WASH
Poverty Diagnostic | SERIES

When Water Becomes a Hazard

A Diagnostic Report on The State of Water Supply, Sanitation and Poverty in Pakistan and Its Impact on Child Stunting

PAKISTAN

WORLD BANK GROUP

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When Water Becomes a Hazard

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Contents

Boxes

Figures

Maps

Images

Tables

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The findings, interpretations, and conclusions expressed in this report are those of the authors and do not reflect the views of the Executive Directors of the World Bank, the governments they represent, or the counterparts consulted or engaged with during the study process. Any factual errors are the responsibility of the team.

Abbreviations

B40	Bottom 40 percent
CPI	Consumer price index
DHS	Demographic and Health Survey
FABS	Financial Accounting & Budgeting System
FSM	Fecal sludge management
HIES	Household Integrated Economic Survey
IFMIS	Integrated Financial Management Information System
JMP	Joint Monitoring Programme
KP	Khyber Pakhtunkhwa
LG	Local government
MDG	Millennium Development Goals
MICS	Multiple Indicator Cluster Survey
MIS	Management information system
NER	net enrollment rate
NGO	nongovernmental organization
NNS	National Nutrition Survey
OD	Open defecation
O&M	Operations and maintenance
ORT	Oral rehydration therapy
PCRWR	Pakistan Council of Research in Water Resources
PHED	Public Health Engineering Department
PIFRA	Project to Improve Financial Reporting & Auditing
PRM	Poverty Risk Model
PSLM	Pakistan Social and Living Standards Measurement Survey
Rs	rupees

SDG	Sustainable Development Goals
T60	Top 60 percent
TMA	Town Municipal Administration
UNICEF	United Nations Children's Fund
WASA	Water and Sanitation Agency
WASH	water supply, sanitation, and hygiene
WHO	World Health Organization

Executive Summary

This report examines the relationship between poverty, access to water and sanitation, and the nutritional status of children—specifically, child stunting.

Over the past decade and a half, Pakistan saw a very substantial decline in poverty. Commensurate with this, access to water supply, sanitation, and hygiene (WASH) infrastructure expanded, open defecation more than halved, and dietary diversity improved, even among the poorest. Health behaviors and access to primary curative health care also improved. Yet, surprisingly, two critical markers of child health: rates of diarrhea and stunting have shown virtually no signs of a decline.

The report focuses on this apparently anomalous set of facts.

We show that the policy focus on the elimination of open defecation (OD) in the absence of any significant investment in the safe management of fecal waste, has been largely responsible for this. The elimination of OD was translated into policy as the need to rapidly expand access to latrines, with little or no attention to fecal waste management or latrine quality, resulting in an unprecedented concentration of untreated fecal waste near human settlements. This is shockingly evident in the level of bacterial (*E. coli*) contamination observed in surface and ground water. Studies also suggest, high levels of bacterial contamination of the soil, multiplying the channels through which the oral transmission of fecal bacteria can occur– food, flies, fingers, fields, and fluids. The use of untreated waste water for crop irrigation, creates further downstream effects.

The report argues that this has not only sustained high levels of diarrhea, it has also created the perfect setting for environmental enteropathy. The results suggest that stunting, diarrhea and other types of morbidity may well have increased but for the decline in poverty, and commensurate improvements in diet, health behaviors and access to primary curative health care.

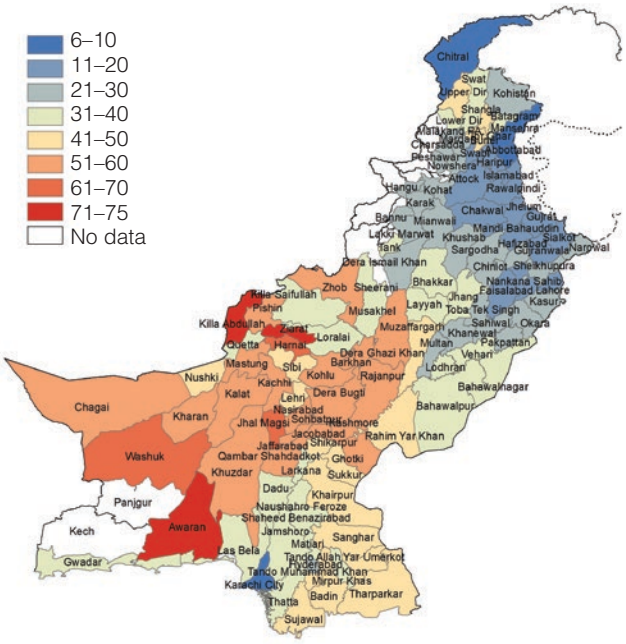
Key message 1: Pakistan has made substantial progress in reducing poverty, but spatial disparities in poverty levels as well as in the pace of poverty reduction remain large. Four out of five poor Pakistanis still live in rural areas, and there are large differences in the level and rate of progress on poverty reduction across districts.

The incidence of poverty declined significantly in Pakistan over the past decade and a half, falling from 64 percent in 2001 to about 30 percent in 2014. The reduction was coupled with an increase in asset ownership and dietary diversity, with substantial gains in both in the bottom quintile. Khyber Pakhtunkhwa (KP) saw the largest decline in poverty, followed by Punjab and Sindh. Balochistan remained the poorest province in the country, with a headcount poverty rate of almost 57 percent in 2014.

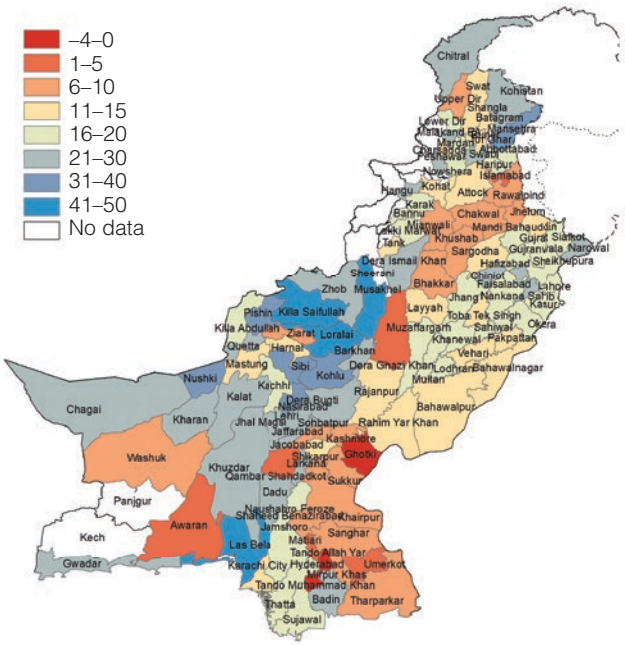
Regional differences in living standards remain large, both within and across provinces. Rural areas continue to lag behind their urban counterparts in terms of both poverty and access to

Map E.1: Base Year Poverty Headcount and Poverty Reduction, by District

a. Poverty headcount (%), 2014–15



b. Poverty reduction (percentage points), 2006–07 to 2014–15



Sources: 2004/05 and 2013/14 Household Integrated Economic Survey (HIES), 2006/07 and 2014/15 Pakistan Social and Living Standards Measurement Survey (PSLM), and World Bank staff calculations.
Note: Split-off districts were assigned the poverty rate of the parent district.

basic services like health and education and the gaps persist across all quintiles of the income distribution.

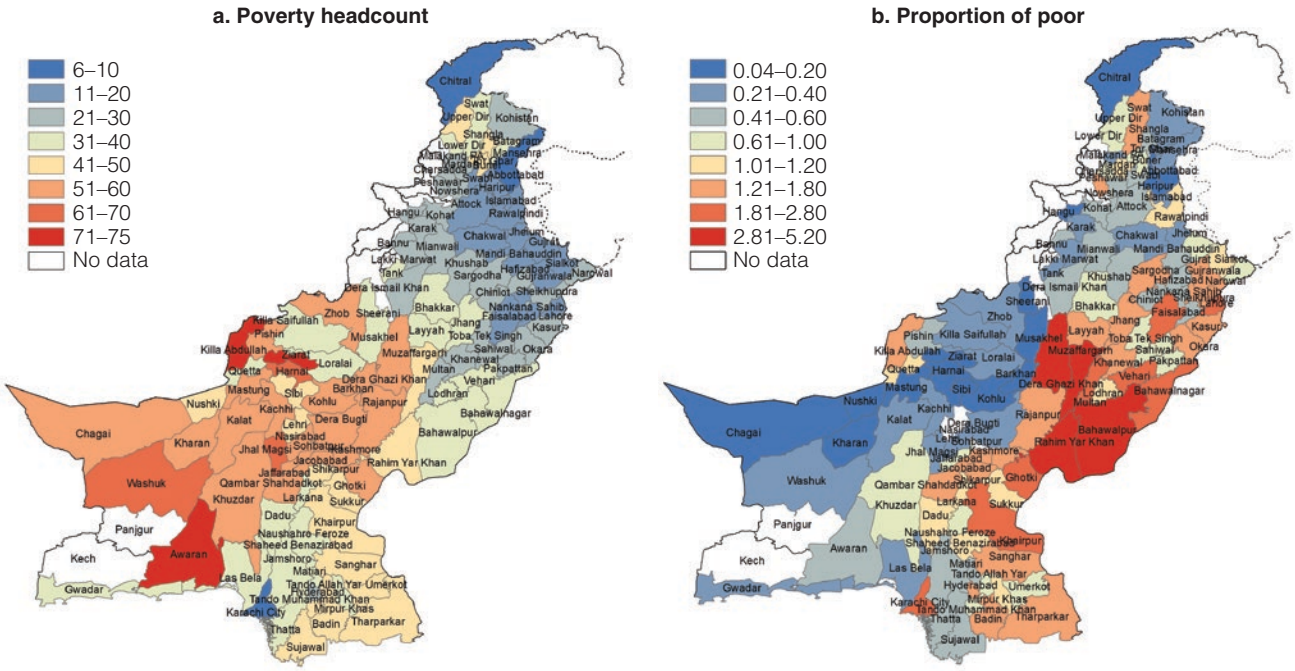
District-level poverty is equalizing over time, but there is a clear north-south divide. Both within and across provinces, the poorest districts registered the largest declines in poverty, but most of the poorest districts are in Balochistan, followed by Sindh and southern Punjab. A north-south divide is also evident within the two most populous provinces of the country, with the bordering districts of southern Punjab and northern Sindh registering the highest poverty rates within the two provinces (map E.1).

Key message 2: Urbanization is positively correlated with poverty reduction, but significant pockets of high poverty exist in better-off districts and large urban centers.

Within districts, urbanization tends to be positively correlated with the pace of poverty reduction. The districts of Hyderabad in Sindh and Musakhel and Killa Abdullah in Balochistan increased their urban share by about 23 and 25 percentage points, respectively, for example, and saw the largest reductions in poverty.

But, pockets of high poverty exist within better-off areas. Districts that host large cities like Lahore, Rawalpindi, and Faisalabad have much higher levels of within-district inequality than smaller districts. District-level policy targeting may lead the government to overlook poverty

Map E.2: Poverty Headcount and the Share of Poor, by District, 2014–15



Sources: 2013/14 Household Integrated Economic Survey (HIES), 2014/15 Pakistan Social and Living Standards Measurement Survey (PSLM), and World Bank staff calculations.

hotspots within otherwise wealthier districts. This underscores the need for more granular data, below the district level, on poverty and basic indicators of wellbeing. Large cities also host a larger number of poor people. Targeting only on the poverty rate may thus miss a significant proportion of the poor residing in larger cities (map E.2).

Key message 3: There was a substantial reduction in open defecation over the past decade, as access to WASH infrastructure rose throughout the country.

Poverty reduction has been coupled with an increase in access to WASH infrastructure throughout Pakistan. Access to within-dwelling improved water increased substantially over the past decade and a half, largely through privately bored hand and mechanized pumps. The percentage of households with latrine facilities also rose significantly, again largely through self provision. As a result, the national rate of open defecation plummeted from 29 percent in 2004/05 to 13 percent in 2014/15.

Key message 4: Large rural-urban gaps in WASH access persist. The public sector provides virtually no piped water or sanitation in rural areas.

Access to even basic levels of improved water and sanitation varies widely, however. Access is much higher in urban areas—the capitals and other major cities in each province. This is

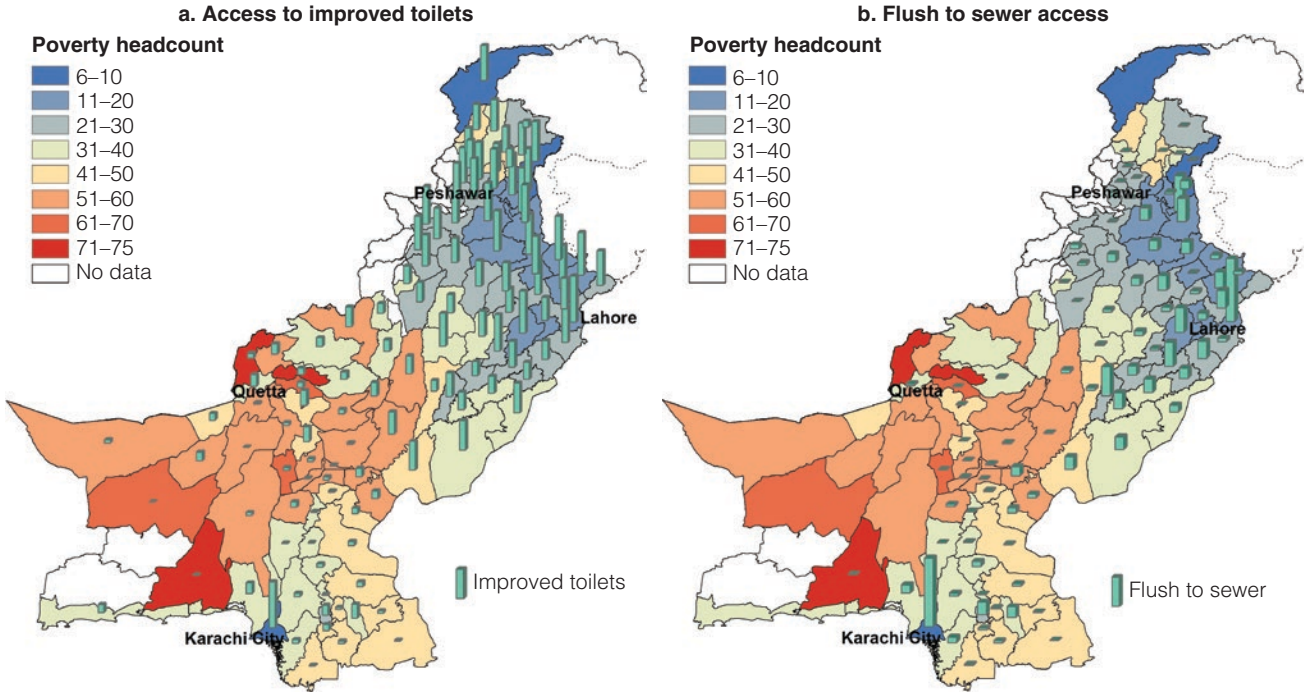
particularly evident in access to piped water supply and flush-to-sewer latrines, which are almost entirely concentrated in the larger available centers. Even among households connected to piped water, there are again large regional disparities in the functionality of piped water supply systems. While 58 percent of connected households have more than six hours of water a day in Punjab, the figure is just 7 percent in Sindh and 2 percent in Balochistan.

Key message 5: At the district level, there is a strong positive correlation between poverty and the quality of water and sanitation infrastructure.

Access to toilets connected to sewers or even septic tanks decreases sharply with an increase in district poverty. Poorer districts have a higher rate of open defecation, and a much higher incidence of unimproved toilets, mainly soak pits and flush to open drain toilets (map E.3).

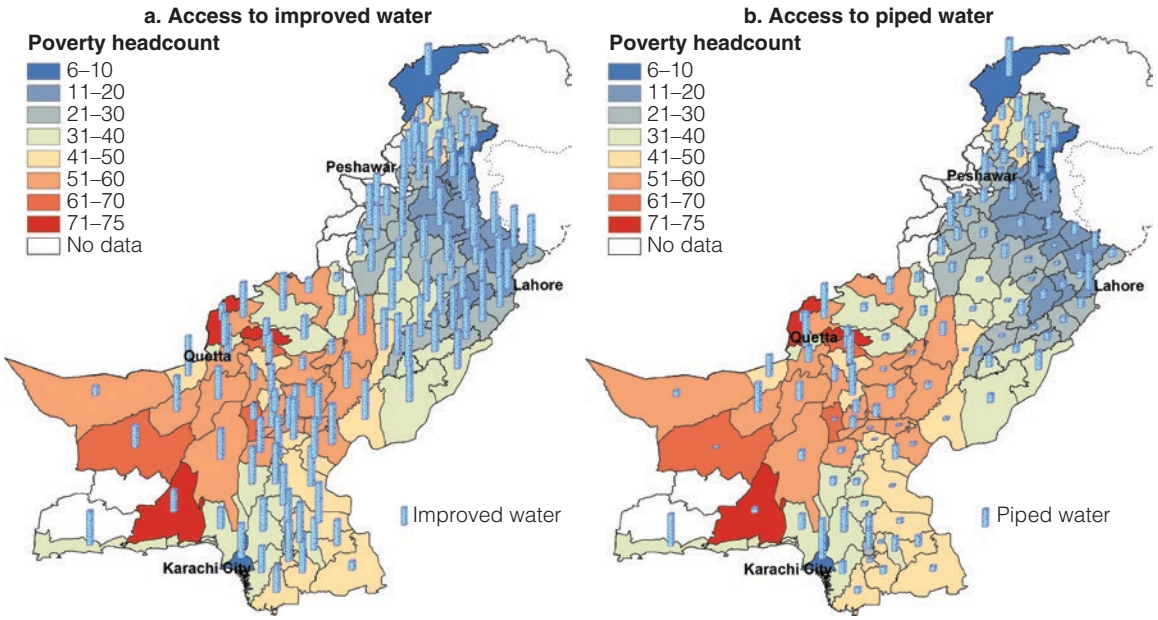
Access to piped water decreases sharply with an increase in district poverty (map E.4). Poorer districts are more reliant on hand pumps than better-off districts. Contamination tends to be lower in water drawn with motorized pumps, because they are used more in contexts where deeper drilling is required (map E.5). Higher depth to the water table implies less contamination through seepage of human excreta from nearby toilets and fecal waste dumping sites. The combination of hand pumps and pit latrines (the most common replacement for open defecation in poorer districts) substantially increases water contamination.

Map E.3: Poverty and Sanitation Access, 2014–15



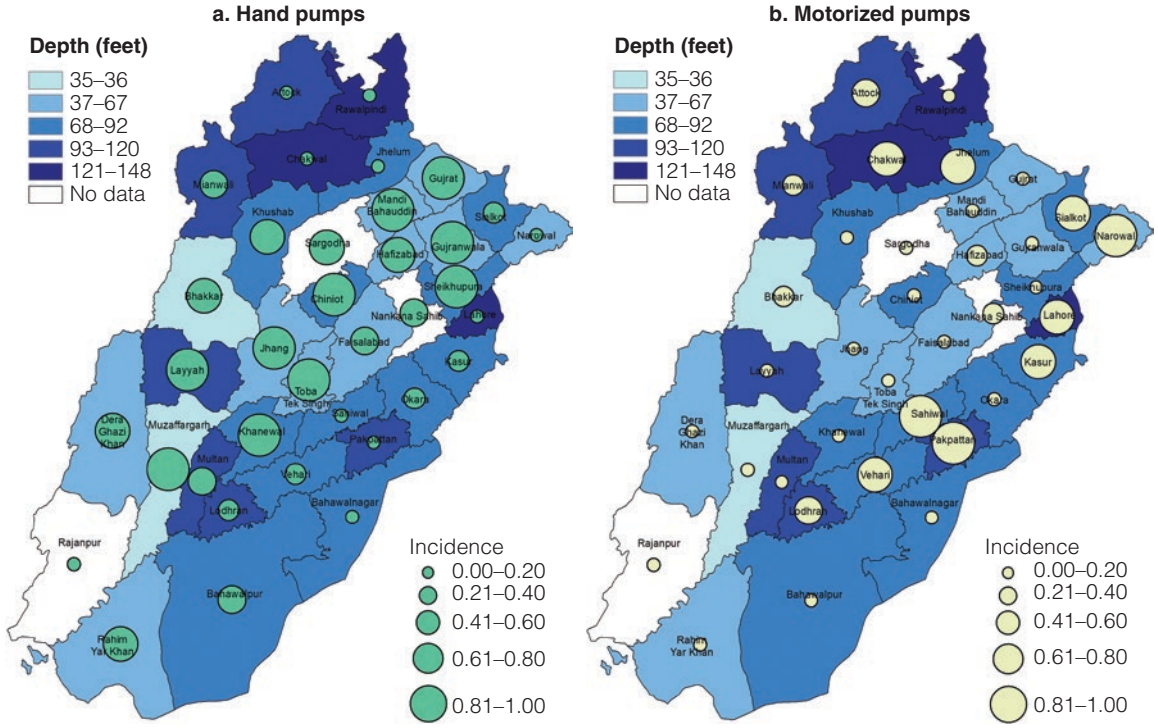
Sources: 2013/14 Household Integrated Economic Survey (HIES), 2014/15 Pakistan Social and Living Standards Measurement Survey (PSLM), and World Bank staff calculations.
Note: Split-off districts were assigned the poverty rate of the parent district.

Map E.4: Poverty and Water Access, 2014–15



Sources: 2013/14 Household Integrated Economic Survey (HIES), 2014/15 Pakistan Social and Living Standards Measurement Survey (PSLM), and World Bank staff calculations.
Note: Split-off districts were assigned the poverty rate of the parent district.

Map E.5: Water Depth and Incidence of Hand and Motorized Pumps, Punjab, 2011



Source: Data from Pakistan Council of Research in Water Resources 2011 and World Bank staff calculations.

Key message 6: Policies on increasing access to improved sanitation have completely overlooked fecal waste management.

Management of drains and treatment of human waste is nonexistent for most rural dwellers, as well as the poor in smaller urban towns and cities, and there has been almost no public-sector effort to regulate toilet quality or monitor water quality. As a result, there is a huge variation in the quality of latrines built. Most of the increase in access to improved latrines is from increases in the number of flush toilets connected to what are referred to as septic tanks. These kinds of toilets are found largely in Punjab and KP. In Sindh the largest increases have been in soak-pit toilets and flush-to-open-drain toilets. Even the classification of toilets as septic tanks is murky. Many are not engineered septic tanks but simply soak-pits, and almost all are manually emptied, with effluents released into open drains.

Virtually no investment has been made in the management of fecal sludge or waste water. Some 42 percent of households in rural Punjab and 60 percent in rural KP have no drains. Drainage infrastructure is practically nonexistent in rural Sindh and Balochistan, with more than 82 percent of households not connected to any drainage system, generating stagnant pools of sewage near dwelling areas in villages. Even where drains exist, a majority are open drains with no treatment of effluents. Under such conditions, untreated fecal waste water seeps into ground water aquifers or drains into surface water, polluting both. Fecal sludge also contaminates the soil.

Key message 7: Improvement in WASH access and the reduction in open defecation have not translated into comparable improvements in children's health.

Pakistan continues to lag behind its neighbors and income peers in terms of child nutritional outcomes. Despite reductions in poverty and increases in WASH access, stunting rates remain high. Indeed, stunting rates were somewhat higher in 2011 (44 percent) than in 2001 (42 percent). At the provincial level, 38 percent of all children in Punjab, 47 percent in Sindh, 49 percent in KP, and 53 percent in Balochistan were stunted in 2011. Although the rate of stunting is lowest in Punjab, a majority of Pakistan's stunted children live there, due to its large population share. More recent data for Punjab and Sindh from the Multiple Indicator Cluster Survey (MICS, 2014) shows no improvement in these rates. The incidence of diarrhea—a critical factor behind immediate weight loss, intestinal damage, and malabsorption of nutrients—also remained at 22 percent between 2006 and 2012 and again shows no improvement in the more recent MICS for Punjab and Sindh.

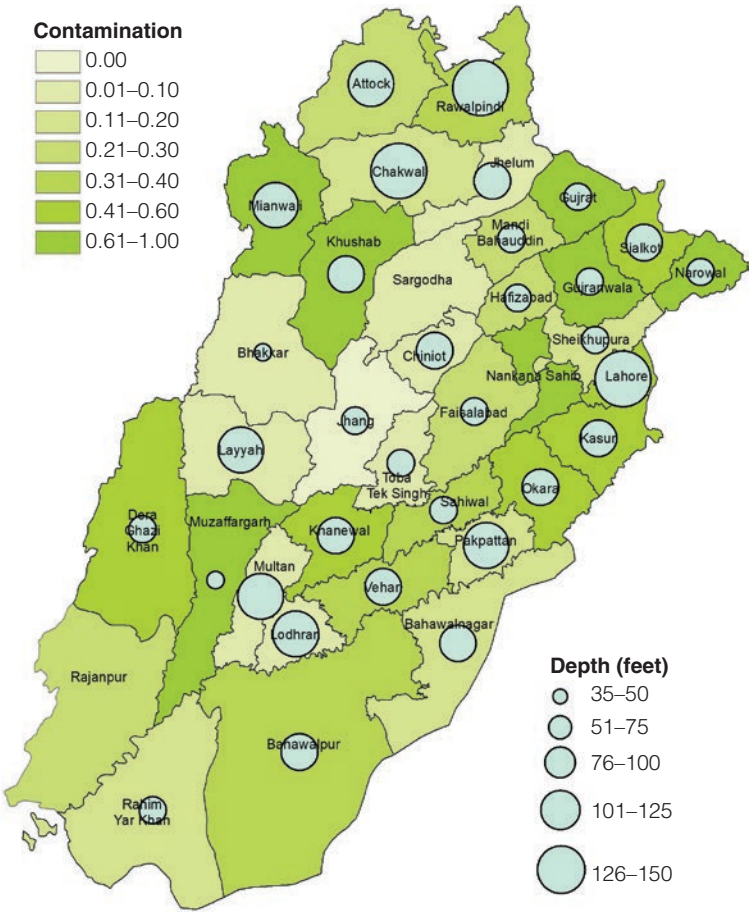
Key message 8: Lack of investment in fecal waste management, combined with the expansion of low quality toilets is the most critical determinant of weak nutritional outcomes in Pakistan.

Lack of good hygiene behaviors, inadequate dietary diversity and quality, and child care practices all have a role in determining levels of stunting but neither poverty nor health behaviors can sufficiently explain the stagnation of nutritional outcomes in Pakistan.

During this period, dietary diversity has improved, access to and use of curative primary health care has increased and health behaviors though still far from adequate, have also improved. The relationship between poverty and child feeding and care practices, is also weak. This suggests that household health behaviors cannot be the main drivers of poor nutritional outcomes.

What has not improved, and has arguably worsened considerably, is the level of bacterial contaminants in water and in the soil (see map E.6 for levels of *E. coli* contamination of water in Punjab). This contaminated water is used for drinking purposes, largely without any treatment, as well as for food production, creating powerful oral transmission mechanisms for fecal waste to find its way into both adults and children.

Map E.6: *E. coli* Contamination of Water in Punjab



Source: Data from Pakistan Council of Research in Water Resources 2011 and World Bank staff calculations.

This has created a major health hazard in Pakistan. Access to improved water has come primarily from greater reliance on groundwater, and access to improved latrines has come from an increase in flush toilets connected to leaching pits or septic tanks connected to open drains. The combination of these two types of infrastructure can provide a perfect recipe for the source contamination of drinking water when the distance between the point of intake of water and the point of disposal of human waste is below recommended levels and the groundwater aquifer is shallow. This is far too often the norm in rural Pakistan. Poor drainage systems add to the misery. In rural Sindh, for instance, poor fecal sludge management combined with a high reliance on water from hand pumps that extract water from shallower

depths had led to contamination rates as high as 57 percent at source. Drinking water contaminated with *E. coli* leads to permanent and irreversible damage to the intestinal villi of children, which hinders their ability to digest nutrients and their long-term life and growth prospects.

In the presence of open drains and soak pits, the distance of the household's water source from the toilet becomes an important factor in determining source contamination. When households depend on groundwater, as is the case in most of rural Pakistan, substrate contamination through leaching pits and unlined drains can severely contaminate drinking water. Data from rural Punjab and Sindh show that for 82 percent of households with flush toilets connected to soak pits, their drinking water source is within 50 feet of the toilet.

