	17
PAIMAN	+ 0.12	29
t-test *p*-value	0.11	46
Capacities		
Control	+ 0.07	17
PAIMAN	+ 0.31	29
t-test *p*-value	0.53	46
Accountability		
Control	−0.44	21
PAIMAN	+ 0.01	37
t-test *p*-value	0.26	58

TABLE 2. *t*-tests of Changes in Levels of Decision Space, Capacities, and Accountability Between 2006/2007 and 2009 Between Comparison/PAIMAN Districts. PAIMAN, Pakistan Initiatives for Mothers and Newborns project

Two additional findings of particular relevance to capacity-building initiatives of the PAIMAN project also emerged. First, the percentage of civil service respondents reporting the existence of (or knowing of) a District Health Management Team in their districts rose markedly between 2006 and 2009, from 55% to 94% (the PAIMAN project had actively sought to strengthen DHMT functioning during the study period, and District Health Management Team indicators were part of the institutional capacities score). While these increases were similar in both PAIMAN and comparison districts, the percentage of respondents reporting that their District Health Management Team met at least quarterly rose in PAIMAN districts between 2006 and 2009 (from 32% to 85%) but stayed virtually the same in comparison districts (60% and 57%, respectively) (results not shown). Second, levels of management training for health officials (e.g., in preparing contracts, procurement, and logistics) increased in PAIMAN districts but either decreased or stayed the same in comparison districts.

This study also attempted to assess the impact of capacity building and decision space changes on health system performance. A first set of analyses compares changes in indicators of health system performance between 2006 and 2009 experienced in PAIMAN and comparison districts (data limitations precluded testing differences with formal statistical association) (see **Table 3**). A mixed picture emerges in terms of administrative performance. On the one hand, PAIMAN districts had more overall district health worker vacancies in 2009 compared to 2006 (i.e., "% staff posts filled"), whereas the vacancy rate for control districts increased slightly. On the other hand, PAIMAN districts increased the percentage of posts filled for two cadres with important roles in maternal and child health (Lady Health Visitors and Women Medical Officers), whereas the percentage of posts filled for those same cadres either rose in control districts or decreased to a lesser degree. There was a similarly mixed picture in terms of financial performance. While the budget utilization rate in PAIMAN districts fell between 2006 and 2009 (but increased slightly in comparison districts), the percentage of the health budget in the district budget increased in PAIMAN districts over the same time period while falling in control districts. In terms of maternal and child health-related outcomes, we found some indications of improved performance. Improvements in PAIMAN districts across all indicators were found

	2006 / 2007	**2009**	**Diff.**	**N**	**2006 / 2007**	**2009**	**Diff.**	**N**	**2006 / 2007**	**2009**	**Diff.**	**N**	**2006 / 2007**	**2009**	**Diff.**	**N**
Human Resource Indicators																
	% staff posts filled*				**% LHV posts filled**				**% WMO posts filled**							
Comparison	0.82	0.82	+0.01	4	0.74	0.67	-0.07	4	0.58	0.62	+0.04	4				
PAIMAN	0.83	0.79	-0.04	9	0.73	0.78	+0.05	9	0.60	0.69	+0.09	7				
Budget Indicators																
	Utilization Rate¶				**As % district budget**											
Comparison	0.95	0.99	+0.04	5	0.11	0.12	+0.01	3								
PAIMAN	0.85	0.95	+0.10	8	0.16	0.14	-0.02	8								
Service delivery Indicators¶¶																
	ANC				**TT**				**SBA**				**PP**			
PAIMAN	0.32	0.41	0.09	10	0.46	0.55	0.09	10	0.39	0.51	0.12	10	0.37	0.53	0.16	10

TABLE 3. Changes in Indicators of Health System Performance. PAIMAN, Pakistan Initiatives for Mothers and Newborns project; LHV, Lady Health Visitor, WMO, Women Medical Officer

*Staff included: high-level administration; mid-level administration; clinical; low-level administration; and outreach workers.

¶Health expenditures /authorized budget.