Beyond contamination at source, additional environmental hazards lead to poorer quality of water at point of use. *E. coli* contamination rates rise by 17 percentage points between source and point of use (water storage devices) in Sindh and by about 10 percentage points in Punjab. Environmental contamination combined with household health behaviors, hygiene practices, water storage norms, and ways of transferring water from the source to the point of use account for the difference in source and point-of-use contamination. The presence of human feces around the premises is associated with an 8 percentage point increase in water contamination at point of use, for example.

Contamination rates are also higher in households with poor handwashing practices, and in which women and children walk barefoot within the home and animals are allowed within the dwelling. Fecal contamination of the soil and surface environment can find its way to children directly or through their mothers' hands, because handwashing practices are inadequate. In rural Punjab and Sindh, for example, soap was found near the handwashing area in only a quarter of households, no respondents washed their hands with soap before feeding their children, and only 7 percent of household members washed their hands with soap after cleaning their latrines or their children's bottoms.

Improper management of solid waste also contributes to environmental contamination. Data from rural Punjab and Sindh show that a majority of households dump their solid waste in their backyards or in adjacent open spaces, increasing environmental contamination.

The safe disposal or treatment of sewage is extremely limited. Only Islamabad and Karachi have biological treatment facilities which remain partly functional. Although good data on this is not easily available, some estimates suggest that, if all available facilities in the country operated at full capacity, just 8 percent of wastewater could be treated. Lack of maintenance of the water supply and sewer system lets waste leak into distribution pipelines. In rural areas, where the vast majority of households use pit latrines, very few households empty their pits, and those that do empty them, do so manually, dumping the fecal waste into nearby rivers or open fields. Households with septic tanks follow the same practice.

Key message 9: Higher income and good hygiene and care practices can moderate the impact of low-quality water and sanitation on nutritional outcomes. The decline in poverty has likely prevented health outcomes like stunting from worsening.

An increase in household consumption is associated with a reduction in the risk of stunting and diarrhea, especially among older children, because richer households can afford better

preventive care (use of oral rehydration salts or other treatment of diarrhea) and a more nutritious diet. Household hygiene behaviors, including the use of soap for handwashing, is associated with a 3–6 percent decrease in the incidence of diarrhea and a reduction of almost 6 percent in the risk of stunting among children between the ages of three and five. Children using the toilet are also much less likely to contract diarrhea than children who have their stool disposed of in the toilet or in the open. Children receiving vitamin A or whose mothers receive prenatal care also tend to have lower rates of stunting and diarrhea. In sum, better health care, nutrition, and hygiene practices help weaken the link between exposure to contaminated soil and water, and the risk of diarrhea and stunting.

Key message 10: Overlapping institutional roles, lack of coordination and planning, limited technical capacity, and weak monitoring systems create governance challenges in the water and sanitation sector.

Water and sanitation is a provincial and local government mandate in Pakistan, but the governance structure remains complex, with many overlaps. The 18th Amendment to the Constitution, shifted all responsibilities in the water and sanitation sector from the federal to provincial and local governments. Although the change could increase accountability in the medium run, it weakens the federal role of setting common policy standards across the country. Moreover, considerable confusion remains at the provincial level about the roles and responsibilities of each tier of government. The operation of multiple institutions in the sector, often with substantial overlap in their functions and responsibilities, creates competition for resources and weakens accountability for outcomes. In Punjab, for example, the Local Government Ordinance of 2001 transferred some responsibility for water and sanitation service to local governments but failed to dissolve the Public Health Engineering Department (PHED). The Local Government Act of 2015 also introduced a rural-urban divide, but the demarcations of urban versus rural are outdated in many cases. As a result, PHED and local governments continue to have parallel roles in major policy initiatives.

Local governments lack the technical capacity and the tools to target resource allocation: The Local Government Act of 2015 needs to define the functions of various tiers of government so as to reduce overlap and enhance accountability. This needs to be followed by the creation of requisite capacity at each tier.

At the provincial level, sector planning frameworks remain weak, and there is no clearly articulated sector-wide approach. To make matters worse, resource allocation is not aligned with sector needs. Moreover, despite insufficient capacity, there is little effort to engage the private sector in service delivery.

The current institutional architecture does not facilitate service delivery for water and sanitation, for several reasons. First, de facto institutional responsibilities do not match de jure mandates. Lack of clarity on specific roles has kept institutions inefficient. Second, no formal and consistent mechanism exists to coordinate the planning of water and sanitation investments, which means that budget allocation is also fragmented. Third, limited local government capacity has resulted in design failures of water and sanitation schemes and insufficient attention to community engagement and the operations and maintenance (O&M) of existing schemes. Once in place, rural infrastructure becomes the responsibility of community-based organizations. Without the technical capacity and the financial budget for O&M, these communities, which are poor and lack capacity, are set to fail in managing local infrastructure. Unsurprisingly,

about a third of all schemes are nonfunctional. Fourth, inadequate information management systems mean that data on service delivery are not systematically collected. Weak monitoring undermines accountability, limits the ability of local governments to respond to issues in the short run, and constrains their ability to plan better in the long run.

Key message 11: Public finance, including allocations for wash, is heavily concentrated in provincial capitals, and it is regressive across other districts (poorer districts and districts with worse water and sanitation infrastructure spend less on WASH). Decentralization has yet to improve the targeting of resources.

Provincial capitals received a majority of funding in 2009/10–2014/15. In Punjab the total per capita allocation for Lahore was almost 18 times higher than the average of all other districts combined. In KP and Balochistan, the gap was slightly smaller (9–18 times) but also large. The gap was largest in Sindh, with Karachi receiving almost 100 times more in per capita terms than other districts in the province. Even if provincial capitals are excluded, the relationship between district poverty and fiscal allocations remains weak. In Punjab and Sindh, in particular, poorer districts tend to receive smaller allocations than richer ones.

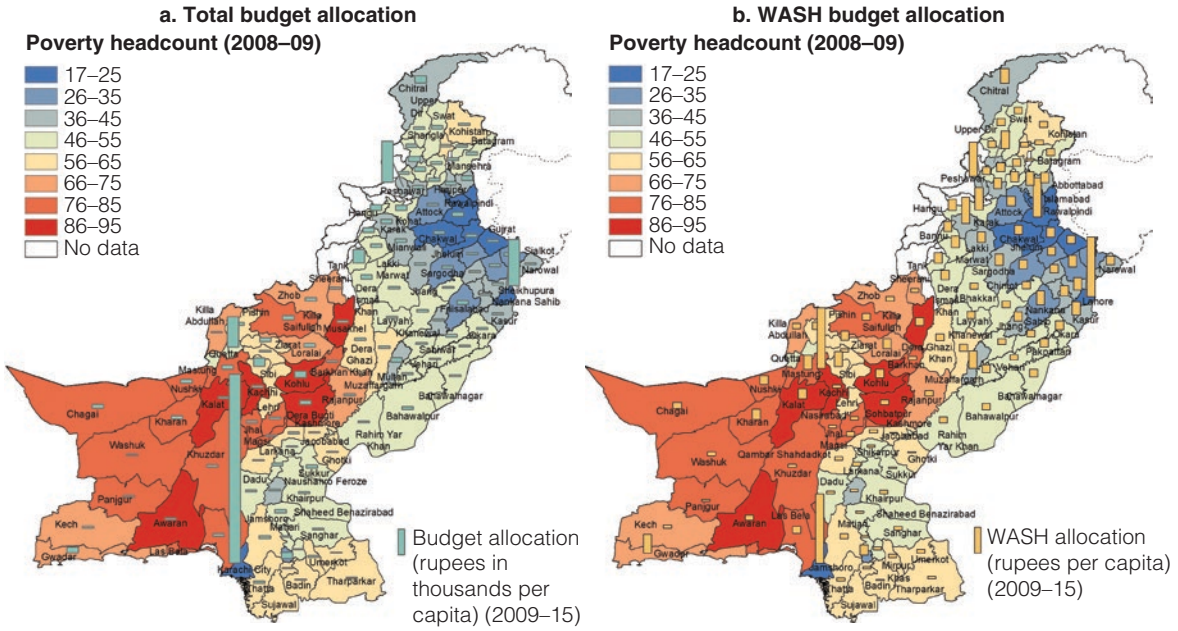
Decentralization has not changed the heavy concentration of resources in provincial capitals or made allocations less regressive. In the post decentralization period (2011-15) average per capita allocations to provincial capitals decreased only slightly. More so in Balochistan and KP much less in Punjab and Sindh.

The concentration of WASH expenditures in provincial capitals increased significantly following decentralization. However, districts other than provincial capitals spent a larger share of their total budget on WASH.

District WASH budgets are not responsive to WASH access or quality at the district level. The poorest districts spent the least on WASH, particularly after decentralization, and districts with lower access to improved water and sanitation facilities received lower per capita WASH budget allocations. Levels of WASH access and decentralization thus do not seem to determine WASH budget allocations. Instead, legacy is the strongest determinant of resource allocation: Both before and after decentralization, the relationship between previous and current budget allocations remained significant and positive.

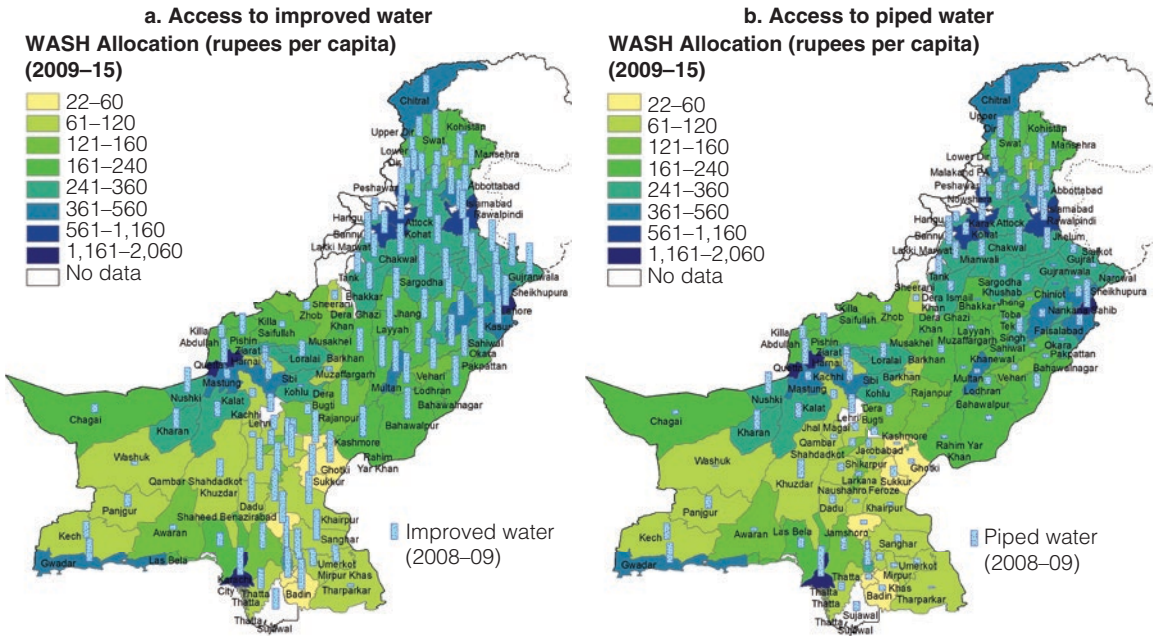
Only a small share of WASH expenditures was spent on O&M. Punjab and Sindh, in particular, focused most of their resources on new projects—a practice that is consistent with making communities entirely responsible for O&M. In contrast, Balochistan spent the bulk of its WASH finances on employee-related expenses, with the rest going to O&M. KP divided its expenditures more evenly between O&M and new infrastructure.

Map E.7: District Poverty and District Budget Allocations, Total and for WASH (Average Per Capita in 2005 Rupees), 2009–15



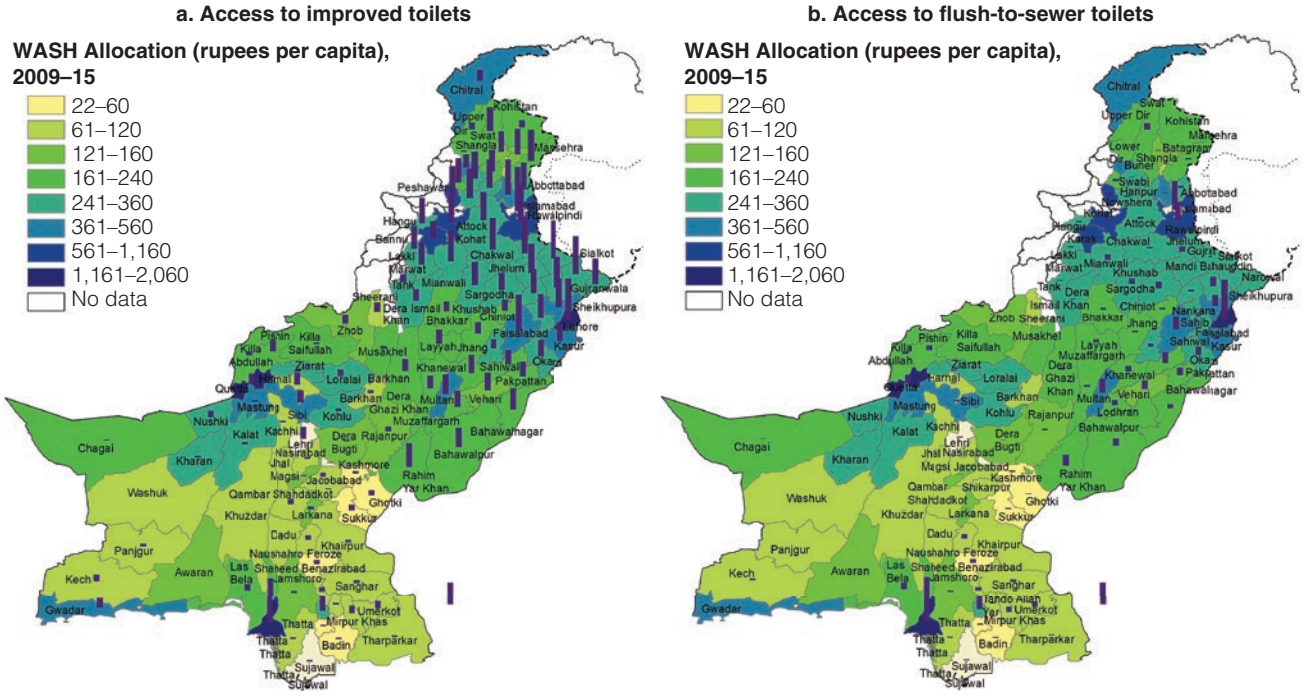
Source: Household Income and Expenditure Survey 2007-08; Pakistan Living Standards Survey 2008-09, Project to Improve Financial Reporting and Auditing (PIFRA), and World Bank staff calculations.
Note: WASH allocation is the six-year average of WASH allocations from 2009 to 2015. All values are expressed in 2005 rupees. WASH = water supply, sanitation, and hygiene.

Map E.8: Average WASH Allocations (Per Capita, 2009–15) and Access to Improved and Piped Water Sources



Source: Household Income and Expenditure Survey 2007-08; Pakistan Living Standards Survey 2008-09, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank staff calculations.
Note: WASH Allocation is the six-year average of WASH allocations from 2009-15. All values are expressed in 2005 rupees.

Map E.9: Average WASH Allocations Per Capita and Access to Improved Sanitation and Flush-to-Sewer Toilets, 2009–15



Source: Household Income and Expenditure Survey 2007-08, Pakistan Living Standards Survey 2008-09, Project to Improve Financial Reporting and Auditing (PIFRA), and World Bank staff calculations.
Note: WASH Allocation is the six-year average of WASH allocations from 2009-15. All values are expressed in 2005 rupees.

Recommendations

Recommendation I

Policy emphasis needs to shift decisively from a focus on improving access to improving the quality and safety of WASH infrastructure and the safe management of human waste.

Policy Actions

- Improve sanitation infrastructure.
- Regulate drainage systems and septic tank designs and enforce a safe distance from water sources.
- Invest immediately in fecal waste management (treatment of sludge and wastewater).
- Create a regulatory body to set and enforce standards for both public and private providers.
- Investments in the safe management of fecal waste must be accompanied by regulations on groundwater extraction and pumping.

Recommendation II

Institutional structure at the provincial and local governments should be matched with their responsibilities for service delivery and the lack of institutional coordination mechanisms and short-term planning horizons, should be remedied.

Policy Actions

- Separate responsibilities for policy making, regulation, and service provision.
- Reduce the overlap of responsibilities and narrow the coordination gap.
- Clearly demarcate the responsibilities of each water and sanitation department by establishing accountability structures at the provincial, district and sub-district levels.
- Provincial umbrella policy to improve coordination among players in the water and sanitation sector.
- Replace vertical grants with sector-specific funds that are conditional on performance.
- Make responsibility for operations and maintenance (O&M) a key part of institutional accountability
- If community engagement is seen as part of the solution, mobilize communities to enhance accountability, not just to provide O&M.

Recommendation III

Improve technical capacity within providing agencies.

Policy Actions

- Develop the capacity of public sector staff, including at the local government level.
- Involve the private sector to help fill the technical capacity gap and create the enabling environment necessary for private sector participation.

Recommendation IV

Monitor the sector and develop performance assessment metrics.

Policy Actions

- Development a sector management information system (MIS)
- Improve the quality of survey data collected for monitoring SDGs related to water and sanitation by the national and provincial bureaus of statistics and ensure definitional consistency between MIS and survey data
- Improve data on poverty and WASH service delivery at lower levels of administration for better policy design and improved poverty targeting.

Recommendation V

Improve water quality on an urgent basis.

Policy Actions

- Invest in point-of-use water treatment (chlorination or other method), with the use of subsidies as needed, to prevent stunting and other health hazards while more comprehensive solutions are being implemented.

- Use information campaigns to inform people about the hazards of contaminated water and combine water treatment efforts with behavior sensitizing interventions aimed at both water treatment and the improvement of hygiene behaviors at the household and community level

- Target 100 percent piped water supply in the long run, with metering and realistic tariffs to cover O&M.

Recommendation VI

Improve the targeting of resources to communities most in need and raise annual national spending on the sector to 1.4 percent of GDP.

- Reallocate existing spending toward districts with the greatest needs

- Review budget use with a view to increasing efficiency. Increase spending, where needed.

- Use multisectoral planning to maximize the benefits from investments.

- Establish a clear allocation system for sanitation-related schemes with a separate budgeting code.

- Budget for O&M needs to be an integral part of all planned infrastructure investments.

Chapter 1
Poverty: Strong Gains but Important Challenges Remain

Key Messages

- Poverty declined rapidly over the past decade and a half, both nationally and across all provinces, but the rate and pace of progress was not even.
- Substantial interprovincial gaps remain. Balochistan is the poorest of Pakistan's four provinces by a large margin.
- Within provinces, there is a substantial rural-urban gap in both poverty and access to basic services. This gap is widest in Sindh.
- Looking across districts, poverty fell faster in districts with higher initial poverty rates and in districts that urbanized more rapidly. However, groups of districts (in southern Punjab, northern Sindh, and Balochistan) seem to be stuck in a high poverty state, with little movement in a decade and half, signaling a need for more targeted measures.

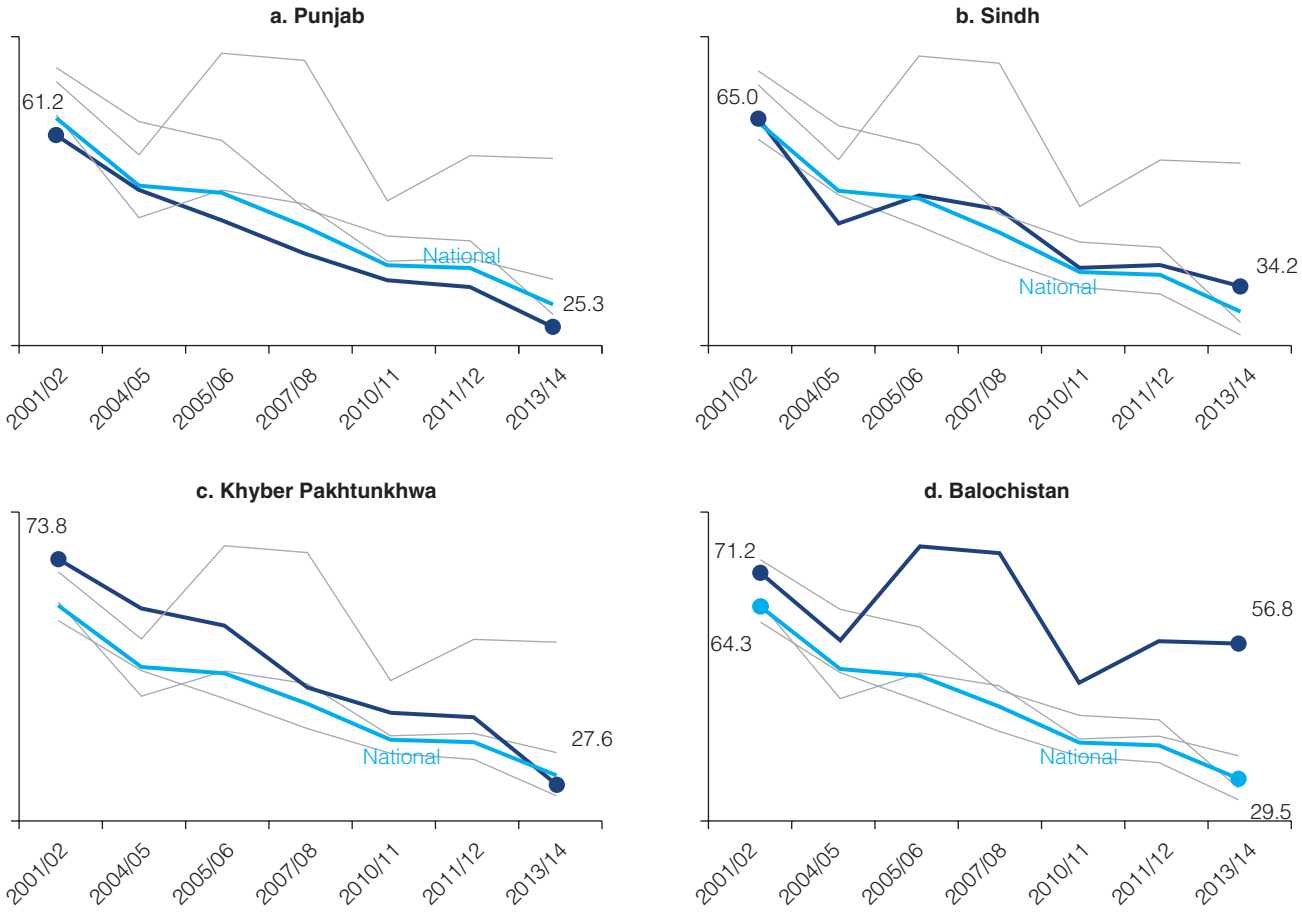
Large Reductions in Poverty and Improvements in Other Welfare Indicators

Headcount poverty in Pakistan fell 35 percentage points between 2001/02 and 2013/14, from 64.3 percent to 29.5 percent (figure 1.1).[1,2] The provincial headcount rates in 2013/14 were 34.2 percent for Sindh, 27.0 percent for Khyber Pakhtunkhwa (KP), and 25.0 percent for Punjab. Balochistan remained the poorest province in Pakistan, with a headcount rate of 56.8 percent. KP, which started out as the poorest of Pakistan's four provinces in 2001/02, ended the period as its second richest province, closing almost all of its 13 percentage point gap with Punjab, the richest province in the country. The decline in poverty in Balochistan was smaller (less than 15 percentage points), and also more volatile, possibly because of the multiple challenges of remoteness, low connectivity, a semi-nomadic population, and conflict that it faces.[3]

In line with the decline in poverty, a number of other indicators of well-being also improved. In all quintiles, the share of the household budget allocated to nonfood items rose, food consumption patterns shifted toward a more diverse and expensive diet, and asset ownership grew. The share of nonfood expenditure for the bottom quintile grew to 46 percent by 2014 (table 1.1). The consumption of nutrient-rich foods like meat, fish, eggs, dairy, fruits, and vegetables increased, while the share of cereals, which provide the cheapest calories, but are low in nutrition, declined from 33 percent to 29 percent (figure 1.2).

Even the poorest households increased their ownership of more expensive assets, such as motorcycles, refrigerators, televisions, and washing machines, and reduced their ownership of relatively inexpensive assets, such as bicycles and radios (figure 1.3).

Figure 1.1: Poverty Headcount, by Province, 2001–14



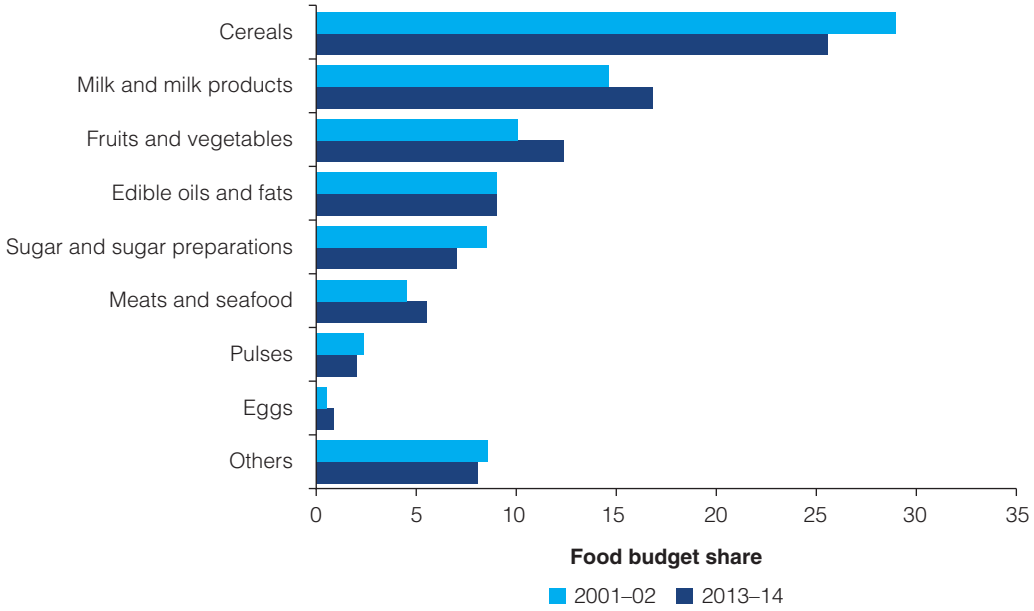
Source: 2001-14 Household Integrated Economic Survey (HIES) Series and World Bank staff calculations.

Table 1.1: Share of Food and Nonfood Items in Total Household Expenditure, by Expenditure Quintile

	Nonfood share (percent)		Food share (percent)	
Quintile	2001/02	2013/14	2001/02	2013/14
1 (bottom)	43	46	57	54
2	44	48	56	52
3	46	50	54	50
4	48	53	52	47
5 (top)	55	59	45	41

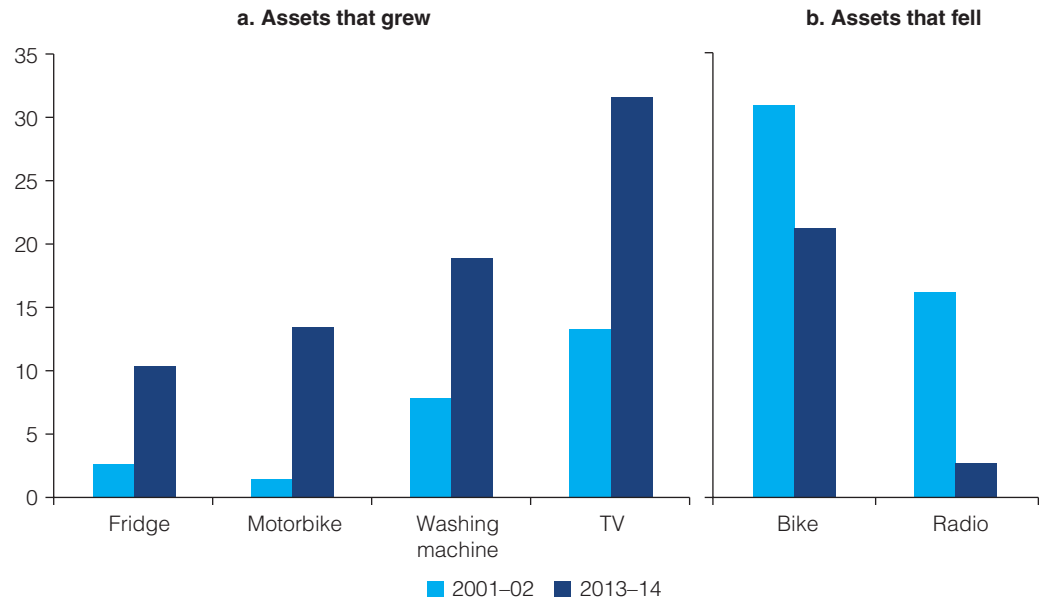
Source: 2001/02 and 2013/14 Household Integrated Economic Survey (HIES) and World Bank staff calculations.

Figure 1.2: Dietary Diversity in the Bottom Quintile, 2001/02 and 2013/14



Source: World Bank calculations based on Household Integrated Economic Survey (HIES) data.

Figure 1.3: Asset Ownership by the Bottom Quintile, 2001/02 and 2013/14



Source: 2001/02 and 2013/14 Household Integrated Economic Survey (HIES) and World Bank Staff Calculations.

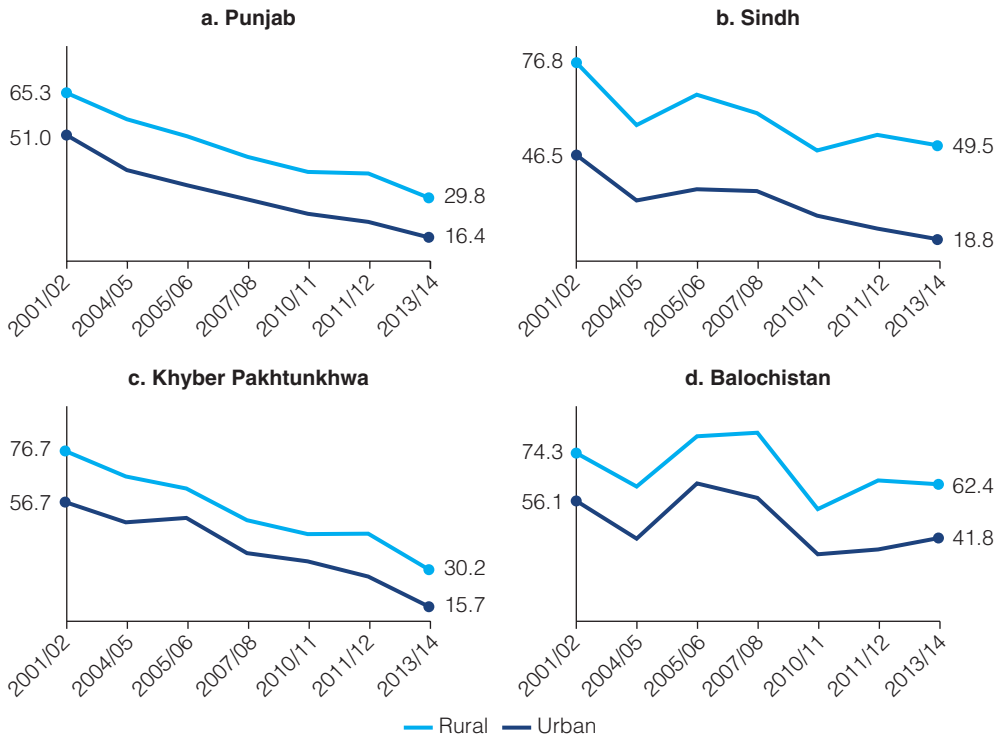
The Persistent Urban-Rural Gap

The decline in poverty has not reduced the urban-rural gap by much. Rural areas in Pakistan remain much poorer than urban areas and are far more disadvantaged in all aspects of service delivery. The poverty headcount rate in rural Pakistan is twice that in urban areas (36 percent versus 18 percent), and the gap has remained virtually unchanged since 2001/02 (figure 1.4). Combined with the slow pace of urbanization (only about 35 percent of Pakistan's population lived in urban areas in 2014), this gap means that 80 percent of Pakistan's poor continue to live in rural areas.

Across provinces, Balochistan has by far the highest rural poverty rate, with more than 62 percent of its rural population living below the poverty line. However, the gap between rural and urban poverty is by far the widest in Sindh at almost 30 percentage points. In contrast, the urban-rural gap in Punjab and KP was 13 and 15 percentage points, respectively.

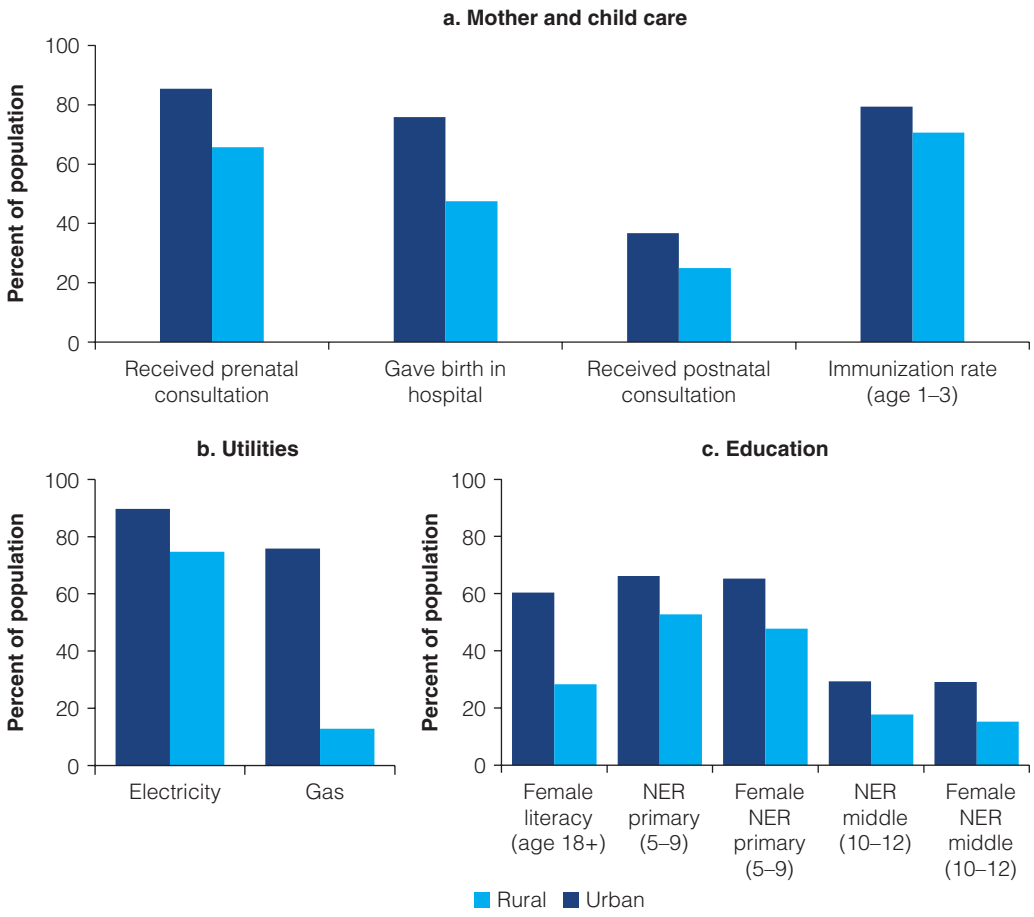
Rural households also face a substantial disadvantage in virtually all aspects of service delivery. Nationally, the rural net enrollment rate is 13 percentage points lower for primary school and 11 percentage points lower for middle school than in urban areas. For girls, these gaps stand at 17 and 14 percentage points, respectively. The rural female literacy rate, at 28 percent, is also less than half that of urban areas. Rural children are 8.5 percentage points less likely than urban children to have adequate immunization by age three, and rural women are 10 percentage points less likely to receive prenatal care, 28 percentage points less likely to give birth in a facility or hospital, and 12 percentage points less likely to receive postnatal care.

Figure 1.4: Poverty Trends by Urban and Rural Areas (2001–2014)
Poverty headcount (percent of population)



Source: 2001/02 and 2013/14 Household Integrated Economic Survey (HIES) and World Bank Staff Calculations.

Figure 1.5: Urban-Rural Gap in Access to Basic Services, 2013/14



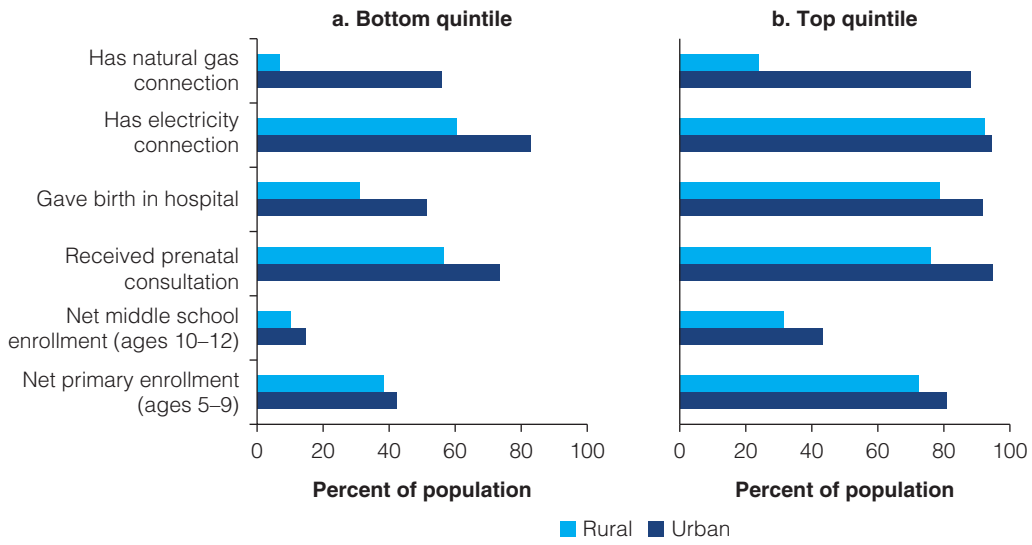
Source: 2013/14 Household Integrated Economic Survey (HIES) and World Bank Staff calculations.

Rural households are also far less likely to have access to key utilities. They are 15 percentage points less likely to have an electricity connection and 63 percentage points less likely to have a natural gas connection than urban households (figure 1.5).

Some of these gaps reflect the disparity in incomes between urban and rural areas, but large gaps persist even within quintiles (figure 1.6). For example, 73 percent of the poorest urban women but just 56 percent of the poorest rural women received prenatal care in 2013/14, and the figures were similar for giving birth in a hospital or health clinic. Just 60 percent of the poorest rural households have an electricity connection (compared with 83 percent among the poorest urban households).

This acute lack of services in rural areas has significant negative consequences for critical human development outcomes, employment prospects, and the accumulation of productive capital, which together provide a pathway out of poverty. Chapter 2 shows that these deprivations are also acute in access to water and sanitation services and the gaps cannot be explained by differences in income levels.

Figure 1.6: Access to Basic Services by Top and Bottom Expenditure Quintile in Urban and Rural Areas, 2013–14



Source: 2013/14 Household Integrated Economic Survey (HIES) and World Bank Staff Calculations.
Note: Quintiles defined on the national distribution of expenditure.

Poverty at the District Level

The 18th Amendment to the Constitution, adopted in 2010, devolved responsibility for many public services, including water and sanitation, to local governments. So far, this has mainly meant that district governments, which have essentially been acting as an arm of the provincial government, are engaged in resource allocation and service delivery decisions. Nonetheless, even this change requires a better understanding of poverty and equity at a much lower level than what is possible using the HIES.

The combination of the HIES which allows for the estimation of poverty up to the provincial level and the Pakistan Social and Living Standards Measurement (PSLM) survey, which is representative at the district level, allows for the use of small-area estimation techniques to arrive at district-level poverty estimates (Elbers, Lanjouw, and Lanjouw 2003). Box 1.1 describes the method and the data series used to obtain district poverty and map 1.1 displays estimated district poverty rates for 2014/15.

The North-South Divide

Districts vary widely in poverty, with the richest district (Abbottabad, KP) at a headcount rate of 5.8 percent and the poorest district (Washuk, Balochistan) at 72.5 percent.

Much of this variation reflects differences in poverty across provinces. The vast majority of the 40 poorest districts are in Balochistan, followed by Sindh. Only three districts each in Punjab and KP fall in this set, and they are not among the poorest in the group. Not a single district in Balochistan is among the richest 40, and only Karachi and Hyderabad in Sindh fall in this set. The divide between KP and Punjab (in the north) and Sindh and Balochistan (in the south) is apparent and quite stark (figure 1.7).

Box 1.1: Applying Small-Area Estimation to Estimate District Poverty Rates

The Household Integrated Economic Survey (HIES), which is representative at the national, provincial, and rural/urban levels, is the only survey in Pakistan that can be used to compute household poverty using a measure of total household expenditure on all goods and services. In order to obtain estimates of poverty at a more disaggregated level, some type of imputation method is required, along with a relevant survey or census that is representative at this more granular level. The Social and Living Standards Measurement Survey (PSLM) provides the best available instrument. It lacks expenditure data, but it shares a very large number of household characteristics with the HIES, making it easy to project poverty from one survey to the other. The two surveys are also fielded back to back in most years, so that there is typically no more than a 12-month period between a given HIES-PSLM pair. This closeness in time increases the credibility of the exercise. District-level poverty rates were estimated for this study using this survey and the small area estimation technique developed by Elbers, Lanjouw, and Lanjouw (2003).

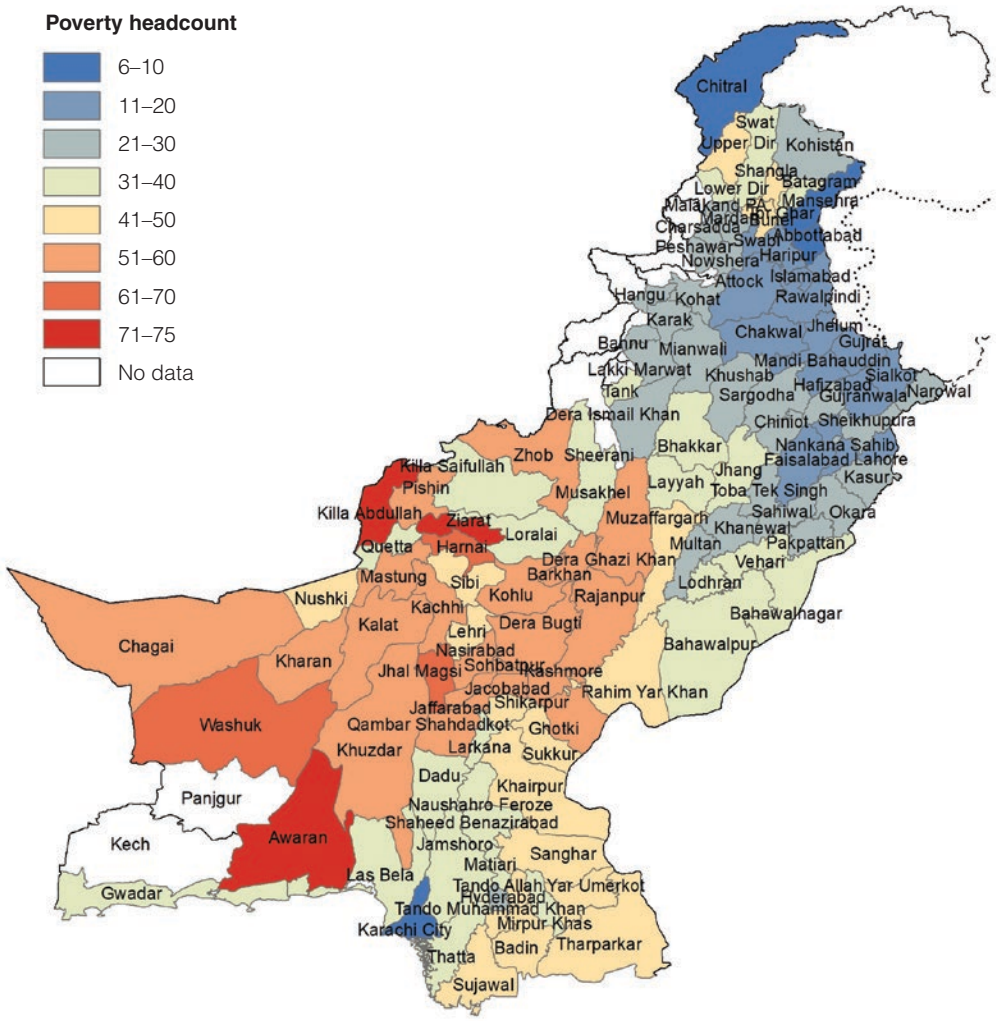
The HIES and PSLM have been fielded, more or less consistently, in alternate years for more than a decade. Five HIES–PSLM pairs can be used to understand the evolution of district poverty over this period. The pairs used include data for the following years: 2006/07 (HIES 2005/06 and PSLM 2006/07), 2008/09 (HIES 2007/08 and PSLM 2008/09), 2010/11 (HIES 2010/11 and PSLM 2010/11), 2012/13 (HIES 2011/12 and PSLM 2012/13), and 2014/15 (HIES 2013/14 and PSLM 2014/15).

Small area estimation involves three main steps:

1. Identify a set of variables that are present in both the HIES and the PSLM, have similar summary statistics, and are potentially correlated with household consumption (statistically significant at 1 percent level). Five broad categories of variables were identified: location (urban/rural, language); household demographics (size, age composition, education); characteristics of the household head (age, gender, marital status, education, employment status); housing conditions (access to water and sanitation, dwelling ownership); and ownership of durable assets and property.
2. Using the HIES data and the list of variables from step 1, develop a model that predicts household consumption per capita. Separate models were developed for each province, to account for geographical heterogeneity in the relationship between the explanatory variables and household consumption.
3. Predict per adult equivalent consumption expenditure for households in the PSLM, based on the estimated coefficients from the model in step 2 and the explanatory variables in the PSLM data. Calculate the headcount poverty rate for each district based on this predicted household consumption.

As only the Multiple Indicator Cluster Surveys (MICS) 2014 have information on key health and nutrition outcomes, such as the incidence of diarrhea and stunting, a similar method was used to match the HIES 2013/14 and the Punjab and Sindh MICS 2014, in order to generate district-level poverty rates from the MICs as well as predicted poverty at the household level.

Map 1.1: Poverty Headcount (Percent) by District, 2014/15



Source: 2013/14 Household Integrated Economic Survey (HIES), 2014/15 Pakistan Social and Living Standards Measurement Survey (PSLM) and World Bank Staff Calculations.
Note: Split-off districts were assigned the poverty rate of the parent district.

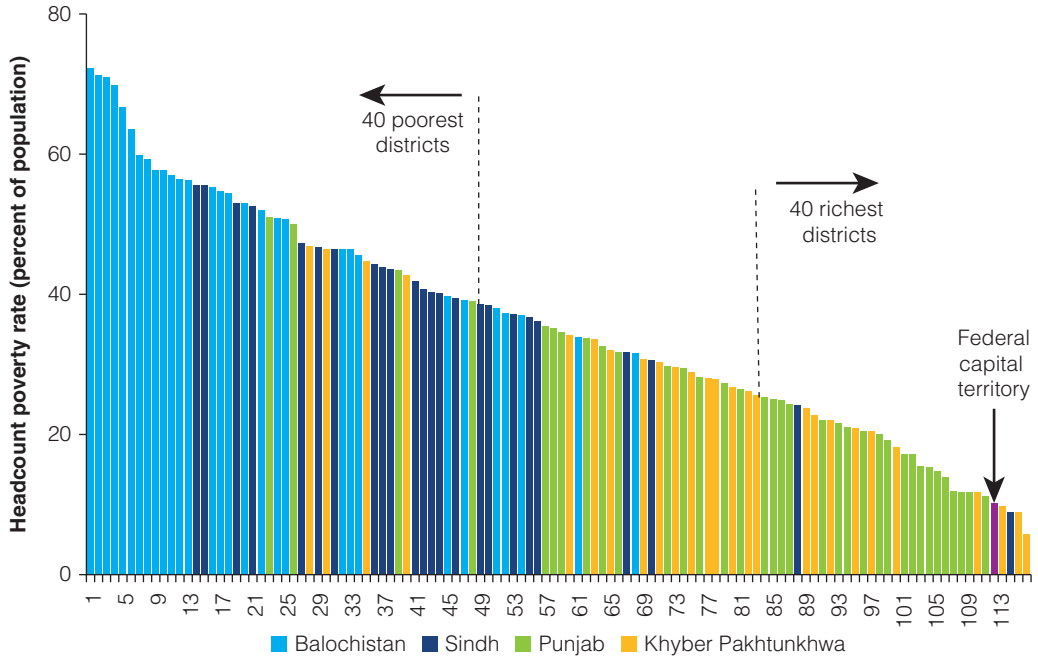
Figure 1.8 decomposes district poverty within and across provinces. It confirms that the variation in district poverty between provinces (13.1 percent) is considerably larger than the variation within each province (10.8 percent).[4]

A second north-south divide is evident within Punjab and Sindh. A belt of extreme poverty extends across southern Punjab and northern Sindh. The districts of southern Punjab are much poorer than districts in the Potohar and Canal colony areas of central and northern Punjab, and the districts of northern Sindh are much poorer than the districts of southern Sindh.

Looking over time, differences in poverty across districts narrowed somewhat between 2006/07 and 2014/15, as poverty reduction was, on average, deeper in poorer districts. The overall deviation in district poverty rates fell from 18 to 15.8 percentage points.

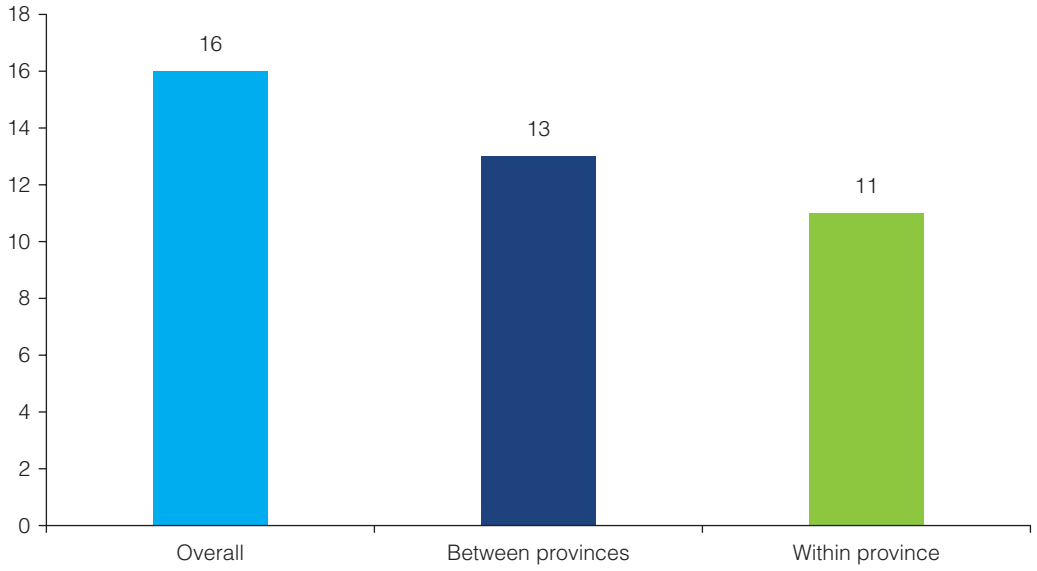
The equalizing trend across provinces, also occurred within provinces, as poorer districts experienced larger reductions in poverty.[5] In terms of headcount rates, the difference in poverty between the poorest and richest districts in Pakistan fell from 77.6 to 66.6 percentage points.[6,7]

Figure 1.7: Ranking of Districts by Poverty Rate, 2014/15



Source: 2013/14 Household Integrated Economic Survey (HIES), 2014/15 Pakistan Social and Living Standards Measurement Survey (PSLM) and World Bank Staff Calculations.

Figure 1.8: District Poverty within and across Provinces, 2014/15



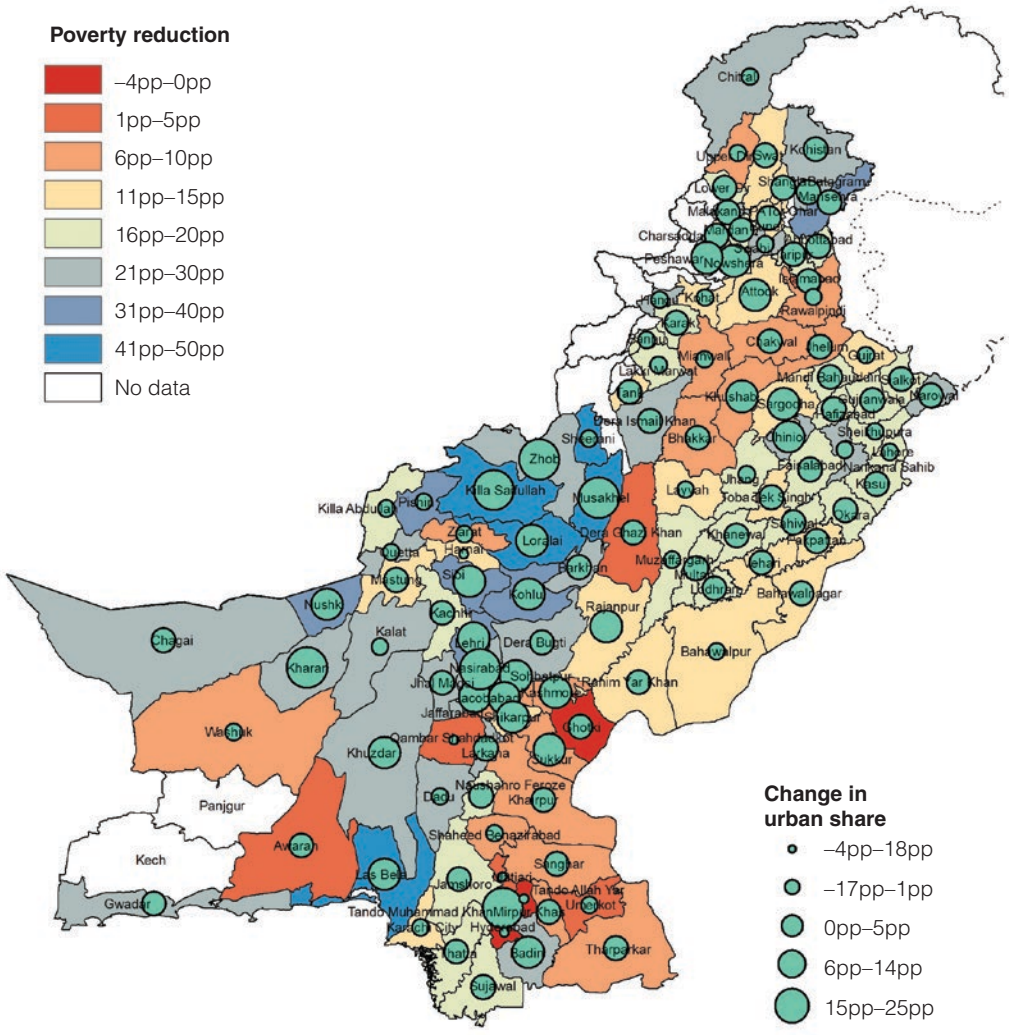
Source: 2013/14 Household Integrated Economic Survey (HIES), 2014/15 Pakistan Social and Living Standards Measurement Survey (PSLM) and World Bank Staff Calculations.

Urbanization and District Poverty

There is some evidence that districts with a higher rate of urbanization registered larger poverty declines.[8] Hyderabad in Sindh and Musakhel and Killa Abdullah in Balochistan, which increased their urban share by 23 and 25 percentage points, respectively, saw the largest reductions in poverty (map 1.2).