¶¶ANC, % women (15-49) with antenatal care (ANC) during current/last pregnancy; TT, women with 2+ doses of tetanus toxoid in last month; SBA, % births assisted by skilled birth attendants; PP, % women provide post-partum care during last pregnancy

Performance indicator	Decision Space		Capacity		Accountability	
	ρ	N	ρ	N	ρ	N
HR						
% staff posts filled	0.12	13	0.43	13	−0.06	13
% LHV posts filled	−0.28	13	0.11	13	−0.41	13
% WMO posts filled	0.16	11	0.39	11	0.44	11
Budgeting						
Health budget utilization rate	−0.09	13	0.67**	13	0.35	13
Health budget as % district budget	0.31	11	0.30	11	0.21	11
Maternal and Child Health						
ANC	0.37	10	0.28	10	0.58*	10
SBA	0.03	10	0.39	10	0.01	10
TT	0.59*	10	0.41	10	0.40	10
Post-partum	0.65**	10	0.70**	10	0.14	10
Composite indicator	0.55	10	0.61*	10	0.31	10

TABLE 4. District-Level Correlations Between Dimensions of Decentralization and Health Sector Performance. HR, Human Resources; LHV, Lady Health Visitor; WMO, Women Medical Officer; ANC, antenatal care during current/last pregnancy; SBA, % births assisted by skilled birth attendants; TT, 2+ doses of tetanus toxoid in last month. **significant at $p < 0.05$; *significant at $p < 0.10$.

between rounds of the survey, ranging from 9% (for antenatal care) to 16% (for postpartum care).

We also related district-level differences in each dimension of decentralization to differences in each of the health system performance indicators (where the district-level indicator for each round represents the unweighted mean of individual-level standardized scores) (**Table 4**). While caution is warranted in making generalizations about the findings, it does appear that changes in district-level capacity are consistently positively related to changes in indicators of administrative performance, even significantly so in terms of health budget utilization rate ($\rho = 0.67$) and maternal and child health indicators ($\rho = 0.61$ for the composite indicator; $p < 0.10$). Further, while decision space changes are not significantly associated with any administrative measures of health system performance, they are positively associated with two maternal and child health outcome indicators.

DISCUSSION

Building on the findings of the previous article,[16] this study shines light on a number of key questions surrounding decentralized decision-making as a key element of health system design. First, it measures and documents evolutions in the levels of three core dimensions of decentralization—decision space, capacities, and accountability—in the context of Pakistan. Officials in both PAIMAN and control districts reported wider *de facto* decision space in 2009 compared to 2006, suggesting that respondents were generally taking greater advantage of their *de jure* decision space than in earlier years. Wider decision space may reflect "learning-by-doing" whereby local decision-makers built on previous experience and became more comfortable with making independent choices. In terms of capacities, district-level decision-makers in 2009 made greater use of processes considered to be consistent with good health system performance and also reported having greater technical and/or administrative skills to make these decisions. Stronger improvement in institutional capacities in PAIMAN project districts relative to comparison districts may reflect successful capacity-building interventions in those districts. Finally, the degree of accountability of health sector decisions toward local councilors (*Nazims*) showed no change. Despite national-level political changes that reduced civil service accountability to *Nazims*, most *Nazim* respondents interviewed felt that they were kept in the loop for sectoral decisions and that decision making was generally perceived as "transparent and collective."

Second, the study provides evidence of synergistic relationships that are important from both research and policy-making perspectives. From a research perspective, these findings provide a statistical justification in using summary/cross-function measures of each dimension to usefully capture each dimension. Across dimensions of decentralization, evidence of synergistic relationships suggests that the strengthening of one aspect of decentralization (e.g., capacities) may also accompany strengthening of other dimensions (e.g., decision space).

Third, the study supports the general promotion of capacity-building as a means of strengthening health system functioning. Such capacity building includes the kinds of management trainings promoted by the PAIMAN project (e.g., in planning, preparing contracts, and forecasting pharmaceutical needs) as well as process-oriented interventions (e.g., strengthening of District Health Management Teams). The study found that both individual and district institutional capacities increased in PAIMAN districts (but not in the control districts) as well as

positive connections between institutional capacities and decision space. Together, these findings suggest that capacity-building activities can usefully advance the decentralization process. Further, there was evidence that increased institutional capacities was positively associated with indicators of both administrative health systems performance (e.g., budget utilization) and maternal and child health-related outcome indicators. Such district-level evidence reinforces the policy recommendation that focused capacity-building interventions directed at local decision-makers may strengthen local health sector processes more widely.