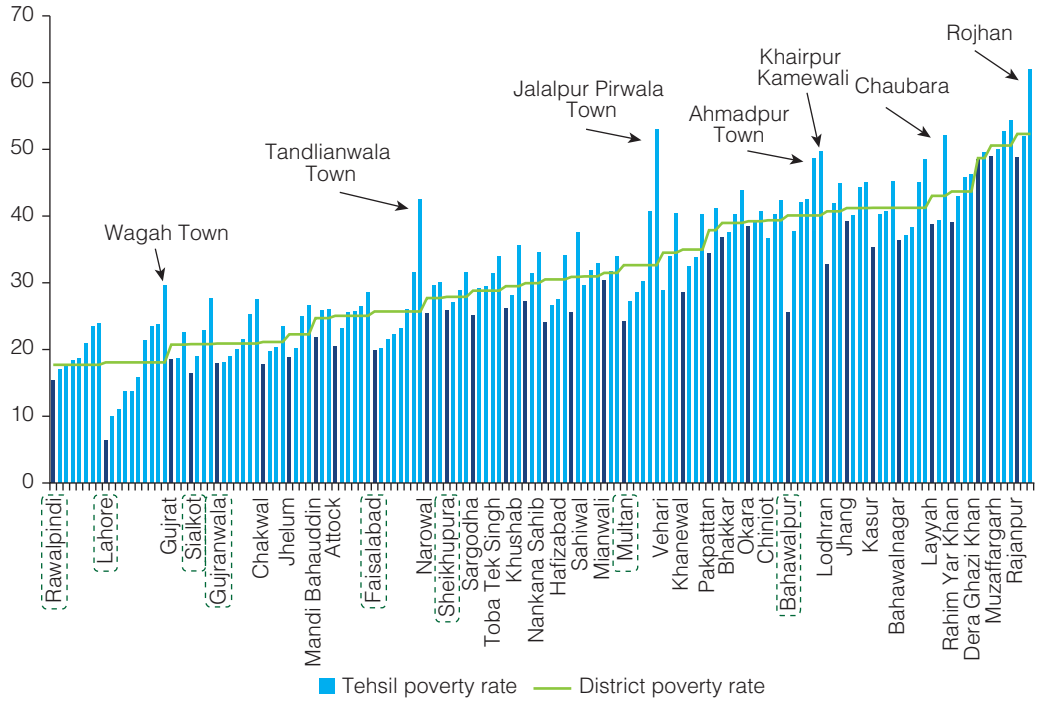
It is possible to drill down to a lower administrative level only in Punjab (using the 2011 MICS survey). Figure 1.9 shows poverty rates by **tehsil** in Punjab for the year 2011. This shows that districts that include large cities (Lahore, Rawalpindi, Faisalabad, Gujranwala, Sargodha, Sialkot, Multan, and Bahawalpur) have much greater within-district inequality than districts that do not. For instance, Wagha Town in Lahore and Tandlianwala Town in Faisalabad had poverty rates of 30 percent and 43 percent, respectively, towering over their district averages of 17 percent and 26 percent and Jalalpur Pirwala Town in Multan,

Map 1.2: Changes in District Poverty and the District's Urban Share between 2006 and 2014



Source: 2004/05 and 2013/14 Household Integrated Economic Survey (HIES), 2006/07 and 2014/15 Pakistan Social and Living Standards Measurement Survey (PSLM), and World Bank Staff Calculations.
Note: pp = percentage points.

Figure 1.9: Poverty Rates by Tehsil in Punjab, 2011



Source: 2010/11 Punjab Multiple Indicator Cluster Survey (MICS), 2010/11 Household Integrated Economic Survey (HIES), and World Bank Staff Calculations.

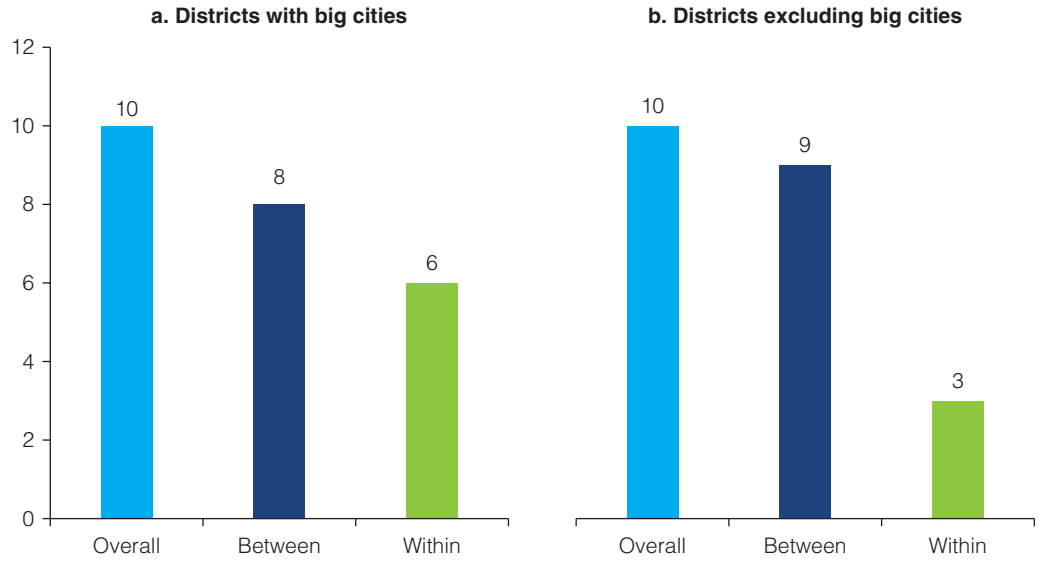
with a poverty rate of 53 percent, was much poorer than the district average of 33 percent. Consistent with this, figure 1.10 shows that within district variation is larger in districts that include a large city.

Poverty reduction or other service delivery efforts that focus only on poorer districts are thus likely to miss pockets of poverty located in better-off districts. Policies focusing only on poorer districts may also miss a large number of poor living in richer but more populous districts. Poverty data at a more granular level seems to be necessary for better policy targeting.

Taking population into account, a large share of Pakistan's poor lives in well-off districts in Punjab and Sindh, particularly Karachi, Faisalabad, and Lahore. Karachi, for example, was the third-richest district in Pakistan in 2014/15, but despite its low poverty rate of 8.9 percent its large population share meant that 2.5 percent of the country's poor lived there. Similarly, Lahore, the sixth-richest city, was home to 2.2 percent of Pakistan's poor. Together, these two cities account for almost as many poor people as the 10 poorest districts, where poverty rates are six or seven times higher. Targeting areas with high poverty rates is important, especially when interventions and resources can be managed at the local level. However, there is a benefit in targeting hot spots with large numbers of poor people if public services can be provided to densely populated areas at a much lower cost (map 1.3).

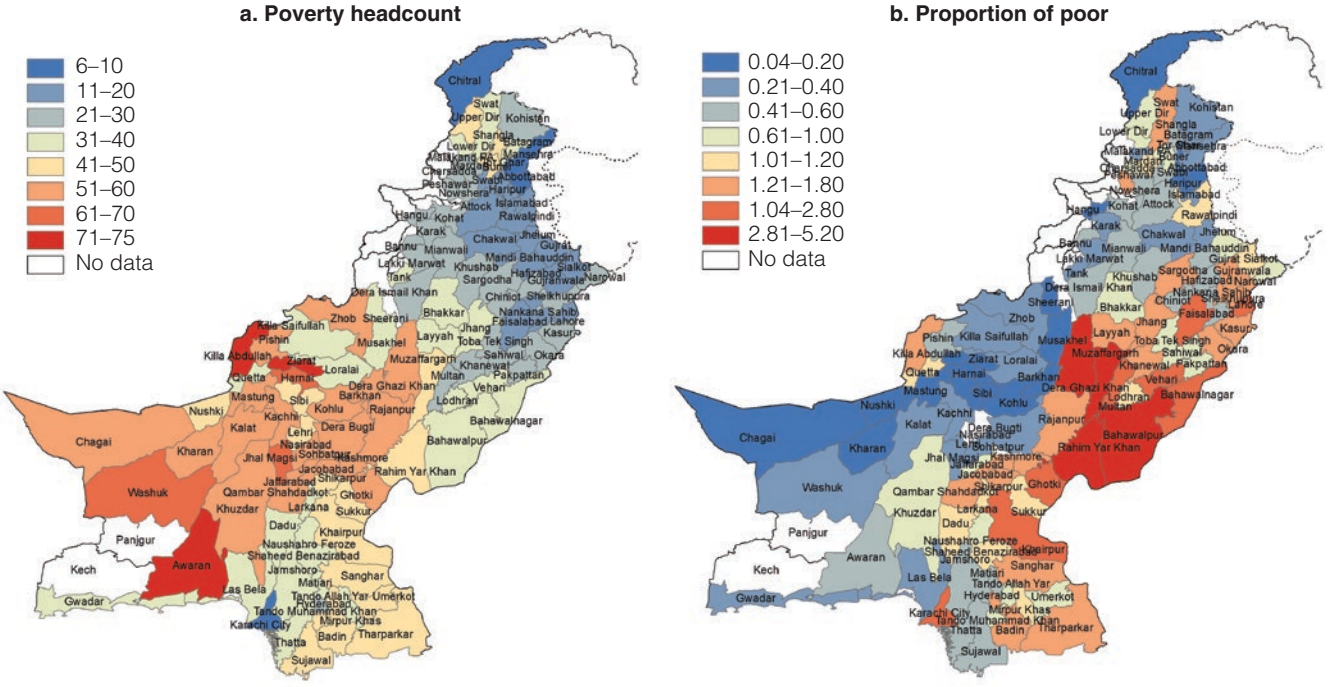
Every province also has a few districts in which little or no progress in poverty reduction occurred in this period (figure 1.11). They include Awaran, Washuk, and Ziarat in Balochistan; DG Khan and Rajanpur in Punjab; Upper Dir in KP; and Ghotki, Jacobabad, Kashmore, Qambar Shahdakot, and Tharpakar in Sindh.

Figure 1.10: Within and across District Variation in Poverty Rates, Punjab, 2011



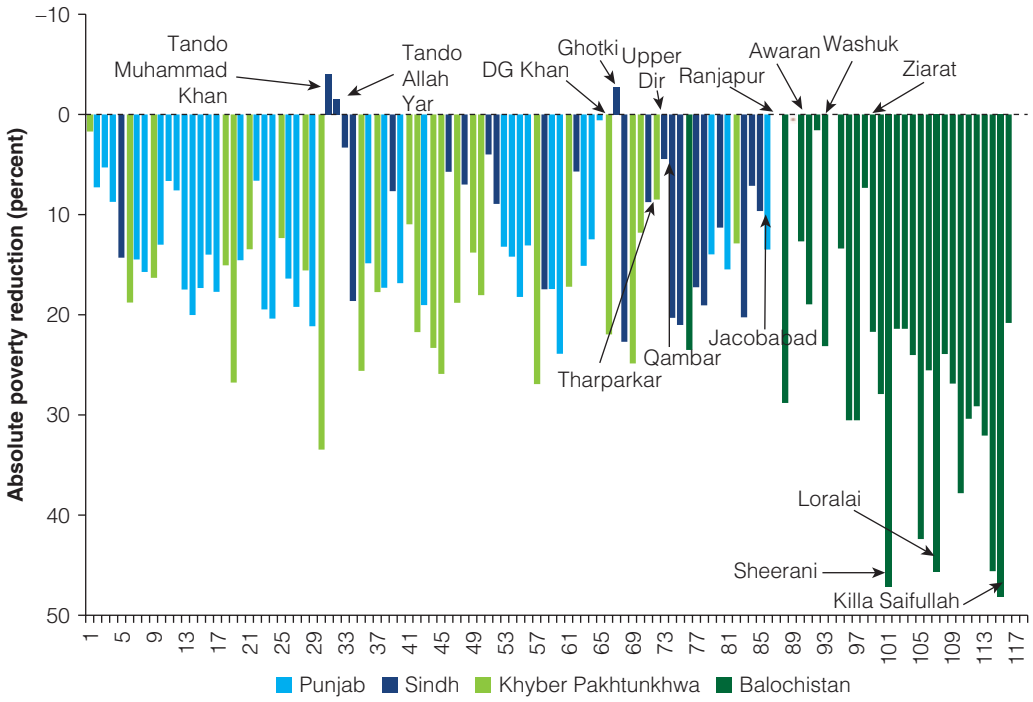
Source: 2010/11 Punjab Multiple Indicator Cluster Survey (MICS), 2010/11 Household Integrated Economic Survey (HIES) and World Bank Staff Calculations.

Map 1.3: Poverty Rate and Proportion of Poor by District, 2014/15



Source: 2013/14 Household Integrated Economic Survey (HIES), 2014/15 Pakistan Social and Living Standards Measurement Survey (PSLM) and World Bank Staff Calculations.

Figure 1.11: Poverty Reduction by Districts, 2014–15, Ranked by their 2006 Poverty Rate



Source: 2004/05 and 2013/14 Household Integrated Economic Survey (HIES), 2006/07 and 2014/15 Pakistan Social and Living Standards Measurement Survey (PSLM) and World Bank Staff Calculations.
Note: Districts are sorted from richest to poorest, based on their 2006/07 poverty rate.

In addition, several high-poverty districts experienced very small gains in poverty relative to others and consequently fell in the national poverty ranking of districts. Among districts with poverty reduction of less than 5 percentage points between 2006/07 and 2014/15 are six in Sindh (Ghotki, Matiari, Qambar Shahdadkot, Tando Allah Yar, Tando Muhammad Khan, and Umerkot) and one in Punjab (Dera Ghazi Khan). These districts, among the poorest in Pakistan, will likely require more targeted policy attention.

Notes

1. These figures are based on the poverty line announced by the government in April 2016. The line represents an expenditure level of Rs. 3,030 per adult equivalent per month. The new poverty line replaced the 2001 poverty line. As expected, it yields a much higher poverty rate, both nationally and provincially. However, the trend in poverty remains virtually unchanged regardless of the line used. The poverty rates in figure 1.1 were obtained by back-casting the 2013-14 line using the survey-month weighted consumer price index (CPI). See Fatima and Mansuri (2016).
2. The most recent data (2015-16 Household Integrated Income and Consumption Survey [HIICS]) shows a further 5.2 percentage point decline in poverty between 2013-14 and 2015-16.
3. The 2015-16 HICCS shows a continuation of this trend. Headcount poverty in KP and Punjab dropped sharply by 9 and 5 percentage points, respectively, between 2014 and 2016. With this, KP completely closed its poverty gap with Punjab. At the other end, Balochistan remained the poorest province in the country with a headcount poverty rate of 42.2 percent, despite experiencing the highest poverty reduction (14.6 percent points) over this period. Sindh, in contrast, saw virtually no decline in poverty over this period.

4. The between-province standard deviation measures the variation of the province-average district poverty rates; the within-province standard deviation measures the variation of the differences between district poverty rates and their corresponding province averages.
5. The equalizing trend across districts may be underestimated, because districts do not remain constant over time. Because of administrative changes, new districts were created or split off from larger districts. In the analysis, the newly created districts were assigned the poverty rates of their parent district. As many of the new districts were formed by splitting off a district's poorer *tehsils*, the actual reduction in poverty in newly formed poorer districts could be underestimated and the decrease in poverty in the original and richer districts overestimated. For a list of the newly formed districts and a discussion of their origins, see the District Poverty Report (Mansuri, and Doan 2018).
6. The many changes in district boundaries and district composition between 2001 and 2006 make it difficult to trace today's districts to districts in 2001. The year 2006/07 was therefore chosen as the start year for the calculation of poverty changes at the district level.
7. The standard deviation is calculated as the square root of the average square deviation of each district's poverty rate from the national average. It indicates the dispersion of district poverty rates across the country: The higher the deviation, the higher the spread.
8. The map excludes districts that changed boundaries during the period, because the original urbanization rate of the district could not be calculated.

References

Elbers, C., J. O. Lanjouw, and P. Lanjouw. 2003. "Micro-Level Estimation of Poverty and Inequality." *Econometrica* 71 (1): 355–64.

Fatima, Freeha, and Ghazala Mansuri. 2016. "Measuring Poverty in Pakistan: A Methodological Note." Mimeo. World Bank, Washington, DC.

Mansuri, Ghazala, and Dung Thi Thuy Doan. 2018. "District Poverty Dynamics in Pakistan: A Methodological Note." Mimeo. World Bank, Washington, DC.

Chapter 2
Water, Sanitation, and Poverty: A First Look

Key Messages

- Over the last decade, Pakistan has seen a substantial improvement in access to water and sanitation along with a sharp decline in open defecation. Some 90 percent of households have access to what is labeled as "improved" water and some 73 percent have access to "improved" toilets.

- These aggregate figures hide enormous variation, however, in the quality and safety of water and sanitation infrastructure

    - Only 25 percent of households have access to piped water, most are urban dwellers. The rest, disproportionately rural, rely mainly on self-provided hand pumps and motorized pumps or at the worst on unprotected water sources.

    - Only 22 have access to toilets connected to underground sewer systems, and most are again urban. The rest, rely on toilets connected to septic tanks, mainly in the better off districts of Punjab and KP. In Sindh and Balochistan, the vast majority of rural dwellers, more than 75, percent rely on much lower quality, barely improved, latrines. The majority of rural dwellers and many urban dwellers also rely on unsafe and unsanitary open drains.

    - The poorest are the most deprived everywhere. They are most likely to practice open defection or use low-quality sanitation facilities and draw water from unimproved sources.

- Aggregate access statistics also hide large disparities between urban and rural dwellers and across richer and poorer districts, not all of which is accounted for by disparities across provinces.

- Public service delivery in both water and sanitation seems to be failing across the board. There is little evidence of any public engagement in water or sanitation provision in rural areas. They seem to be basically fending for themselves. But, even among urban dwellers, things look dismal. Public piped water coverage has actually declined overtime and piped water has become more unreliable in terms of hours of service, particularly in Sindh and Balochistan, leading to greater reliance on water tankers or private motorized and hand pumps, in places where ground water extraction is economically feasible.

This chapter discusses Pakistan's performance on access to water supply, sanitation, and hygiene (WASH). Data for monitoring access to WASH has focused almost entirely on what has been labeled as "improved" water and sanitation under the Millennium Development Goals (MDGs). Essentially, this is measured as access to a drinking water scheme close to households (ideally within the dwelling) and the elimination of open defecation through latrines/toilets that, in principal, secure human waste from human touch, thereby preventing contamination.

On these limited measures, as this chapter will show, Pakistan has done reasonably well. Access to "improved" water and sanitation has expanded considerably over the past decade and half, and open defecation has declined. However, large gaps in access remain between urban and rural dwellers and across provinces. Inequitable access is also evident across districts, and not all of it is accounted for by disparities across provinces. Finally, poorer households do much less well everywhere.

Equally importantly, though, these measures can tell us little, if anything, about the safety of the water being provided, or the ability of the toilets built to ensure the safe management of human waste. The third aspect of WASH, hygiene behavior at the household or community level, has been almost entirely neglected in national household surveys.

Pakistan is not alone in this narrow approach. This is largely a reflection of how the MDGs were translated into policy in many cases—with a large, and often exclusive, focus on ending open defecation and ensuring water near dwellings. The data collected on the sector to meet reporting requirements reflects this emphasis.

In the chapter to follow, the report discusses Pakistan's performance on WASH access when the safe management of water and human waste is taken into account. It shows that the vast majority of the WASH infrastructure in place is of extremely poor quality—providing neither safe water nor the safe management of human waste. Instead, as the analysis shows, it has helped exacerbate a host of health issues related to poor quality or absent sanitation. Of these, the most egregious is the incidence of diarrhea, stunting and morbidity among young children, which is at crisis levels across Pakistan.

Monitoring Access: "Improved" versus "Safely Managed" Water and Sanitation

To allow for international comparability and monitoring of the MDGs, 1990–2015,[1] the World Health Organization (WHO)/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation established a standard classification to differentiate between "improved" and "unimproved" drinking water sources and sanitation facilities.[2] It defines an improved drinking water source as one that, by nature of its construction or through active intervention, is protected from outside contamination, in particular contamination with fecal matter. It defines an improved sanitation facility as one that hygienically separates human excreta from human contact.

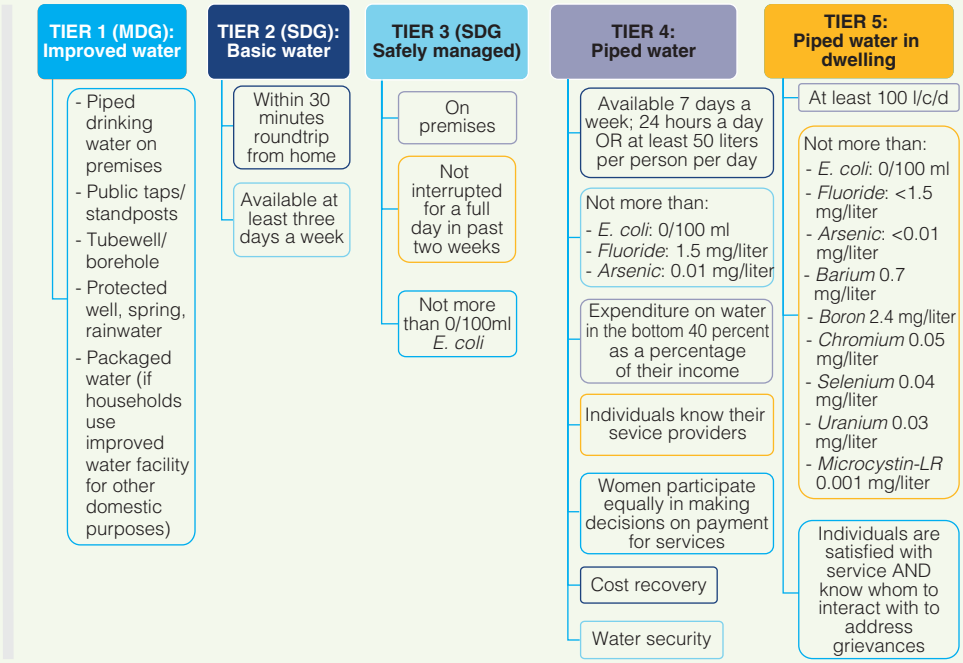
Although the definitions of improved water and improved sanitation imply both access and quality, conventional monitoring, as discussed above, has focused almost entirely on access and use.

Monitoring Access to Water

Box 2.1 describes the monitoring framework the report uses to evaluate access to water.[3] The definition of Tier 1 in water is referred to as "improved" in the MDG timeframe.[4] A dataset with Tier 2 information is required to have adequate information on both (a) whether households are drinking from an "improved" source, and (b) whether the source is within 30 minutes roundtrip of the dwelling. Tier 3 matches the new core SDG indicator "safely managed."[5] Datasets that allow assessment of whether a household has safely managed drinking water must have information not just on whether the source is improved, but also on whether it is located within the household, available when needed, and free of contamination (defined as 0/100 ml *E. coli* bacteria).[6]

Tiers 4 and 5 require that the sector also be sustainable in terms of cost recovery, that piped and safe water be available 24 hours a day to everyone, and that appropriate accountability

Box 2.1: Access Plus Categories for Water



structures be in place to ensure high-quality service delivery. While these requirements may be aspirational for developing countries, they are important for monitoring access and quality as countries move up the tier ladder.

The only nationally representative household survey in Pakistan that contains both WASH information and the data necessary to measure poverty is the Household Integrated Economic Survey (HIES). This allows for the measurement of access at Tier 1 only. The Pakistan Social and Living Standards Measurement (PSLM), has very similar information on WASH, but is district representative, allowing for the use of small area estimation to measure district level poverty, thus allowing for a more granular assessment of access at Tier 1.

As of now, no national survey in Pakistan provides information on Tier 3 indicators, including the MICS and DHS, since they were not required for MDG monitoring. To look at WASH access, therefore, we focus on the Tier 1 “improved” definition.

For Tier 1, both surveys ask what the main source of drinking water is for the household. However, some categories in the surveys are not clearly improved according to the definition. For example, the surveys record whether the household uses spring water but does not identify whether the spring is protected. Among households that use bottled water for drinking, it is not clear whether they also use improved water for other domestic purposes. SDG classifications now generally consider all bottled water to be improved. Given the data available, households whose main source of drinking water is a pipe, a pump, bottled water, a covered well, or a filtration plant are considered as having access to improved water.

For Tier 2, the HIES and PSLM provide information on the time it takes to reach the source of drinking water. For Tier 3, PSLM does not provide any information, i.e. whether the water is on

premises, not interrupted for a full day in the past two weeks, and not contaminated with *E. coli*. It does provide limited information of interruptions experienced by households with piped water. HIES indicates whether the water source is on premises but lacks all the other conditions. For Tier 4, the PSLM identifies whether the household uses piped water, and the HIES indicates the presence of piped water and the number of hours water is available, but neither survey provides information on the other criteria. For Tier 5, other than piped water, the PSLM offers no information on the criteria of this tier. The HIES has data only on one condition: whether the piped water is inside the dwelling.

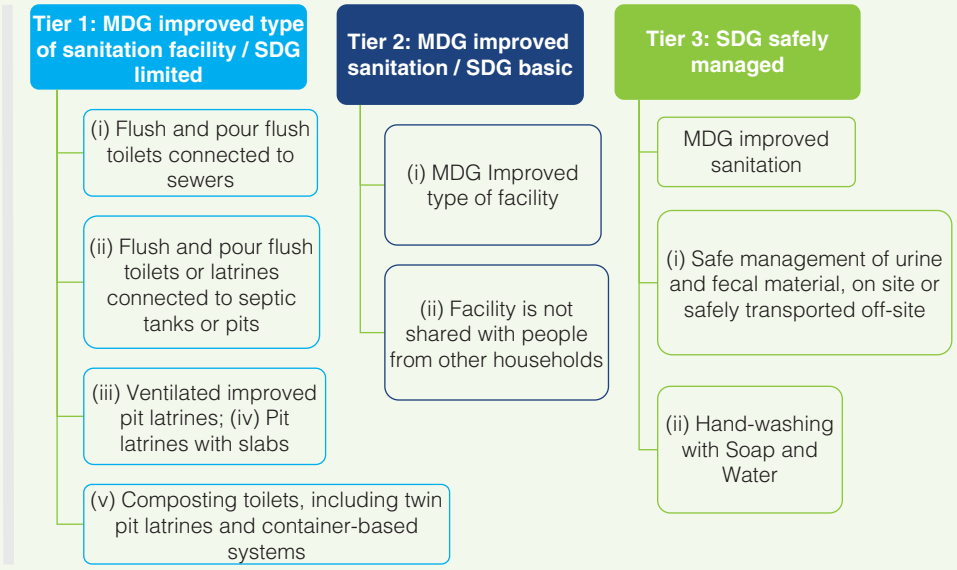
Monitoring Access to Sanitation

Box 2.2 describes the monitoring framework used for sanitation. Tier 1 classifications are based only on data about the type of sanitation facility used – the facility must be of an MDG-improved type. Under SDG classifications, this helps determine whether access is at least "limited." A Tier 2 dataset also allows analysis of whether the household has private use of the facility, thus allowing analysis according to the MDG classification access to "improved sanitation" / SDG classification access to "basic" sanitation. More recently, the JMP has added Tier 3 which focuses on "safely managed" sanitation and critical health behaviors. This shifts the focus squarely towards fecal sludge management (drainage systems and waste treatment).

As discussed above the emphasis in the SDGs on safe management is a necessary and welcome shift in policy focus.

The HIES and PSLM provide sub-optimal information to measure access at tier 1, and lack information beyond that. For Tier 1, both the HIES and the PSLM ask what the household's main toilet facility is. Both surveys provide data on the first two types of toilet facilities in Tier 1 (flush-to-sewer and flush-to-septic tank toilets). pit latrines are also considered improved under Tier 1. Other toilet types which are quite important in some parts of Pakistan, such as flush to

Box 2.2: Access Plus Categories for Sanitation



open drain toilets and dry pit latrines are ambiguous by this definition. More worryingly, a special purpose survey[7] designed to understand the relationship between WASH quality and health indicators like diarrhea and stunting, revealed that pour flush toilets connected to septic tanks are also an ambiguous category. Many households that claimed they had a septic tank, basically had a single pit that was not engineered for the purpose, essentially making it little different than a simple pit latrine. For the purposes of the analysis in chapter 2, all the toilet types labeled improved as per the MDG (Tier 1 definition) are considered "improved."

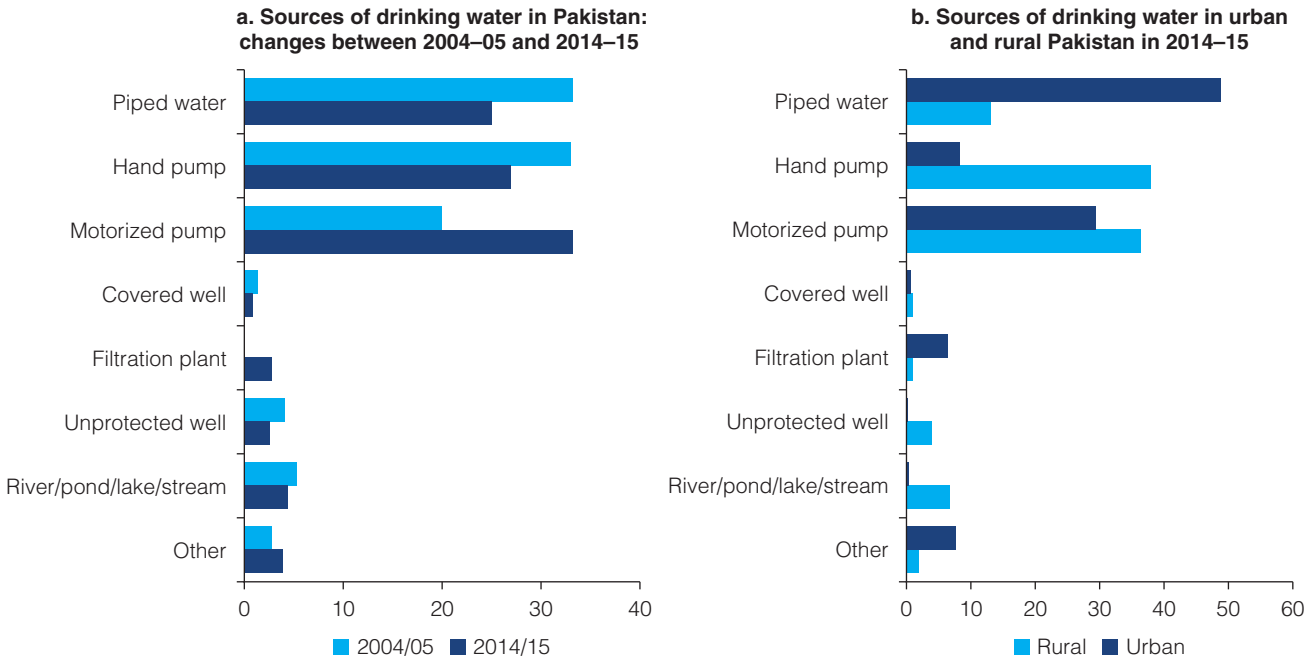
The surveys provide no information on Tiers 2 and 3 indicators: toilet-sharing arrangements or child fecal waste management (the additional checks needed for Tier 2) or fecal waste management of adults, hand-washing practices, and menstrual hygiene practices (the additional conditions needed for Tier 3).

Chapter 3, drops this approach. It uses a special purpose survey which was explicitly designed to understand the relationship between infrastructure quality and water contamination and between infrastructure quality and health indicators like diarrhea and stunting. For this analysis, and the one done using MICS survey which also has child health indicators, like diarrhea and stunting, only pour or flush to sewer and pour or flush to septic tank toilets are included in the improved category to reduce ambiguity.

Access to Water

According to JMP's definition of "improved" water (Tier 1, box 2.1), access to water is relatively high, at about 89 percent, but has shown almost no growth over the past decade. This average statistic masks wide variation in access rates by water source, however. Only 25 percent of households had access to piped water in 2014/15 (figure 2.1). In contrast, some 60 percent self-provided water through the installation of hand or motorized pumps located within the dwelling compound. And some 11 percent continued to rely on completely unprotected sources.

Figure 2.1: Sources of Drinking Water, Pakistan, 2004/05 and 2014/15



Source: Data from the 2004/05 and 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Surveys and World Bank staff calculations.

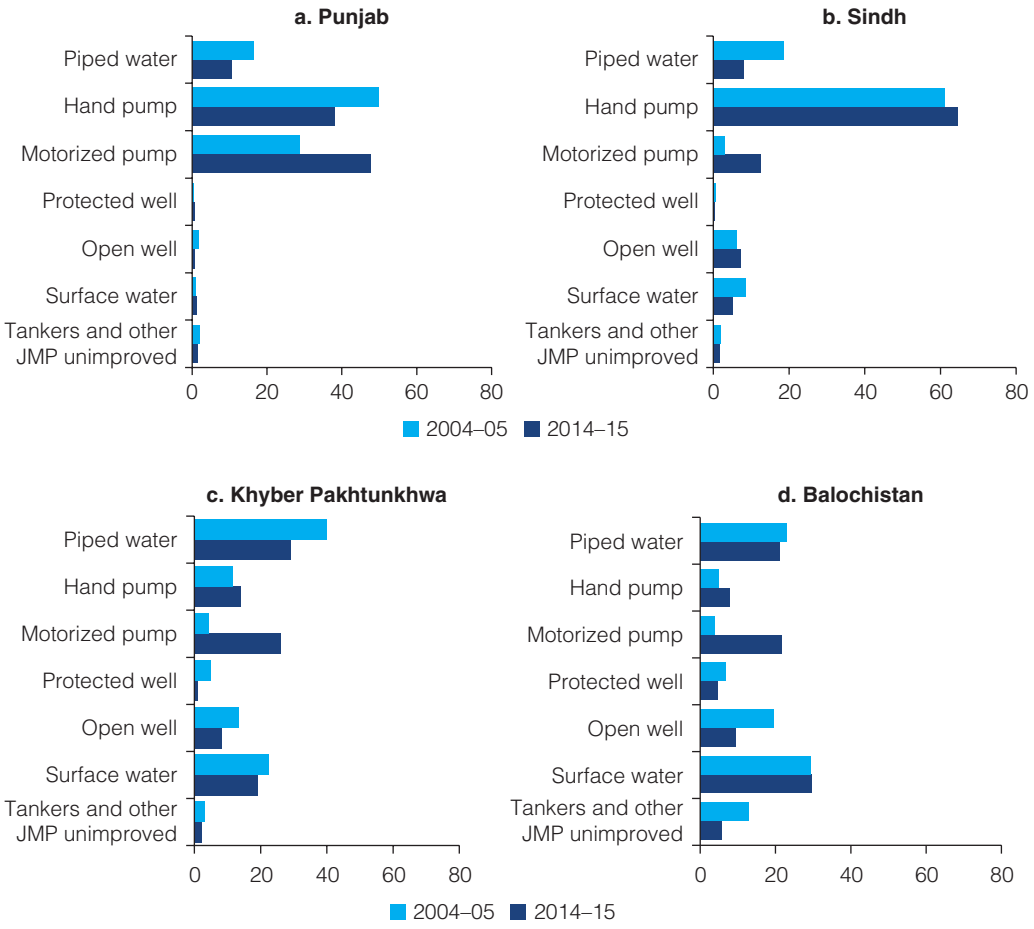
Rural-urban gaps in water access have also persisted. Access to government-provided piped drinking water is almost four times higher in urban areas (48 percent) than in rural areas (13 percent). In urban areas, only 36 percent of households rely on privately provided ground water, in contrast to 73 percent of rural households. In rural areas, some 10 percent of households still get water from unimproved surface sources as compared to about 8 percent in urban areas.

Since the responsibility for the provision of water and sanitation has been transferred in large part to provincial and local governments under the 18th amendment, it is important to examine access at the provincial level and to look at within province variations in access, at the highest local government level, the district, and across rural and urban households.

Access to Water in Rural Areas

Turning first to differences across provinces in access to water among rural households, the first fact that stands out is the decline in access to piped water across rural Pakistan (figure 2.2). Only 11 percent of rural households in Punjab and 8 percent in rural Sindh had access to piped water in 2014–15, down from 16 and 19 percent, respectively, in 2004–05. In rural KP and Balochistan 29 and 21 percent of households relied on piped water in 2014–15, as compared to 40 percent and 23 percent in 2004–05.

Figure 2.2: Access to Water in Rural Areas, by Source and Province, 2004/05 to 2014/15



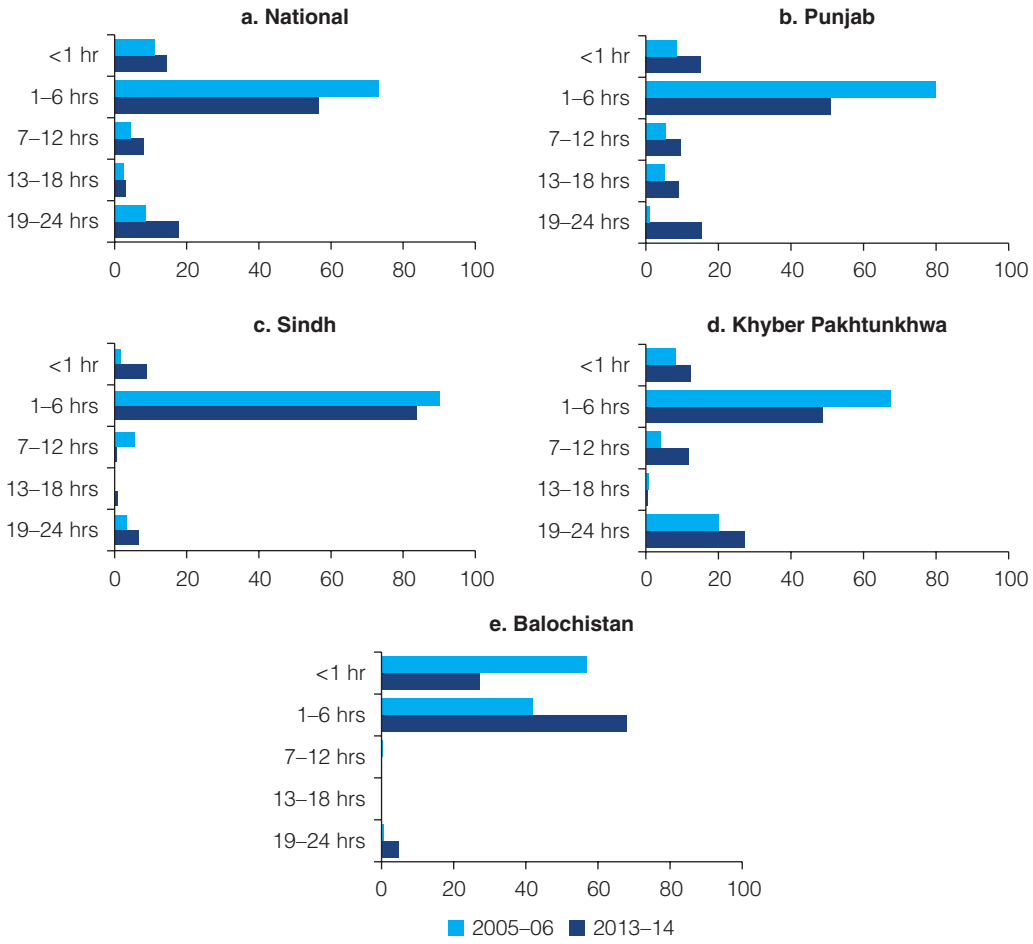
Source: Data from the 2004/05 and 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Surveys and World Bank staff calculations.

Not only is access to piped water low, and declining, in rural areas, reliability of piped water supply, even for those with access, is extremely low. Only 29 percent of households with piped water access had water available for more than 6 hours a day in 2013/14 (figure 2.3). Rural Sindh and Balochistan fare much worse compared with the other provinces. Only 5 and 7 percent of households in rural Balochistan and Sindh, respectively, received water for more than 6 hours a day. The corresponding figures were 40 percent in rural KP and 34 percent in rural Punjab.

As discussed above, most rural dwellers rely on pumps (motorized and hand), which together accounted for about 86 percent of drinking water in rural Punjab, and 77 percent in Sindh, 40 percent in rural KP and 30 percent in Balochistan.

There is also considerable variation across provinces in the use of mechanized versus hand pumps. Rural Punjab, KP and Balochistan rely more on motorized pumps (48 percent, 26 percent and 22 percent of all water sources, respectively) and less on hand pumps (38 percent, 22 percent and 8 percent, respectively). Rural Sindh, in contrast, relied far more on hand pumps (65 percent) and less on motorized pumps (13 percent). This is largely due to a shallower depth to the water table in Sindh.

Figure 2.3: Hours of Availability of Piped Water in Rural Areas



Source: Data from the 2004/05 and 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Surveys and World Bank staff calculations.

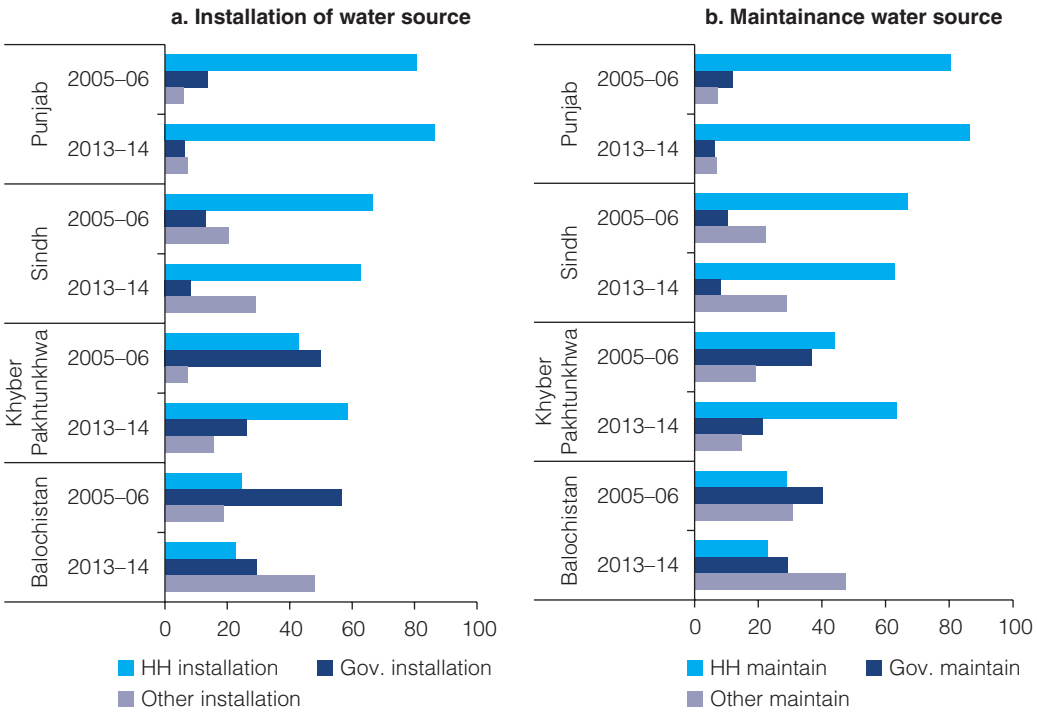
The rest relied mostly on surface water, unprotected (open) wells and tankers. These sources account for just 4 percent of households in rural Punjab, but almost 15 percent in rural Sindh, 31 percent in KP and a whopping 49 percent in Balochistan. While differences in topography, water table depth and even population density could account for some of these large disparities in access, they also have important implications for regional equity in development outcomes that need to be kept in mind.

The decline in access to piped water supply and the quality of piped water delivery, are also evident in the declining role of government in the installation and maintenance of water delivery systems in rural areas (figure 2.4). The decline is particularly evident in Punjab and Sindh. The institutional and governance structures that have contributed to this state of affairs is discussed in Chapter 4.

Access to Water in Urban Areas

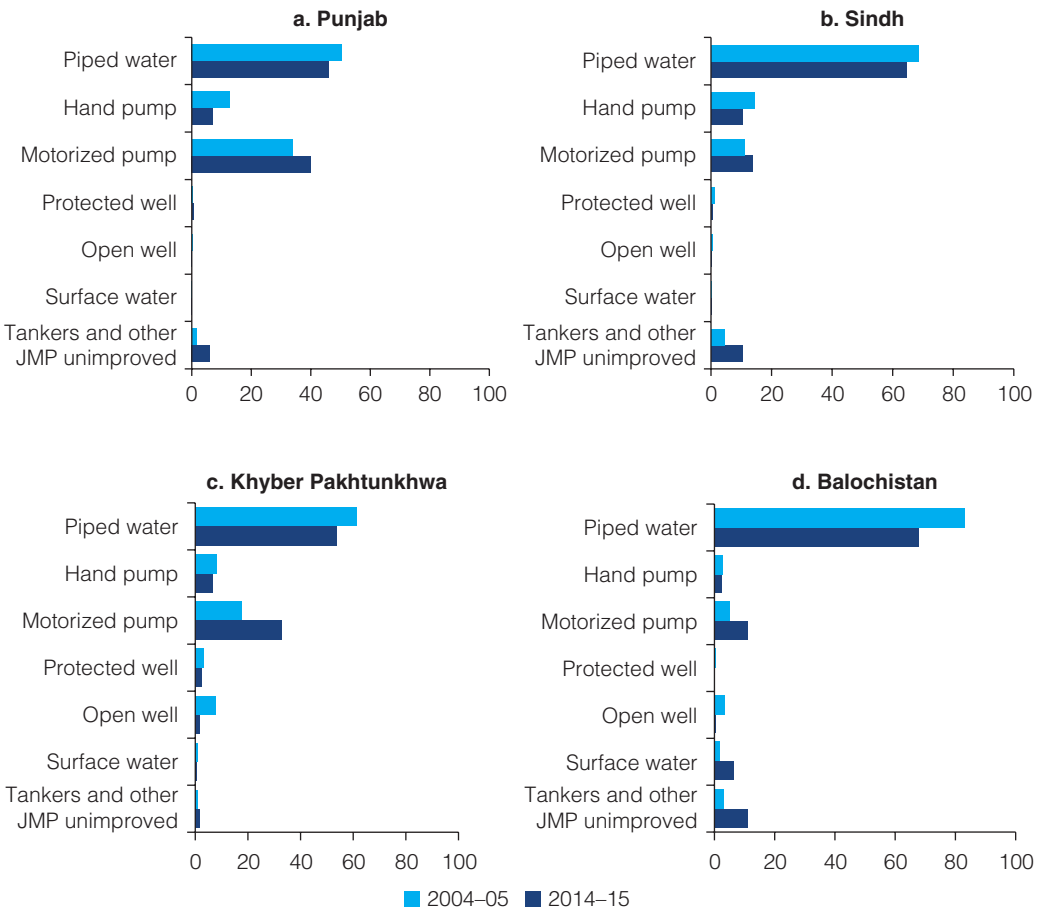
A majority of urban households in all provinces continue to rely on piped water sources (figure 2.5). However, reliance on piped water has been decreasing, replaced by water from motorized and hand pumps and tankers. In 2014/15 access to piped water was highest in urban Balochistan (68 percent) followed by urban Sindh (65 percent) and then KP (54 percent) and finally, Punjab (46 percent) (2.5). Motorized pumps were the second-most common source of drinking water in urban Punjab (40 percent) and KP (33 percent). They accounted for just 14 percent of urban water sources in Sindh and 11 percent in Balochistan. Hand pumps accounted for 10 percent of water sources in urban Sindh, 7 percent in urban Punjab and KP, and just 3 percent in urban Balochistan. Tankers and other unimproved

Figure 2.4: Installation and Maintenance of Household Water Supply Systems in Rural Areas, by Province, 2005/06 to 2013/14



Source: Data from the 2005/06 and 2013/14 Household Integrated Economic Surveys (HIES) and World Bank staff calculations.

Figure 2.5: Access to Water in Urban Areas, by Source and Province, 2004/05 to 2014/15



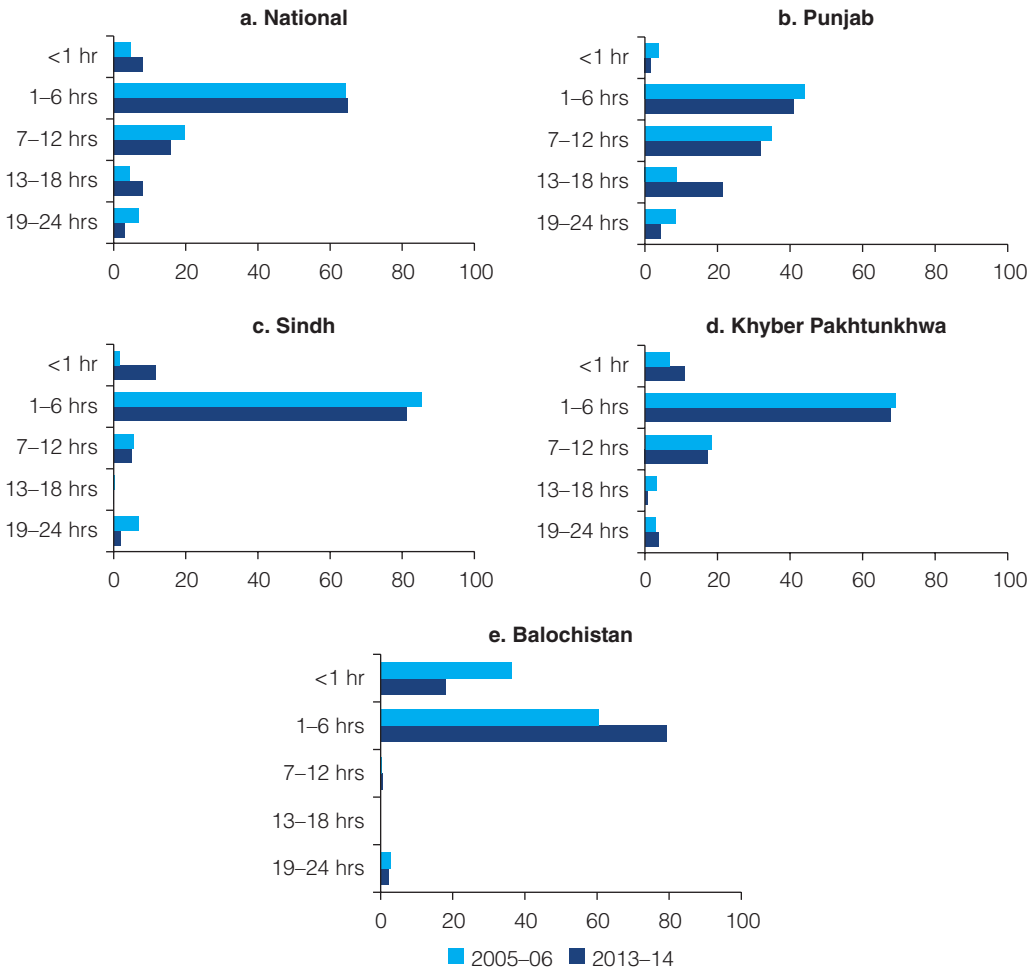
Source: Data from the 2004/05 and 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Surveys and World Bank staff calculations.

sources accounted for 11 percent of water in urban Sindh and Balochistan, 6 percent in Punjab, and 2 percent in KP.

However, simply having access to piped water whether in rural or urban areas says little about the reliability of water supply. Only 27 percent of urban households with piped water had water available for more than six hours a day in 2013/14 (figure 2.6). In Punjab, this number rises to 57 percent, in KP it is 22 percent, while in Sindh and Balochistan, it falls to only 7 and 3 percent, respectively. This implies that the bulk of residents of cities like Quetta, Karachi and Hyderabad, are effectively without publicly provided water though on paper, at least 65 percent of all urban households are connected to a piped water source.

In light of this declining access to piped water, and its shockingly high levels of unreliability, reliance on publicly installed and maintained water services shows an interesting pattern. In Punjab and KP, government installed and maintained water services have declined as private provision through mechanized pumps has risen (figure 2.7). In Balochistan, on the other hand, things have remained more or less constant, reflecting the specific challenge of using ground water there, given its topography. Sindh is the only province where there has been an increase in publicly installed and maintained water services in urban areas, largely reflecting the importance of Karachi, which accounts for the lion's share of urban

Figure 2.6: Hours of Availability of Piped Water in Urban Areas



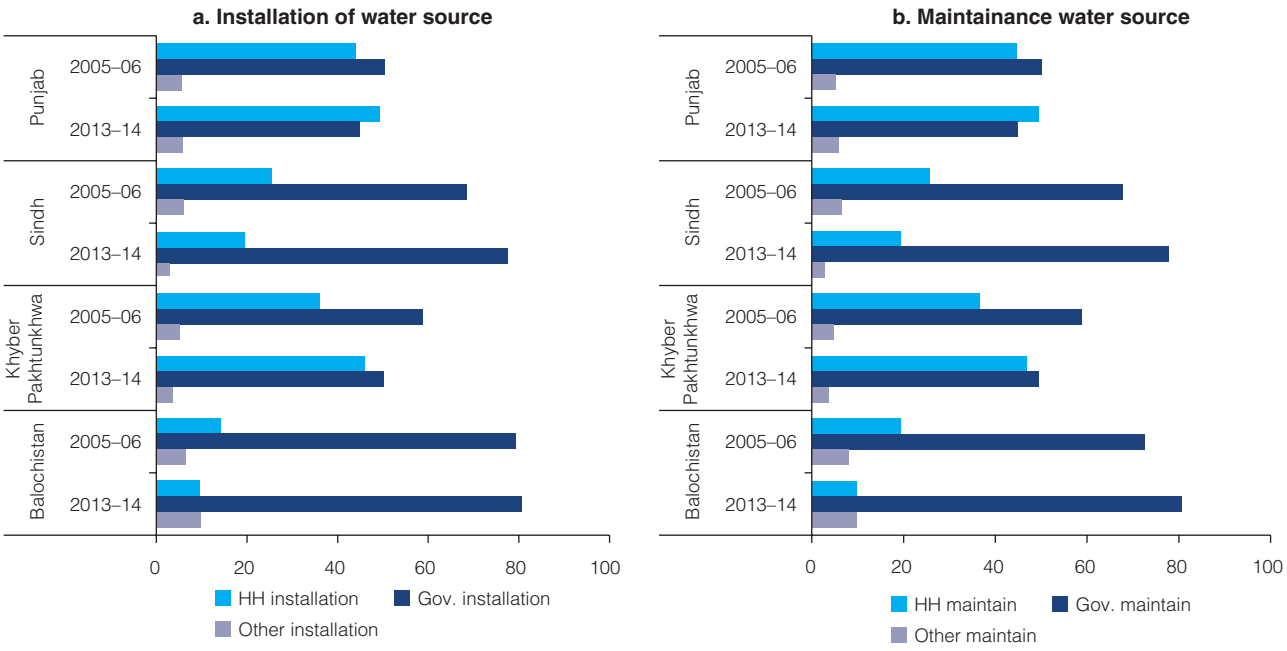
Source: Data from the 2004/05 and 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Survey and World Bank staff calculations.

Sindh and as we show in Chapter 5 also accounts for a lion's share of the overall and the WASH budget of the province in per capita terms. This in combination with the astonishingly low quality of public water delivery in urban Sindh, with only 7 percent of households with piped water reporting that water is available for more than 6 hours a day, suggests that resource use in Karachi and other parts of urban Sindh needs serious review and scrutiny.

Willingness to Pay for Water

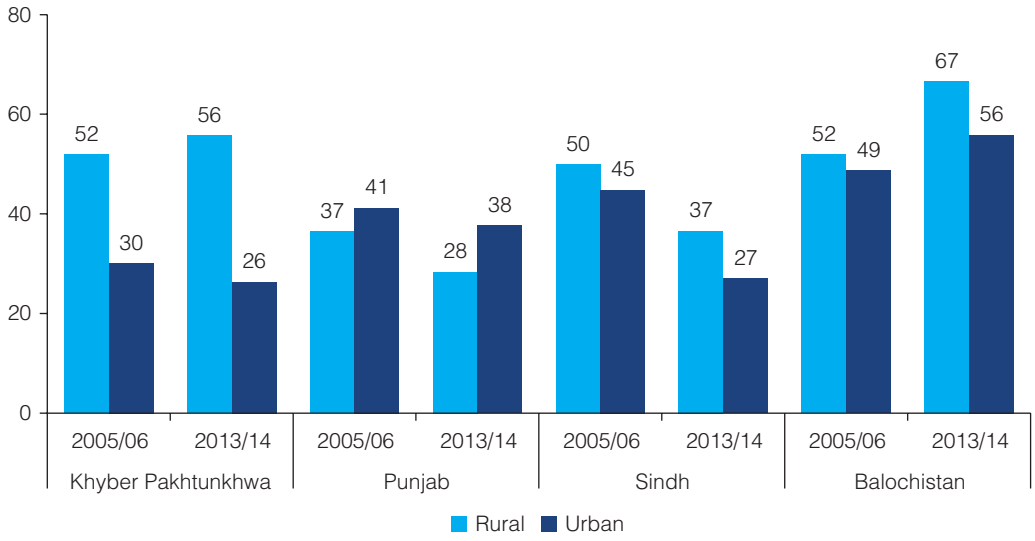
Willingness to pay for water can be seen as either an indicator of need or as an indicator of satisfaction with prevailing water access. There is some variation in reported willingness to pay across provinces (figure 2.8), but it is clear that, overall, willingness to pay has been declining since 2004–05, with the exception of Balochistan, where it remains high, in both rural and urban areas, despite the province having by far the highest levels of poverty in the country. Willingness to pay is also consistently higher in rural, as compared to urban areas, despite lower rural income and consumption levels. Finally, it is useful to note that willingness to pay has declined the most in Sindh. While it is difficult to say precisely what this set of facts capture, what is clearly the case is that publicly provided water service in Balochistan and Sindh, whether in urban or rural areas, is far worse than in the other two

Figure 2.7: Installation and Maintenance of Household Water Supply Systems in Urban Areas, by Province, 2005/06 and 2013/14



Source: Data from the 2005/06 and 2013/14 Household Integrated Economic Survey (HIES) and World Bank staff calculations.