The decision space approach also highlights the need for a greater understanding of the relationships among the dimensions of decentralization in order to design decentralization-oriented reforms. It is possible that some or all of the observed synergies are the result of initial actions taken within a single dimension. A locally elected official who is highly involved in decision-making, for instance, might facilitate training in budgeting for local health officials and, after training, provide greater leeway in preparing budgets. Under such a scenario, a well-sequenced set of decentralization-related reforms might focus first on the accountability dimension, and secondarily on institutional capacities or decision space. Future research to tease apart issues of temporality and causality would therefore be of great benefit to decentralization policymaking.

Returning to the general questions posed, this study suggests that decentralization can be an important process for the achievement of improvements in health sector objectives. The study found a mixed but generally positive relationship between capacity-building initiatives and decentralization for health system indicators. Administrative indicators showed a mixed picture, while service delivery indicators tended to be positive. Overall, we conclude that the interventions were positive.

However, how decentralization is done is important. If the core of decentralization, decision space, is expanded, then it is likely that improving the local administrative capacities, along with encouraging greater accountability to local elected officials, might improve the performance of the health system. The synergies we found among the dimensions of decision space, capacities, and accountability and among the functions (planning, budgeting, human resources, and service organization) suggest that these dimensions and functions might be strengthened hand in hand with programs of capacity building and accountability.

LIMITATIONS

The small district-level sample size ($n = 15$) limited the extent to which statistical tests of associations could be used to address the research questions. In particular, the study had limited ability to control for factors independent of, or simultaneously affecting, either dimensions of decentralization or district-level indicators of health system performance (e.g., district level of development). While a difference-in-difference approach in analyzing outcomes against indicators of decentralization would have been desirable, there were not enough data points to apply such a framework. Findings that relate indicators of decentralization to health sector performance outcomes should therefore be treated with caution.

Second, measures of decentralization were based on survey respondent perceptions, and there exist no gold standard measurement tools against which to validate our measures of decision space, institutional capacities, and accountability. However, the research instruments were designed in collaboration with local organizations knowledgeable of decision-making processes at the district level, giving reason to believe that the measures validly reflect the concepts that they are intended to capture. Additionally, civil service cadre respondents with higher *de jure* financial responsibilities reported wider *de facto* decision space both in budgeting and the overall indicator of decision space. The instrument design process and empirical findings therefore support the instrument's validity.

Further, respondents in 2009 were not necessarily those from 2006/2007 because officials interviewed in many districts in 2006/2007 had rotated into different districts. It is possible that variations in responses across time were due to different interpretations of survey questions rather than changes in levels of decentralization. However, questionnaires were designed to elicit information on specific aspects of health sector implementation (decisions, resources, and stakeholder involvement). Because levels of decentralization were calculated on the basis of such objectively oriented questions, unmeasured characteristics of respondents that may have affected answers were minimized.

DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST

The authors have no conflict of interest or financial interests to declare.

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NOTES

[a] Since the period under study, Pakistan has experienced significant changes in its devolution process with a constitutional amendment that strengthened the provinces vis à vis both the national government and the districts. See Joint Mission WHO, World Bank, DFID, USAID-TAUH Devolution of the Health System Following the 18th Amendment of the Constitution of Pakistan: Opportunities and Challenges. WHO Regional Office for the Eastern Mediterranean, 2012.

[b] For more detail on the specific functions devolved or deconcentrated to the districts, see Ref. 16.

[c] See Ref. 16.

[d] For more detail on the DHMT, see Ref. 17.

[e] See Ref. 16 for details on the survey instruments and the initial findings of the baseline study, 2011.

[f] Because of the small sample size, statistical analyses were limited to *t*-tests of mean district-level changes in each dimension of decentralization between PAIMAN/comparison districts and between 2006/2007 and 2009. Differences in means were calculated separately by category of official (e.g., in each district, the level of DS reported by the DCO in 2006/2007 was differenced from the level reported by the DCO in 2009).

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