Figure 2.8: Willingness of Rural and Urban Households to Pay for Better Water Supply, by Province, 2005/06 and 2013/14



Source: Data from the 2005/06 and 2013/14 Household Integrated Economic Survey (HIES) and World Bank staff calculations.

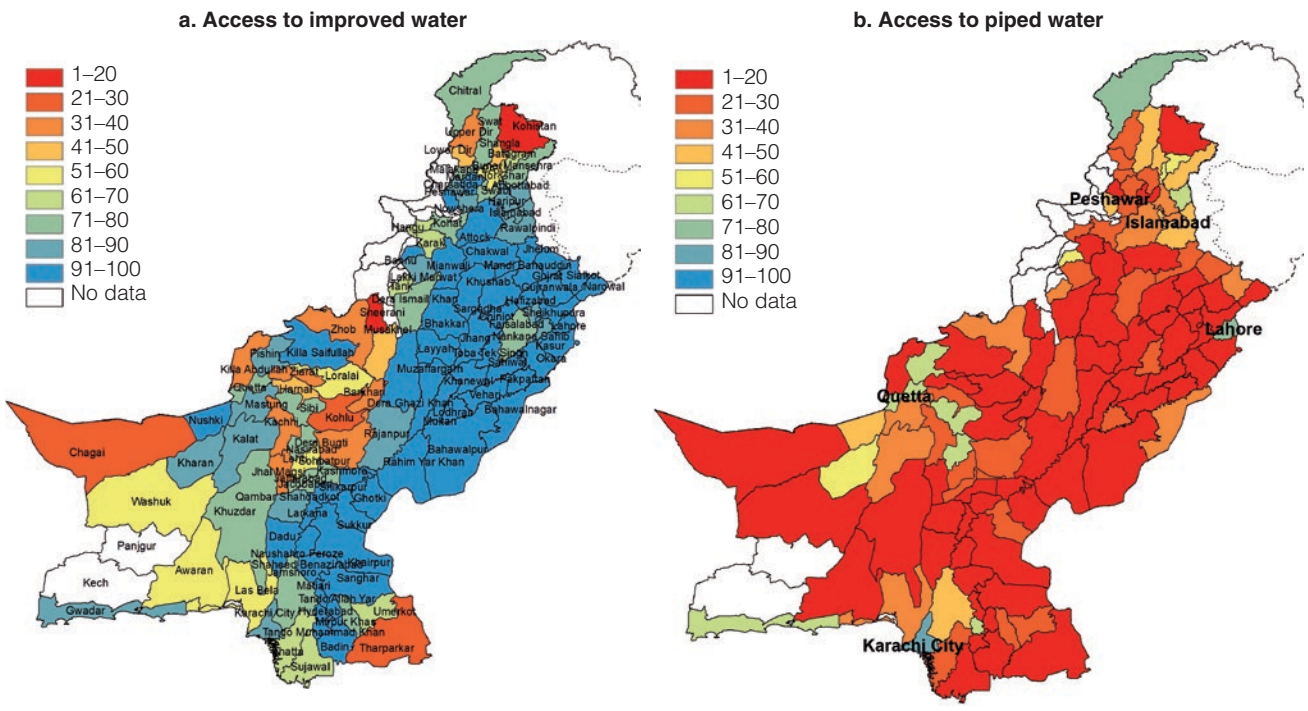
provinces in the country. The difference is that households in Sindh have turned to private alternatives in the form of hand and motorized pumps in rural areas and tankers in urban areas, while the residents of Balochistan, have few private alternatives to public water delivery given the topography of the province and average depth to the water table. This at least explains the high and rising willingness to pay for water in Balochistan, in contrast to the other three provinces.

Map 2.1 drills down further to provide a district level view of water access. Panel a shows access to tier 1 improved water and panel b shows access to piped water. Access is defined in terms of the percent of households covered in the district and the color shifts from red to blue, as the legend indicates, as access rises. Unsurprisingly, the yellows and reds in this map are almost entirely in Balochistan. On basic access, Pakistan looks reasonably good overall, thanks almost entirely to private ground water extraction, which is both unregulated and unmetered, providing essentially unlimited water to those who live in areas with reasonably shallow ground water aquifers. Once we turn to public water provision in the form of piped water, however, as captured in map 2.1 panel b, access plummets, with only Karachi showing as blue, and cities like Lahore, Quetta, Peshawar etc. showing light green. The bulk of the map is red and orange. As discussed above, even this is largely an illusion. Having a piped water connection is no guarantee of reliable water supply.

Access to Sanitation

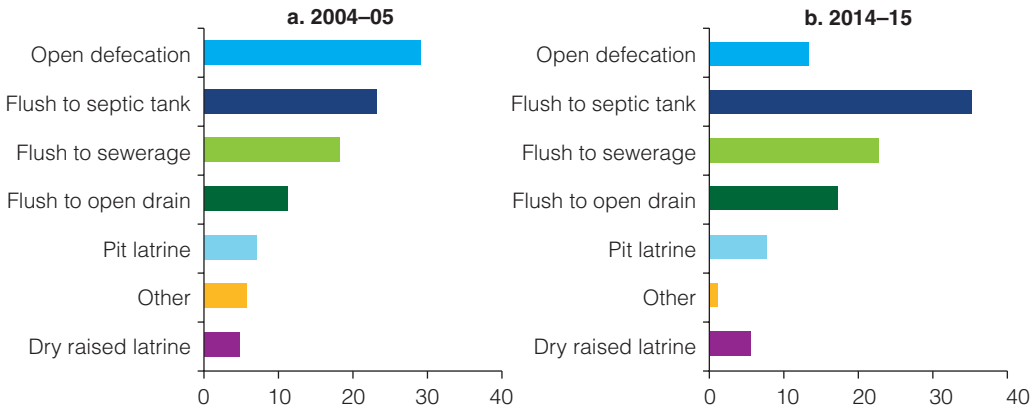
Access to Tier 1 improved sanitation facilities in Pakistan increased substantially over the past decade, and the rate of open defecation plummeted, from 29 percent in 2004/05 to 13 percent in 2014/15 (figure 2.9). However, toilet expansion was achieved mainly by an increase in the number of flush-to-septic tank (up 11 percentage points) and flush-to-open drain (up 7 percentage points) toilets. In contrast, the number of toilets connected to sewer systems grew by only 4 percentage points.

Map 2.1: Access (Percent Households in District) to Water: A District View, 2014–15



Source: Data from the 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Survey (PSLM) and World Bank staff calculations.

Figure 2.9: Types of Toilets, Nationally and in Urban and Rural Areas, 2004/05 and 2014/15

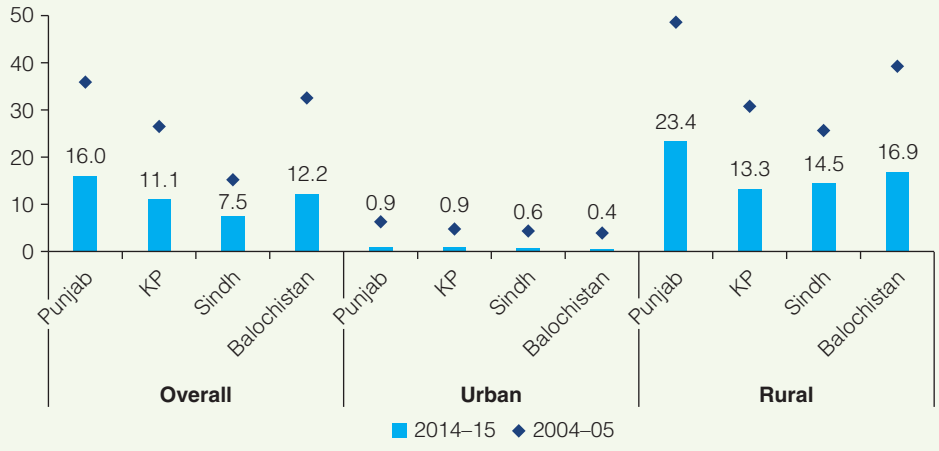


Source: Data from the 2004/05 and 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Survey and World Bank staff calculations.

Box 2.3: Progress Toward Reducing Open Defecation across Provinces

Balochistan and Punjab made the most progress in reducing open defecation in absolute terms, with rates of open defecation falling by 20 and 21 percentage points, respectively, between 2004/05 and 2014/15. However, the incidence of open defecation is still highest in Punjab (16 percent overall and 23 percent in rural areas). About 69 percent of people who practice open defecation live in Punjab, which accounts for about 56 percent of the national population.

Figure B2.3.1: Rates of Open Defecation, by Province, 2004/05 and 2014/15



Source: Data from the 2004/05 and 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Surveys and World Bank staff calculations.

box continues next page

Box 2.3: Continued

Table B2.3.1: Share of National Population and Share of Open Defecation, by Province, 2014/15

Province	Share of national population	Share of open defecation
Punjab	56	69
Sindh	25	15
Khyber Pakhtunkhwa	14	12
Balochistan	5	5

As with access to water, large rural-urban gaps also persist in access to improved toilets. By 2014/15, 74 percent of households in urban areas had access to improved toilets, but this fell to just 46 percent of households in rural areas. Among households with improved toilets, urban areas relied more heavily on toilets connected to a sewerage system, while rural areas had a higher incidence of toilets connected to septic tanks. Among households with unimproved toilets, the share that had pit latrines and flush toilets connected to open drains was about a quarter in urban areas and a third in rural areas.

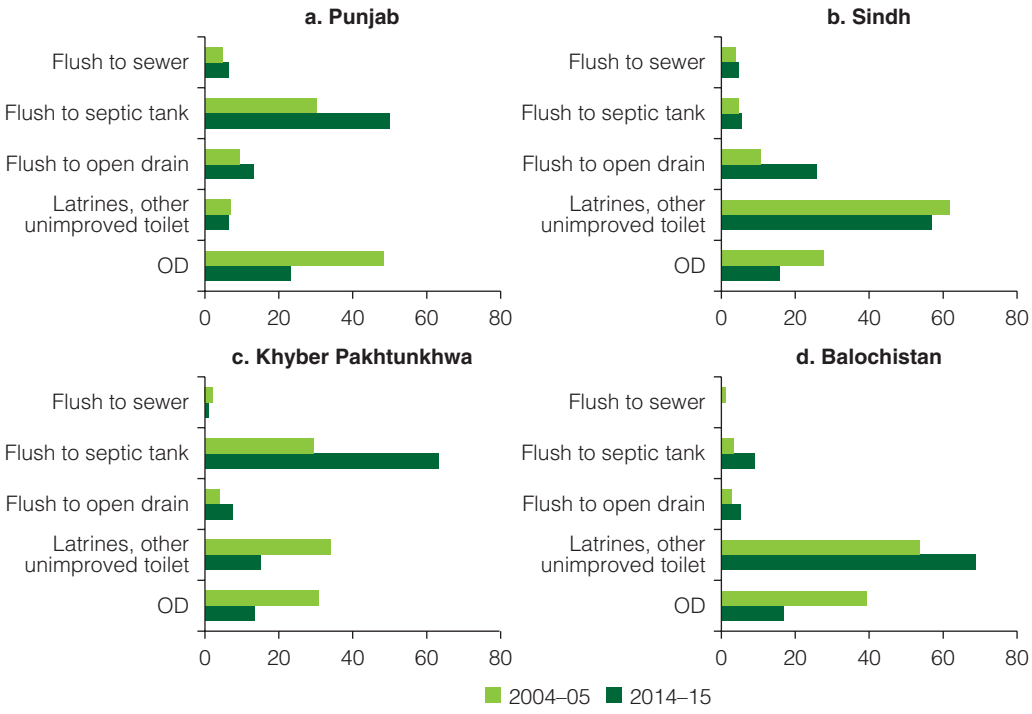
Rates of open defecation are also significantly higher in rural areas. Only 1 percent of urban households practice open defecation, compared to 20 percent of rural households. Figure B2.3.1 and Table B2.3.1 in Box 2.3 describe the variation in open defecation rates across provinces, as well as the burden of open defecation, which falls mainly on Punjab, followed by Sindh, because of their large population sizes. Rural-urban gaps in toilet access also persist within provinces.

Rural Sanitation

In all four provinces, access to flush toilets connected to sewers remains negligible in rural areas (figure 2.10). Sanitation infrastructure in rural KP and Punjab is dominated by flush toilets connected to septic tanks, while rural Balochistan and Sindh rely mostly on flush toilets connected to open drains and pit latrines. In 2013/14 the share of households with access to flush toilets connected to septic tanks was 63 percent in KP, 50 percent in Punjab, but just 9 and 5 percent in Balochistan and Sindh, respectively. Households in rural Balochistan and Sindh rely mainly on unimproved toilet types and pit latrines.

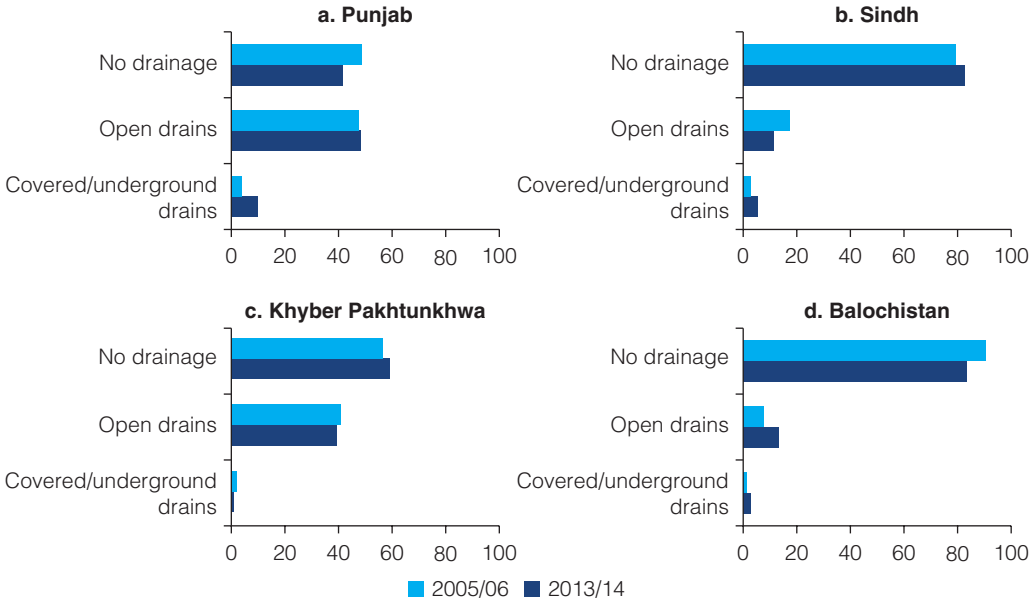
The connection of toilets to drainage systems is a key indicator of toilet safety and quality. On this dimension, Pakistan's rural areas look far more similar. Looking across provinces (figure 2.11), access to covered or underground drains remained virtually absent in rural areas, across all four provinces. The only nonnegligible increase over the decade was in rural Punjab, where the proportion of households with access to covered drains increased by 6 percentage points. Even with this gain, by 2014–15, only 10 percent of households in Punjab, 5 percent in Sindh, 3 percent in Balochistan, and 1 percent in KP had access to covered or underground drains connected to their toilets.

Figure 2.10: Access to Sanitation in Rural Areas, by Type of Toilet and Province, 2004/05 and 2014/15



Source: Data from the 2004/05 and 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Surveys and World Bank staff calculations.

Figure 2.11: Access to Drainage in Rural Areas, by Type and Province, 2005/06 and 2013/14



Source: Data from the 2004/05 and 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Surveys and World Bank staff calculations.

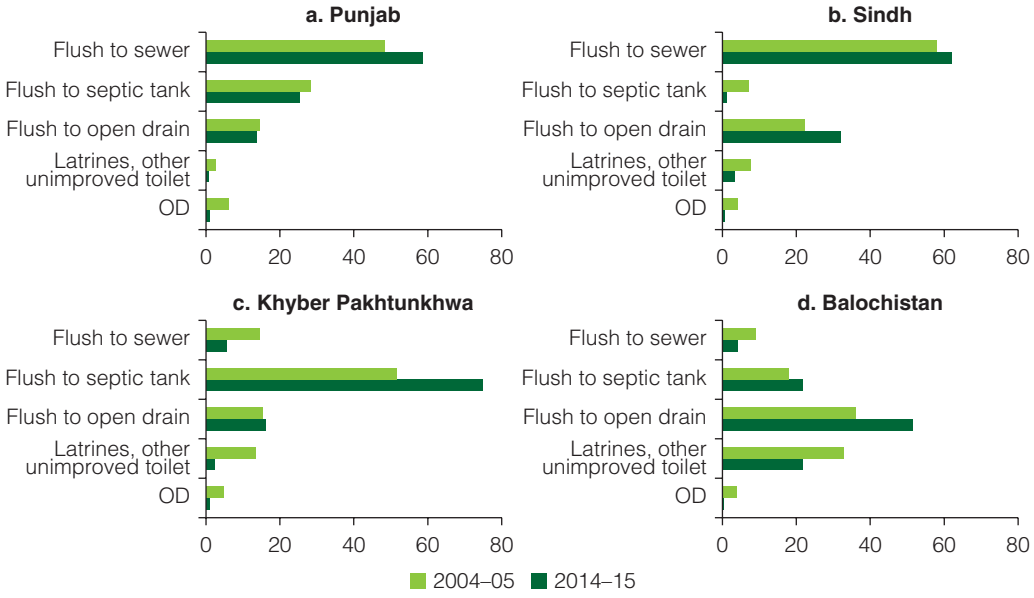
In fact, most rural households had no drainage connection at all in 2013/14. In rural Balochistan and Sindh, more than 83 percent of households had no drains, while in rural KP and Punjab, some 60 percent and 42 percent of households, respectively had no drains at all. The rest were connected to open drains, which are arguably just as, or even more, dangerous from the perspective of the safe management of fecal waste, and pose serious health hazards.

Urban Sanitation

In urban areas, Punjab and Sindh have the lion's share of flush toilets connected to sewers. In Punjab some 59 percent of households had toilets connected to sewer systems. In urban Sindh, that number is at 63 percent. This plummets to just 5.6 and 4.1 percent in KP and Balochistan, respectively. KP relies almost entirely on flush toilets connected to septic tanks, which can be relatively safe if properly engineered, but in urban Balochistan, 52 percent of households have flush toilets which are connected to open drains. These toilets are basically unimproved, since there is no separation of waste matter from human contact. Untreated fecal material flows directly into an open drain. Shockingly, an additional 22 percent of urban households in Balochistan use even more basic "unimproved" facilities (figure 2.12). Overall, 74 percent of urban dwellers in Balochistan rely on unimproved or no toilet facilities. Sindh comes next, with some 36 percent of urban dwellers relying on unimproved sanitation, even at the most basic level. These numbers fall to 19 percent in KP and 15 percent in Punjab.

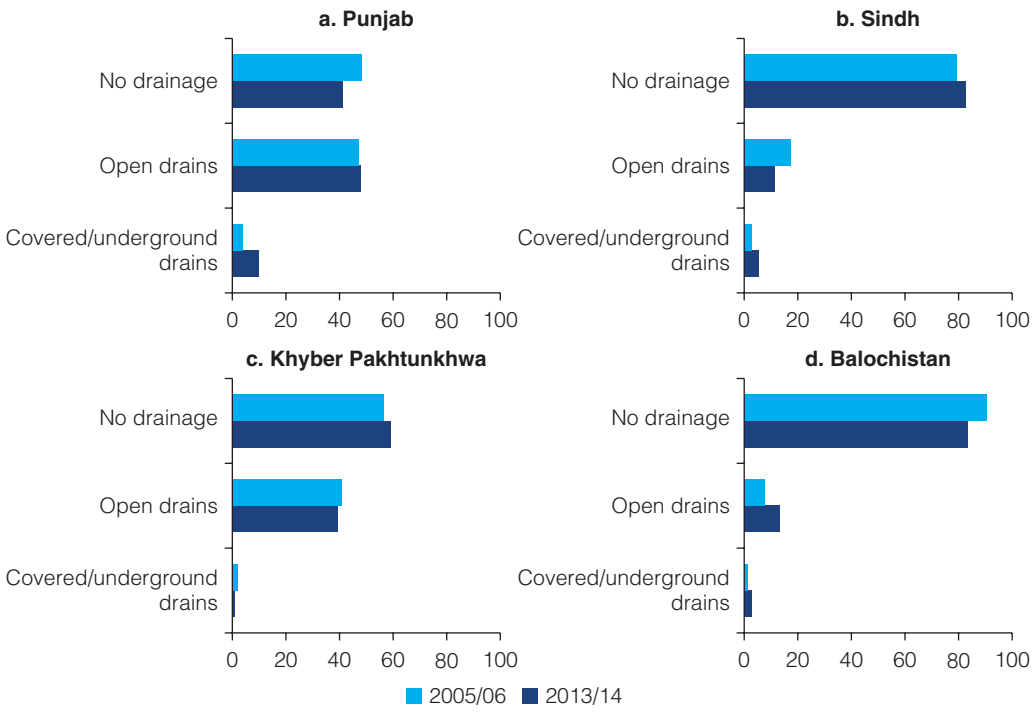
As discussed above, the connection of toilets to drainage systems is a key indicator of toilet safety and quality. On this front, urban areas fare better (figure 2.13), but things are far from adequate. Overall, urban Punjab and Sindh have much greater access to covered underground drains than KP and Balochistan. In urban Punjab, 59 percent of households

Figure 2.12: Access to Sanitation in Urban Areas, by Type of Toilet and Province, 2004/05 and 2014/15



Source: Data from the 2004/05 and 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Surveys and World Bank staff calculations.

Figure 2.13: Access to Drainage in Urban Areas, by Type and Province, 2005/06 and 2013/14



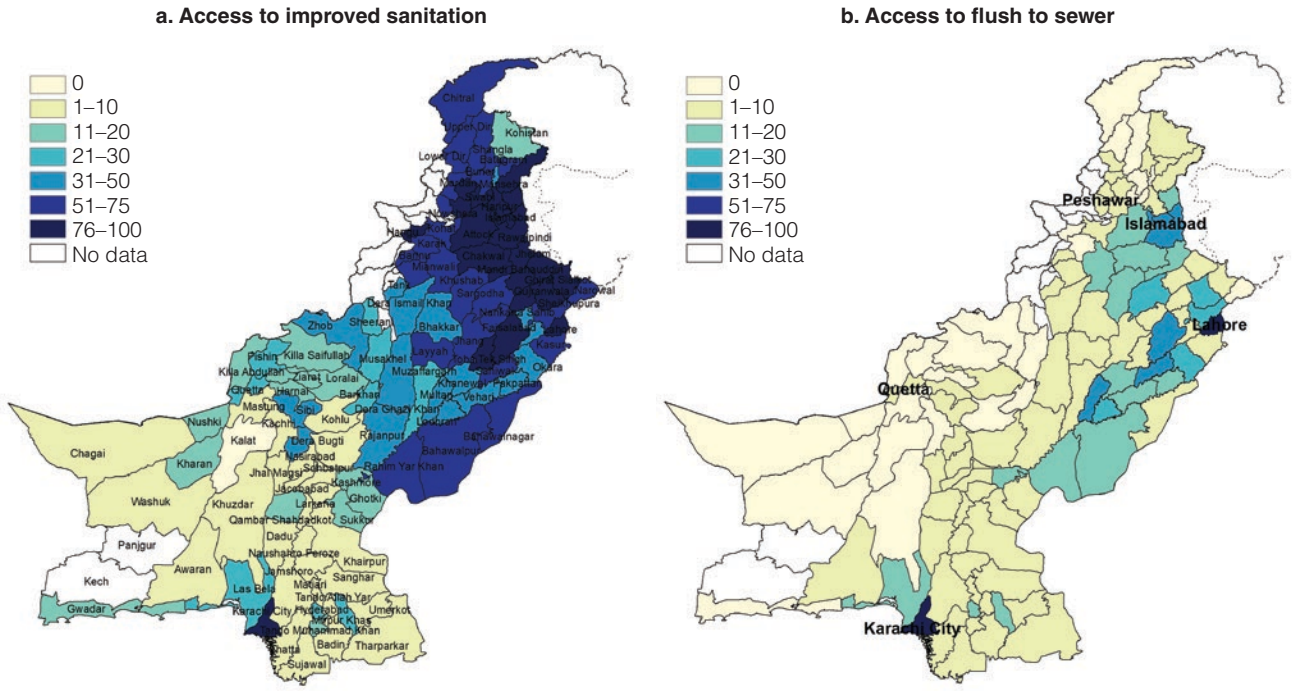
Source: Data from the 2004/05 and 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Surveys and World Bank staff calculations.

had access to underground or covered drains, 35 percent used open drains, and 5 percent had no access to drains in 2013/14. In urban Sindh, 68 percent of households were connected to underground or covered drains, 28 percent used open drains, and 4 percent had no access to drains.

Most households in Balochistan and KP were connected to open drains or no drains. In Balochistan 43 percent of households had open drains, and 25 percent had no drains. In KP 84 percent of urban households had open drains, and 8 percent had no drains. Covered drains were only 8 percent in KP and 32 percent in Balochistan. These figures reveal that, with the exception of, some parts of urban Punjab and Sindh, the increase toilet access in both rural and urban areas has not been accompanied by an increase in the quality of sanitation.

Map 2.2 provides a similar picture as map 2.1 for access to toilets. Map 2.2 panel a shows district level access to tier 1 improved sanitation, whereas panel b shows access to toilets connected to sewer systems. Access is defined in terms of the percent of households covered in the district and the color shifts from yellow to dark blue, as the legend indicates, as access rises. Here a north south divide is clearly apparent as discussed above. With the exception of Karachi, the bottom half of the map is almost entirely yellow with some islands of blue-green. But even the poorest districts of Punjab, such as Rajanpur and Muzaffargarh, do far better than almost any part of Sindh, and certainly much better than Balochistan. Panel a of map 2.2 shows an even more dismal picture. Other than a few islands, basically some big cities in Punjab and Karachi in Sindh, access to flush to sewer toilets is low to non-existent.

Map 2.2: Access (Percent Households in District) to Sanitation: A District View, 2014–15



Source: 2013/14 Pakistan Social and Living Standards Measurement Survey (PSLM) and World Bank Staff Calculations.

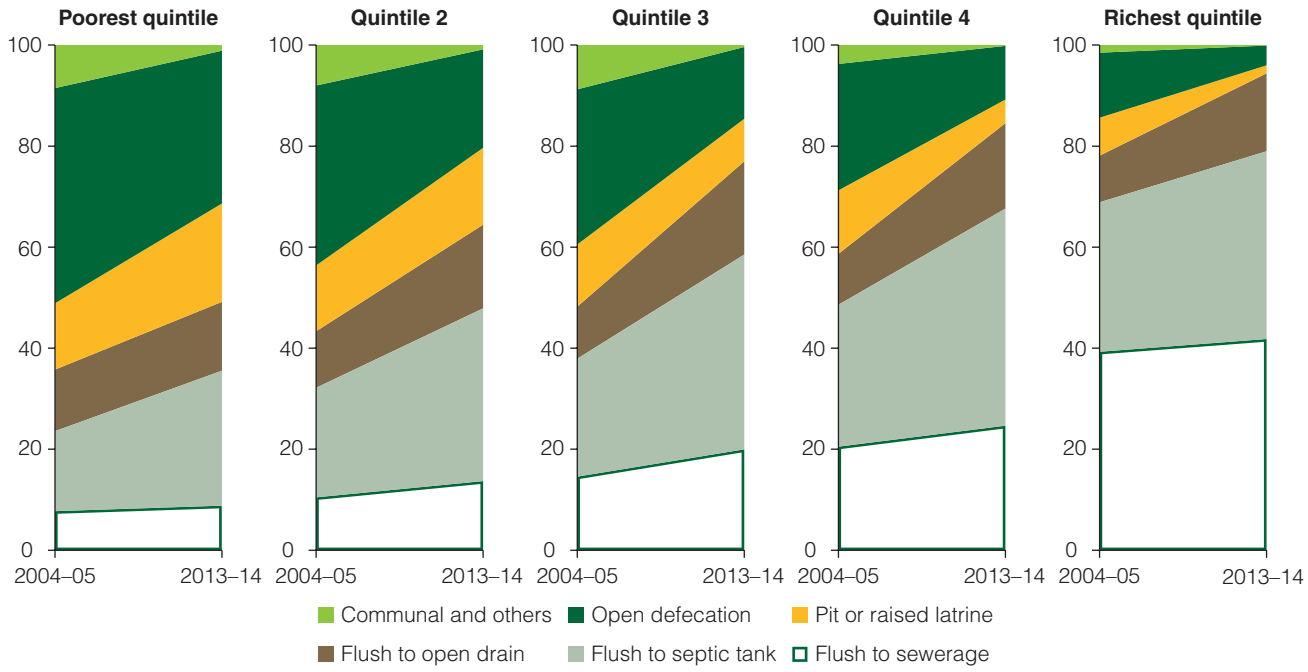
Inequality in Access to Water and Sanitation: A Distributional Perspective

So far, the analysis has examined disparities in access along regional and sectoral dimensions. However, access is also an issue of affordability. Wealthier households are likely to both demand better quality services, whether from government or private providers and to opt out of public services and seek private solutions, if public service delivery fails them.

There are several ways to examine differences in access across households situated at different points in the distribution of income or wealth. In Pakistan, the only reliable data on a household's monetary level of wellbeing is household expenditure, as discussed in chapter 1. This provides the closest proxy to income in available data. By placing individuals in ascending order on the distribution of total expenditure per person per month, we can look at differences in access to water and sanitation by quintile, with the lowest quintile representing the poorest group. We can also group households by whether they belong to the bottom two quintiles of the distribution (Bottom 40) or the top three quintiles (Top 60), to look at the World Bank's shared prosperity indicator. Finally, we can use the national poverty line and look at access from the perspective of the poor and the vulnerable relative to the non-poor. At the district level, such a perspective, as discussed in chapter 1, basically translates into the proportion of district residents below the poverty line. Districts can then be ranked on descending order of poverty, from those with the highest number of poor individuals to those with the smallest number.

Equity in access is reviewed from all three of these vantage points below.

Figure 2.14: Access to Improved Sanitation, by Type and Quintile, National, 2004/05 to 2013/14



Source: Data from the 2005/06 and 2013/14 Household Integrated Economic Survey (HIES) and World Bank staff calculations.

Turning first to a comparison across quintiles of the distribution of expenditure (figure 2.14), it is evident that, nationally, open defecation and the use of pit and raised latrines and flush to open drain toilets is heavily concentrated among the poorest two quintiles. In contrast, flush-to-sewer systems and flush-to-septic tanks are concentrated in the top quintiles. A household in the top quintile, for example, is five times more likely than a household in the poorest quintile to have a flush toilet connected to a sewer.

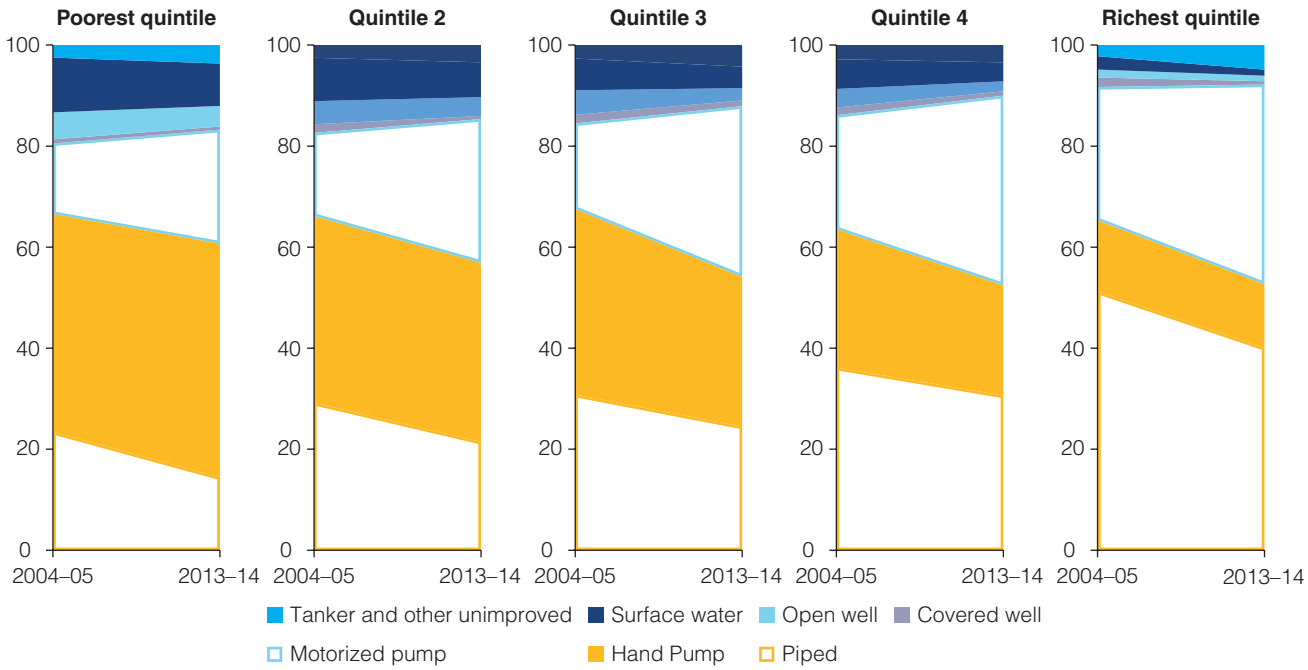
Similarly, figure 2.15 shows that while access to piped water has been declining across the board, access to it is also highly unequal. In 2014/15 just 14 percent of the bottom quintile had access to piped water, compared with 40 percent of the top quintile. In contrast, open well, surface water, and other unimproved water sources were more prevalent among the poorest quintiles.

From the perspective of shared prosperity, table 2.1 shows that rural areas have a larger share of the bottom 40 (based on a national distribution of expenditures) than urban areas do. In urban areas, almost three-quarters of the population is in the top 60 percent (T60) of the national distribution of expenditure. In contrast, in rural areas, almost half the population falls into the bottom 40 percent (B40).

Figure 2.16 looks at changes in WASH access among the top 60 and bottom 40 over the period from 2005/06 to 2013/14, for which comparable data is available. This also shows that the top 60 had much better access to both piped water and flush to sewer toilets, as well as to all improved water and sanitation facilities. In terms of change over time, it is evident that not much changed at all in the relative position of the bottom 40.

Finally, inequality in access can be seen from the perspective of poverty. In chapter three this is explored in more detail at the household level but it is instructive to get a first view

Figure 2.15: Access to Improved Water, by Type and Quintile, National, 2004/05 to 2013/14



Source: Data from the 2005/06 and 2013/14 Household Integrated Economic Survey (HIES) and World Bank staff calculations.

Table 2.1: Share of the Bottom 40 and Top 60 Percent of the National Distribution in Urban and Rural Areas

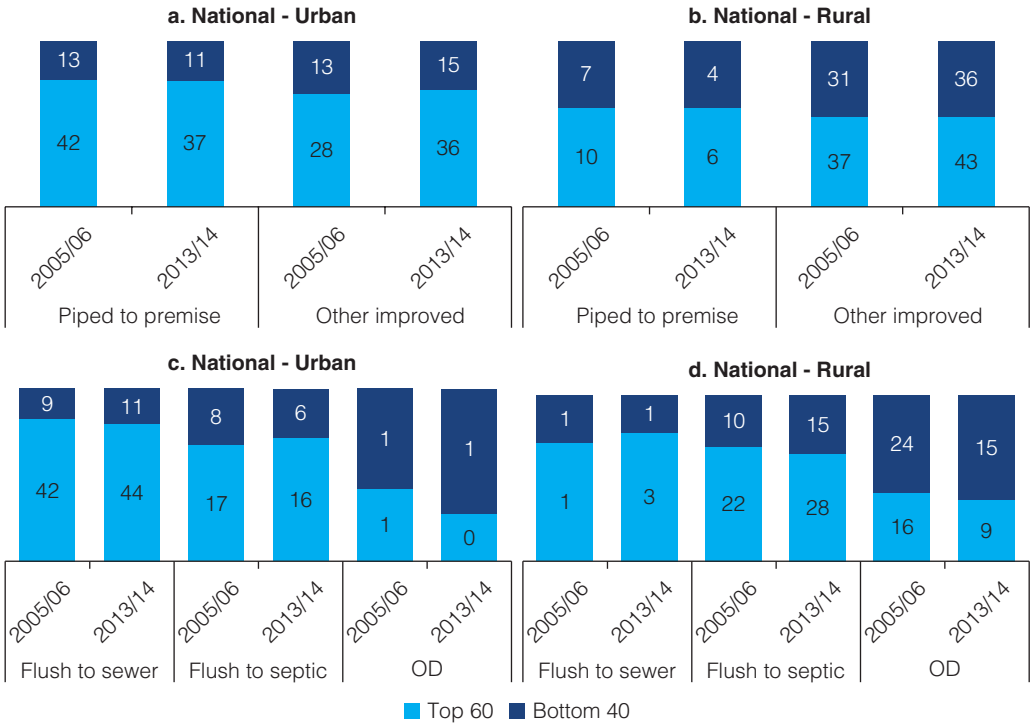
Population group	Upper 60	Bottom 40
National	60.0	40.0
Rural	52.9	47.2
Urban	73.3	26.8

Source: World Bank staff calculations based on HIES 2013–14.

of differences in access among richer and poorer regions in the country. In Pakistan, given the data, this can be done at the district level, using district poverty rates based on the national poverty line, as discussed in chapter 1 and shown in map 1.1. This is shown in map 2.3 and map 2.4. Districts are ranked in ascending order of poverty, as the legend shows, from those with the highest number of poor individuals in red to those with the smallest number in blue.

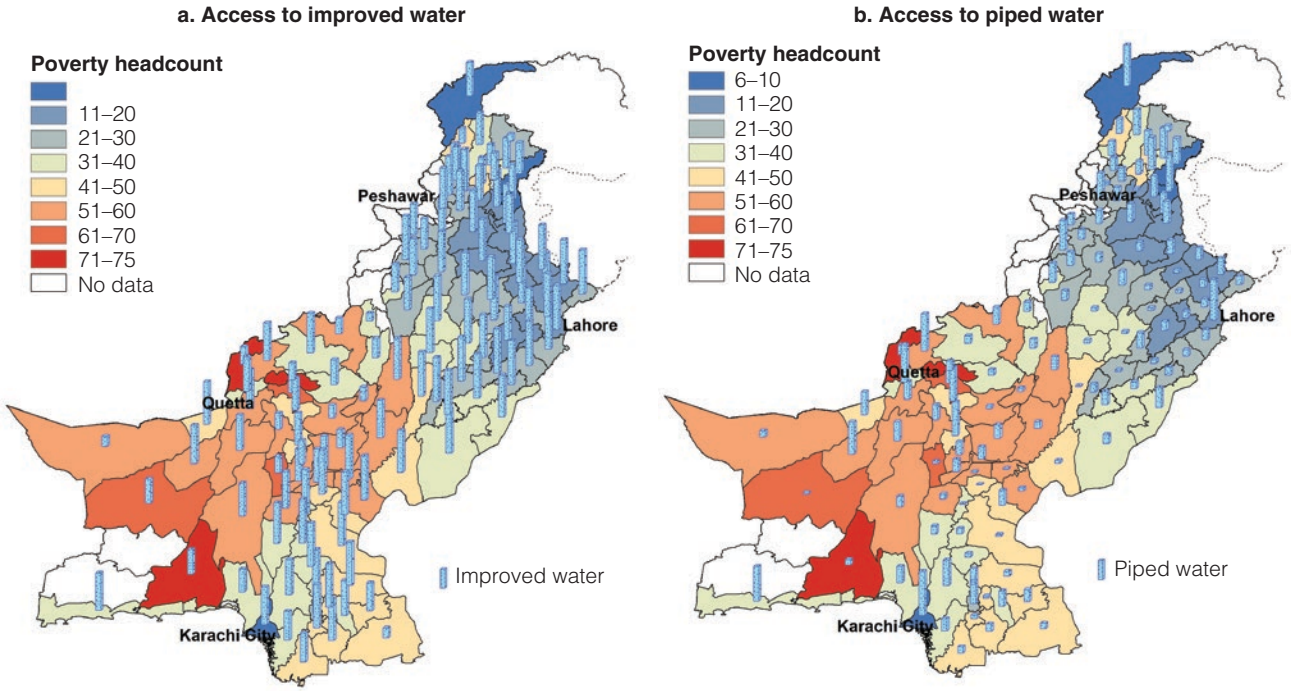
These maps show a startling concentration of access in better off districts, even within provinces. The disparity in access is even higher when higher quality infrastructure, piped water and flush to sewer toilets is looked at. It also presages the discussion on the allocation of WASH budgets to districts. Given the incredibly low and unequal access to WASH infrastructure and services reviewed in this chapter, some sensitivity of resource allocation decisions to levels of access is reasonable to expect. Chapter 5 looks at whether this is the case.

Figure 2.16: Changes in Access to Improved Water and Sanitation, Bottom 40 versus Top 60, Urban and Rural Areas, 2005/06 to 2013/14



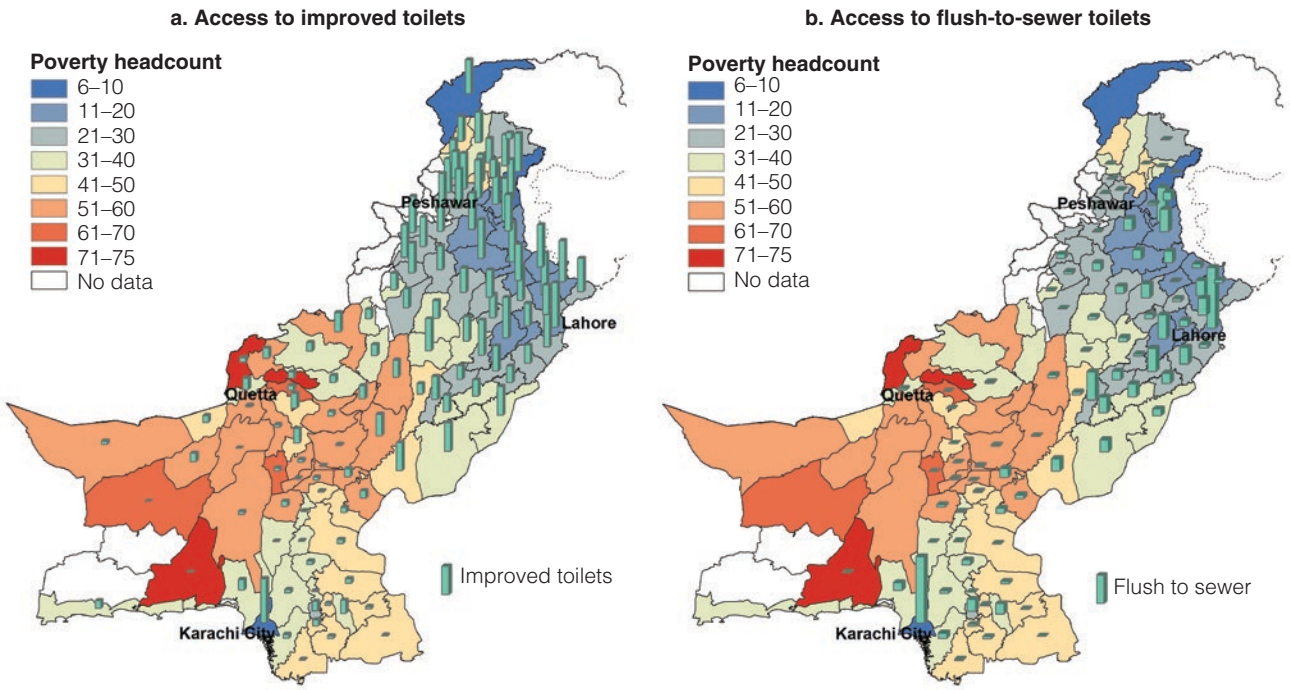
Source: Data from the 2005/06 and 2013/14 Household Integrated Economic Survey (HIES) and World Bank staff calculations.

Map 2.3: District Poverty and District Access to Improved Water, 2014/15



Source: 2013/14 Household Integrated Economic Survey (HIES), 2014/15 Pakistan Social and Living Standards Measurement Survey (PSLM) and World Bank Staff Calculations.
Note: Split-off districts were assigned the poverty rate of the parent district.

Map 2.4: District Poverty and District Access to Improved Sanitation, 2014/15



Source: 2013/14 Household Integrated Economic Survey (HIES), 2014/15 Pakistan Social and Living Standards Measurement Survey (PSLM) and World Bank Staff Calculations.
Note: Split-off districts were assigned the poverty rate of the parent district.

Notes

1. MDG 7, Target 7c calls on countries to "halve, by 2015, the proportion of (1990) population without sustainable access to safe drinking-water and basic sanitation." See http://www.un.org/millenniumgoals/environ.shtml.
2. For the JMP-defined categories of improved and unimproved water and sanitation facilities, see https://www.wssinfo.org/definitions-methods/watsan-categories/.
3. This framework, labeled "Access Plus" was developed by the World Bank to enable the systematic cross-country use of household surveys to analyze the relationship between WASH and poverty. It allows for the creation of harmonized data which is as consistent as is feasible, for the new SDG definitions.
4. Labeled "limited access" under Sustainable Development Goals (SDGs).
5. While the "improved" and "unimproved" categories remain relevant in the SDG timeframe 2015–2030, they are supplemented by important stricter requirements to define "safely managed."
6. *E. coli* (*Escherichia coli*) is a type of bacteria that lives in human and animal intestines. *E. coli* can cause diarrhea through the consumption of contaminated food or water. Some strains of *E. coli* make a toxin (called Shiga) which damages the lining of the intestine. The O157:H7 strain of *E. coli* can cause severe illness and is considered a leading cause of acute kidney failure in children. Some strains of *E. coli* can also cause pneumonia and breathing problems, especially in young children, who are most vulnerable.
7. The survey is reported on in a background paper to this report (Mansuri 2017).

Reference

Mansuri, G. 2017. "When Water Becomes a Hazard: The Elimination of Open Defecation and Child Stunting." Mimeo. World Bank, Washington, DC.

Chapter 3
Child Stunting: The Role of Water Supply, Sanitation, and Hygiene[1]

Key Messages

- Due to the policy focus on eliminating open defecation, and the decline in poverty, there has been a large expansion in privately owned toilets, which have been built using poor technology and in the absence of any government oversight or regulations. Commensurate investments in critical human waste management systems (sewers, drainage systems, treatment facilities) have also been severely neglected.

- This has magnified the concentration of fecal waste near human settlements, despite a decline in open defecation and led to widespread bacterial contamination (*E. coli* bacteria) of ground water sources, surface water and soil, particularly in rural areas. Urban areas face a different challenge. Many are connected to piped water supply, but the interrupted flow of water in the system, the proximity of water and sewer lines and decaying infrastructure in both systems, create a serious hazard for water quality. In many major cities, up to a third of residents also relay on low quality latrines and open drains.

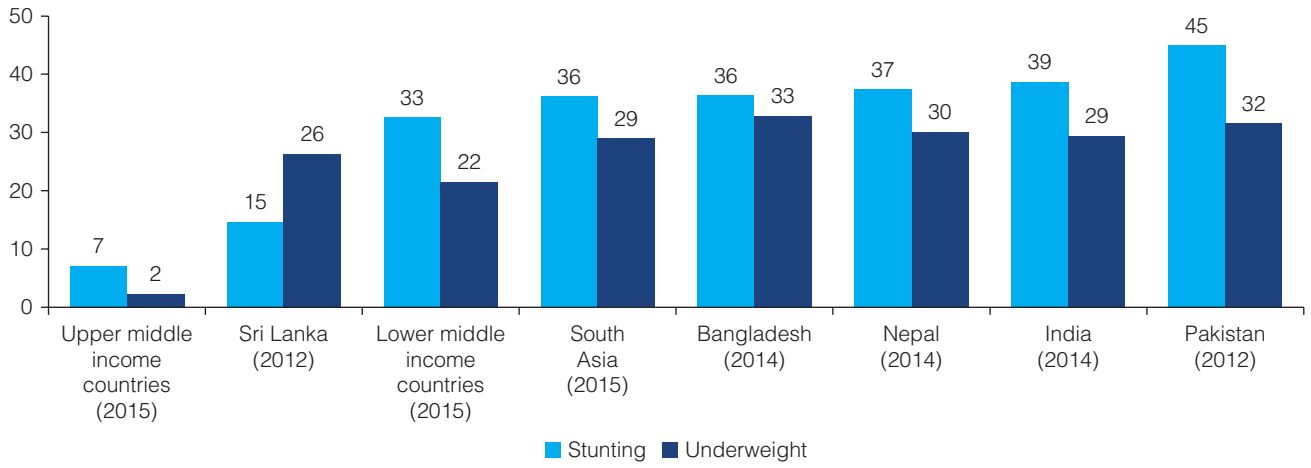
- *E. coli* contamination is responsible not just for diarrhea. It leads ultimately to environmental enteropathy, a more silent but far more deadly problem for child growth faltering as well for long run morbidity.

- Due to this, diarrhea and stunting rates have remained high and stable over time, despite a large decline in poverty (chapter 1), and a sharp decrease in open defecation, accompanied by an increase in access to "improved sanitation" and "improved water" (chapter 2).

- The evidence suggests that stunting, diarrhea, and other types of morbidity among infants and young children may well have *increased* but for the rapid decline in poverty which has helped improved hygiene behaviors, such as handwashing and the treatment of water, and allowed households to access more timely and better quality curative health care.

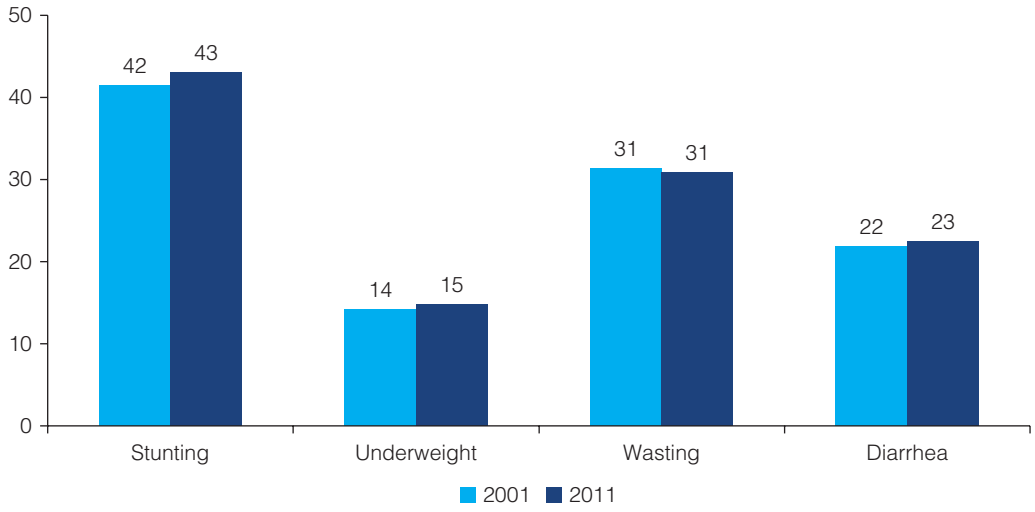
Pakistan continues to lag behind its regional neighbors and income peers in terms of child nutritional outcomes. Figure 3.1 compares stunting and wasting rates for children under 5 in Pakistan with those from a range of other countries, over roughly the same period. The stunting rate for Pakistan, at 45 percent, was 9 percentage points higher than the average stunting rate for the South Asia Region (36 percent) and 12 percentage points higher than the average stunting rate in lower-middle-income countries (33 percent). Pakistan also had the second-highest incidence of underweight children in the region. These numbers are from the World Development Indicators.

Figure 3.1: Comparison of Nutritional Outcomes (Rate in Percentage Points) in Pakistan and Other Countries



Source: World Development Indicators.

Figure 3.2: Changes in Stunting, Underweight, Wasting, and Diarrhea (Rates in Percentage Points) in Children under Five in Pakistan, 2001 and 2011



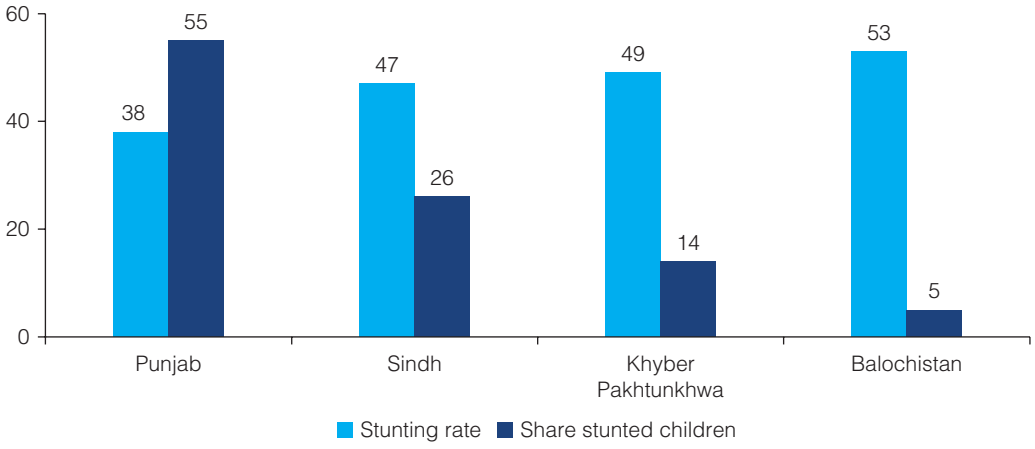
Sources: Data on diarrhea are from 2006–12 Demographic and Health Survey (DHS). All other data are from the 2001 and 2011 Pakistan National Nutrition Survey (NSS) Reports.

Figure 3.2 looks at changes in nutritional outcomes (stunting, underweight, and wasting) and diarrhea over a roughly 12-year period within Pakistan using the 2001 and 2011 National Nutrition Survey (NNS) reports and the 2006 and 2012 Demographic and Health Surveys (DHS). This shows an astonishing absence of progress over a 12-year period when both poverty and the practice of open defecation declined rapidly, and access to improved water and sanitation expanded substantially. In fact, three of the four indicators worsen slightly.

Within Pakistan, the nutritional status of children under five is somewhat better in Punjab, at 38 percent, than in the other three provinces—47, 49 and 53 percent, respectively, in Sindh, KP and Balochistan (figure 3.3). It is worth noting, however, that because of its large population, Punjab accounts for more than half of all stunted children under five.

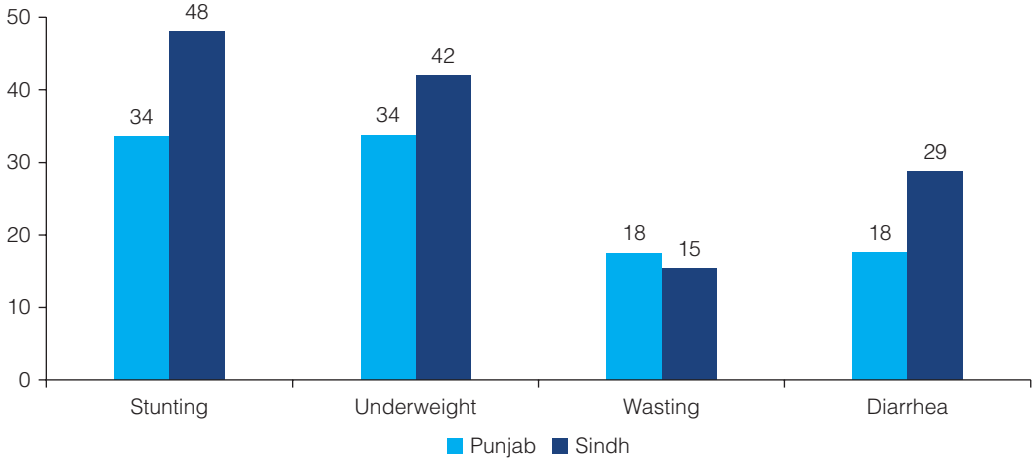
More recent surveys also provide little cause for optimism (figure 3.4). The 2014 Multiple Indicator Cluster Survey (MICS), which is available only for Punjab and Sindh, shows a small improvement in the stunting rate in Punjab (from 38 to 34 percent) but a further worsening in Sindh (from 47 to 48 percent).

Figure 3.3: Prevalence of Stunting among Children under Five in Pakistan (Rates in Percentage Points), by Province, 2011



Source: 2011 National Nutrition Survey (NSS) Reports.

Figure 3.4: Prevalence of Stunting among Children under Five in Pakistan (Rates in Percentage Points), Punjab and Sindh, 2014



Source: 2014 Multiple Indicator Cluster Survey.

Policy Efforts to Reduce Malnutrition

In the face of such acute levels of child malnourishment, policy efforts to combat malnutrition in Pakistan have focused on two main fronts: increasing nutritional intake/quality and reducing the incidence of open defecation.

Nutritional interventions aimed at improving child feeding practices, enhancing food security and improving dietary diversity and quality are extremely important in their own right and have also been at the core of the World Bank Group's nutrition-related operations in Pakistan. The question the report addresses is whether these are driving factors behind child malnutrition in Pakistan. Operations to provide better sanitation facilities have focused almost entirely on reducing open defecation through improved toilet access. The underlying assumption has been that nutrient-poor diets and high incidence of open defecation are the key drivers behind worsening child nutritional and health outcomes.

As the analysis presented in this chapter shows, a careful compilation of the evidence does not corroborate either of these assumptions.

The Undelivered Promise of Reduced Open Defecation

In recognition of the key role that the environment plays in tackling malnutrition, the elimination of open defecation has been a nodal policy reform for improving nutritional outcomes. Besides enhancing life quality in many other dimensions, the promise of toilets was that they would distance human waste from human contact, reducing exposure to bacteria like *E. coli* which is a leading cause of diarrhea and can even be a cause of mortality in infants, who are most susceptible.

However, as seen in figure 3.2 the prevalence of diarrhea, which is both a health outcome and a critical cause of immediate weight loss, intestinal damage, and the malabsorption of nutrients, registered no improvement between 2006 and 2012. If anything, the overall rate inched up slightly from 22 to 23 percent.

Within Pakistan, regions with lower rates of open defecation failed also fail to show lower diarrhea and malnutrition rates than regions with higher rates. In 2014 outcomes were better in Punjab, which had a much higher prevalence of open defecation than Sindh (16 percent versus 8 percent, respectively, by 2014) had a much lower incidence of diarrhea—18 percent as compared to 29 percent in Sindh—and a greater decline in stunting—34 percent as compared to 49 percent in Sindh (see box 2.3 in chapter 2 and figure 3.4).

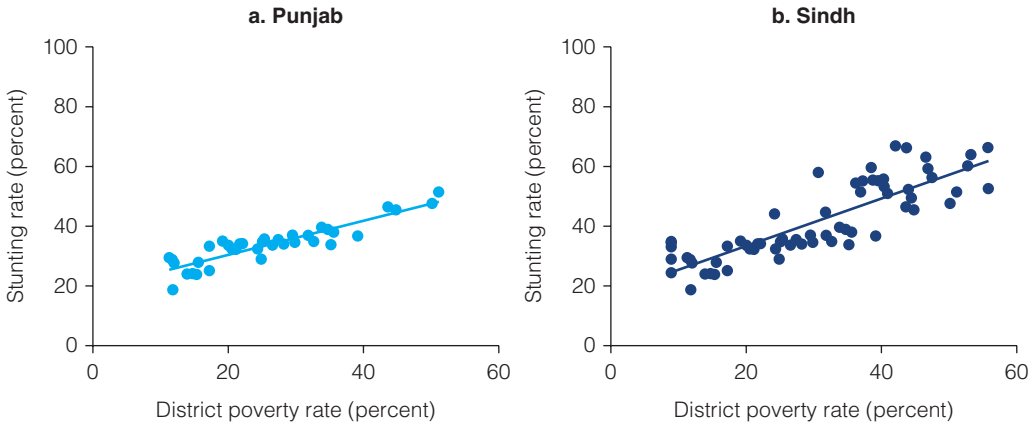
According to the NNS, infant deaths also decreased only marginally over this period, from 86 to 72 per 1,000 live births, and under-five mortality rates fell from 110 to 79 per 1,000 live births, nationally. Globally Pakistan is listed among the 10 countries with the worst infant mortality rates. Regionally, the under-five mortality rate in Pakistan is higher than Afghanistan at 70, and more than double that in Bangladesh, at 34. India's rate is at 43, still far lower than Pakistan.

Taken together with the discussion in chapter 1, on the substantial fall in poverty and the increase in dietary diversity, this stubborn stability of child malnutrition, morbidity and mortality risk seems out of place. This has led some to question whether the data on poverty are somehow incorrect or conceal some form of nutritional deprivation.

Is Poverty a Driver of Diarrhea and Malnutrition in Pakistan?

While there is no question that diet quality and diversity are still quite inadequate at the lower end of the distribution of income across Pakistan, the evidence of a very substantial decline in

Figure 3.5: Stunting and Poverty across Districts: Punjab and Sindh, 2014



Source: Data from the 2014 Multiple Indicator Cluster Surveys of Punjab and Sindh.

poverty between 2001 and 2014 is extremely robust.[2] So is the evidence of an improvement in dietary diversity. So how do we square this circle?

There is no question that if one looks across households in any one time/survey period, poverty seems to be strongly correlated with high rates of diarrhea and malnutrition. In 2014/15 for example, Sindh, which had a poverty headcount rate of 34.2 percent, also performed worse than Punjab (where the headcount rate was 25.3) on all nutritional outcomes.

Figure 3.5 takes this one step lower. It ranks districts by their poverty rank (declining in the percentage of poor households) and looks at the simple correlation between a district's poverty rank and the percentage of children under 5 in that district that are stunted. Map 3.1 shows the same relationship for both stunting and diarrhea and it is easy to see that poorer districts also have higher rates of stunting and diarrhea than better off ones.

Looking at households ranked by income, instead, provides a different lens (figure 3.6). Overall, it is again evident that under-five malnutrition rates, including stunting, wasting and underweight, are considerably higher among poorer quintiles of the expenditure distribution, as is the incidence of diarrhea.

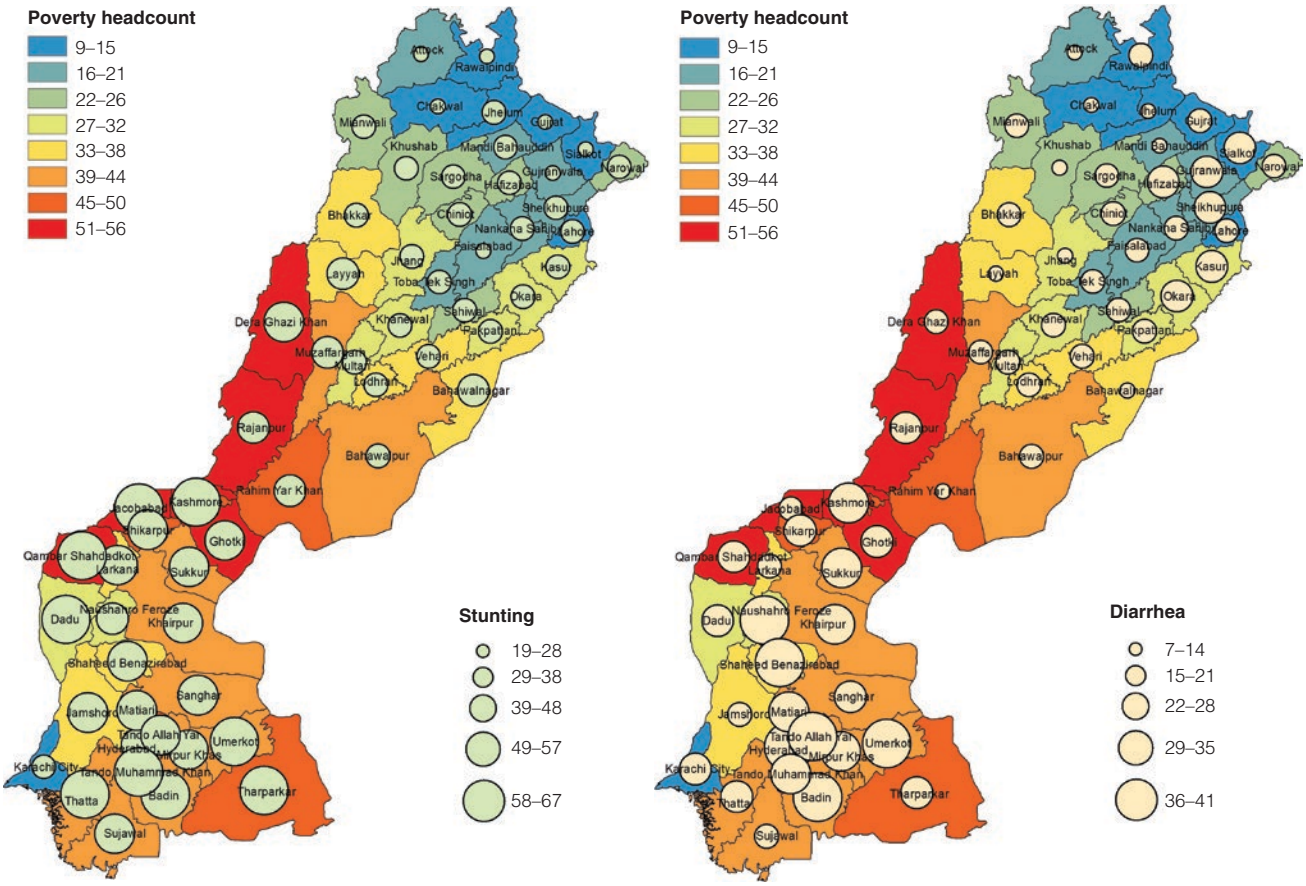
What is astonishing, however, is that the stunting rate in the wealthiest group in urban Sindh, predominantly Karachi, which is among the very richest districts in Pakistan, is still as high as 24 percent.

Equally interestingly, in rural Sindh, the protective effect of income is much weaker than in rural Punjab. The wealthiest rural quintile in Sindh still has a stunting rate of 42 percent, as compared to its counterpart in Punjab, at under 18 percent.

When it comes to diarrhea, income seems to provide no protection at all. What is significant, however, is that diarrhea rates are at least 10 percentage points higher in rural Sindh than in Punjab, and urban Sindh's diarrhea rate is much higher than urban Punjab's.

What emerges from this set of facts is that, in general, poor regions have more diarrhea and stunting, and even the richest households living in these poor regions are not protected against this regional impact of living in a poor area. Second, even very wealthy areas like the urban district of Karachi can sustain extremely high rates of diarrhea – which is also quite insensitive to income levels—and commensurately high levels of stunting.

Map 3.1: Stunting and Diarrhea across Districts in Punjab and Sindh, by Level of Poverty, 2014



Sources: 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Survey and the 2014 Multiple Indicator Cluster Surveys (MICS) of Punjab and Sindh and World Bank staff calculations.

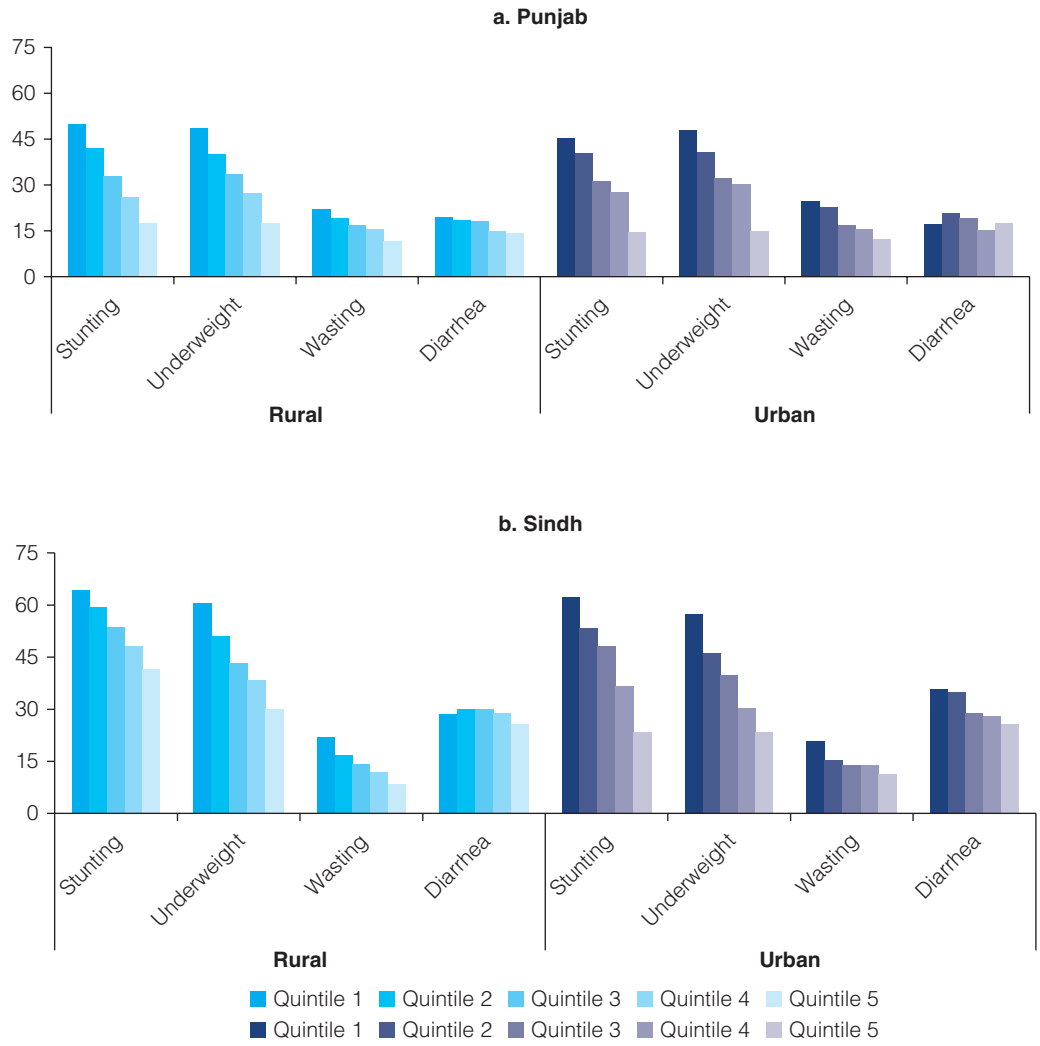
How does this evidence square with the belief that poverty is a driving factor in child malnutrition in Pakistan?

If it is inadequate food consumption by poorer households that causes child malnutrition, why are the top quintiles so susceptible? Why does it matter where you live, provided you have enough income to have a good diet and good quality water and sanitation in your own home? The remainder of the chapter tackles this question.

A third candidate explanation that is often seen as a driver of malnutrition is poor household health behaviors. This can encompass a large number of actions, including those around water and sanitation, but also actions related to child feeding and care, use of preventive services like vaccination and curative actions like the use of ORS to treat diarrhea. There is no question that health behaviors, like adequate nutrition, are critical for child health. The question is whether poor health behaviors provide an adequate explanation of why the gains Pakistan has made on poverty and access to water and sanitation have not translated into improved statistics on stunting, and critically which health behaviors could offer the best explanation.

This question can be analyzed at two levels: (1) determining whether relevant health behaviors differ by poverty status and by stunting rates cross regionally within Pakistan, and (2) determining how much such behaviors contribute to the incidence of diarrhea, stunting, or

Figure 3.6: Stunting, Underweight, Wasting and Diarrhea in Children under Five in Punjab and Sindh, by Rural and Urban and Expenditure Quintile, 2014



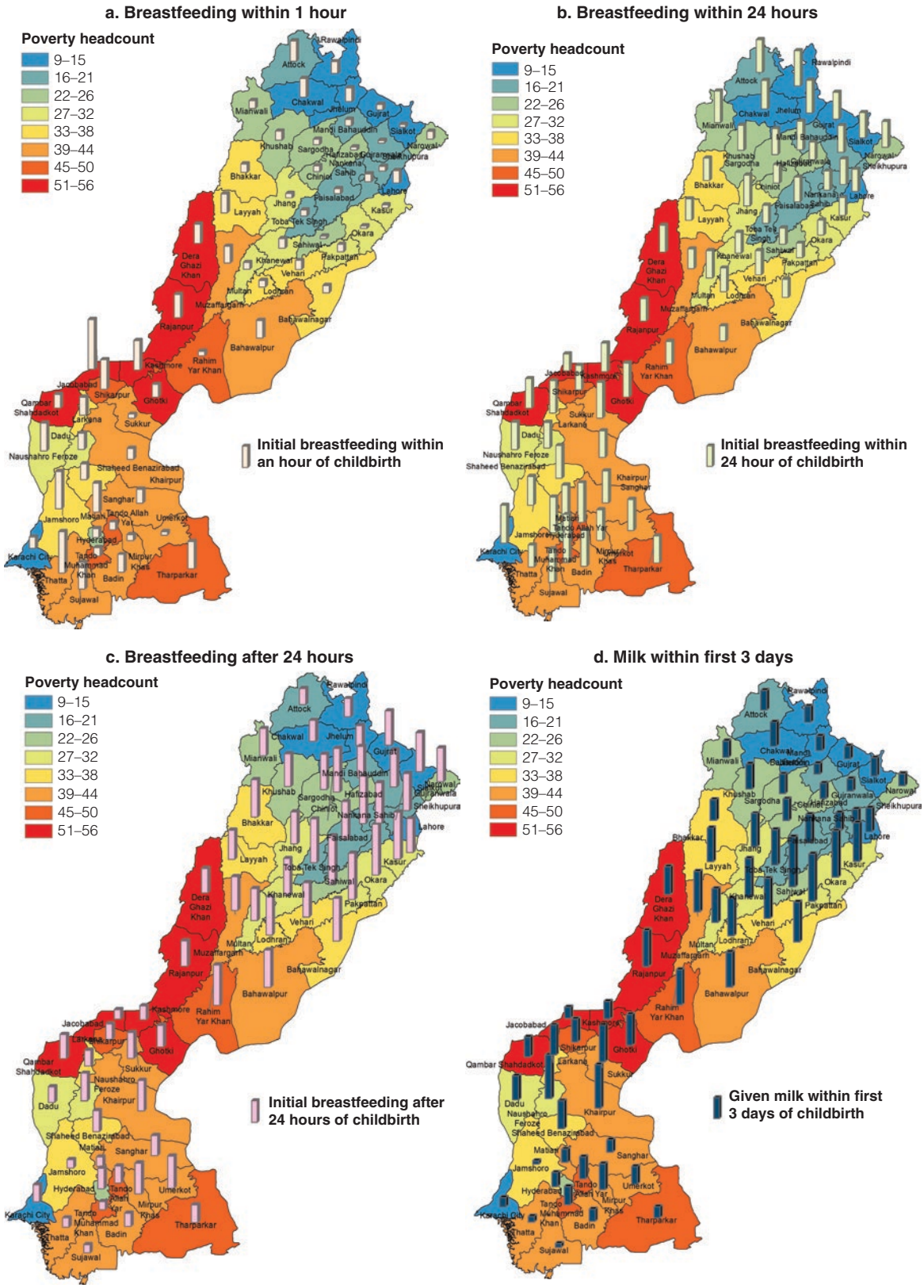
Source: Data from the 2014 Multiple Indicator Cluster Surveys of Punjab and Sindh and World Bank staff calculations.
Note: Expenditure deciles are imputed from the application of small area estimation techniques using the 2013-14 HIES and the 2014 MICS survey.

wasting after controlling for household poverty, location characteristics and other relevant household and community characteristics. The analysis presented in this chapter does both, examining breastfeeding practices, child feeding practices, maternal care, and child care practices.[3]

Household health behaviors can be separated into two broad categories. Behaviors related to water and sanitation and behaviors related to child feeding and care. These are taken up in turn.

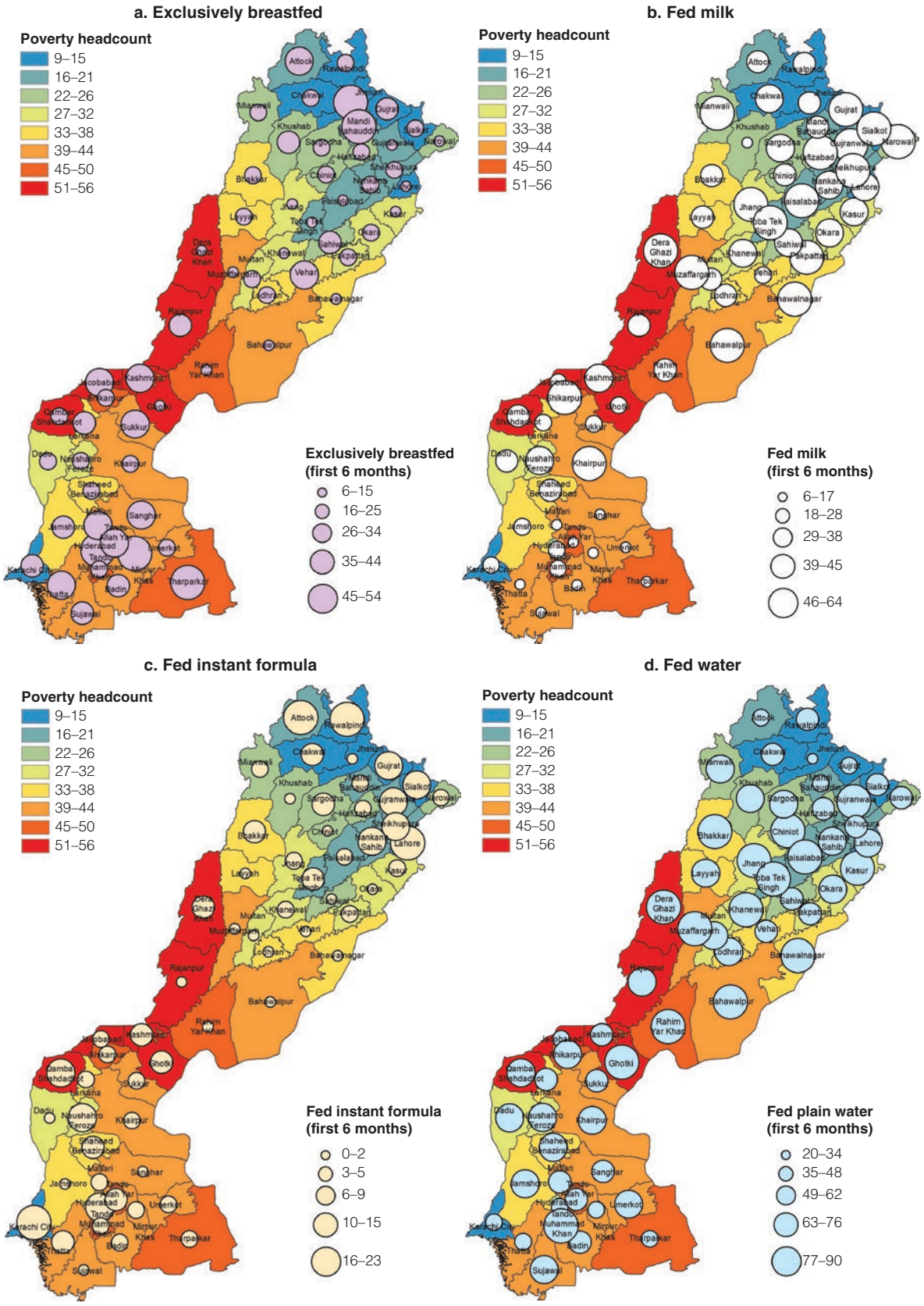
Maps 3.2 to 3.5, show a range of behaviors and their association with district level poverty. The findings are somewhat surprising at first glance. Child feeding practices immediately after birth are similar in rich and poor districts, but exclusive breast feeding and breast feeding within the first hour of birth are higher in poorer districts and generally more prevalent in Sindh, which has both a higher poverty rate and a higher stunting rate than Punjab. Starting breastfeeding after

Map 3.2: Child Feeding Immediately After Birth across Districts in Punjab and Sindh, by District Poverty Level, 2014



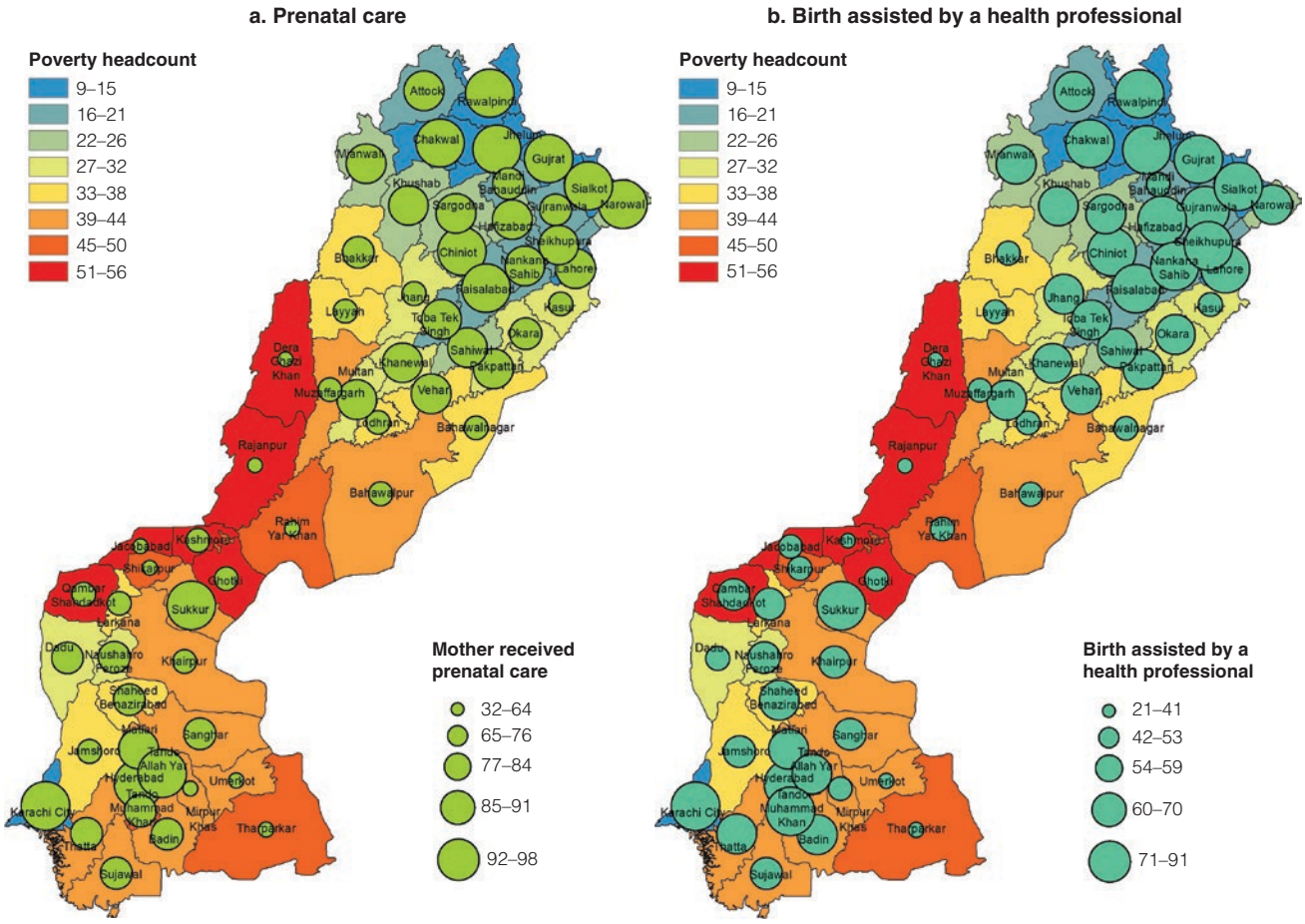
Sources: 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Survey and the 2014 Multiple Indicator Cluster Surveys (MICS) of Punjab and Sindh and World Bank staff calculations.

Map 3.3: Child Feeding in the First Six Months after Birth in Punjab and Sindh, by District Poverty Level, 2014



Sources: 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Survey and the 2014 Multiple Indicator Cluster Surveys (MICS) of Punjab and Sindh and World Bank staff calculations.

Map 3.4: Maternal Care in Punjab and Sindh, by District Poverty Level, 2014



Sources: 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Survey and the 2014 Multiple Indicator Cluster Surveys (MICS) of Punjab and Sindh and World Bank staff calculations.

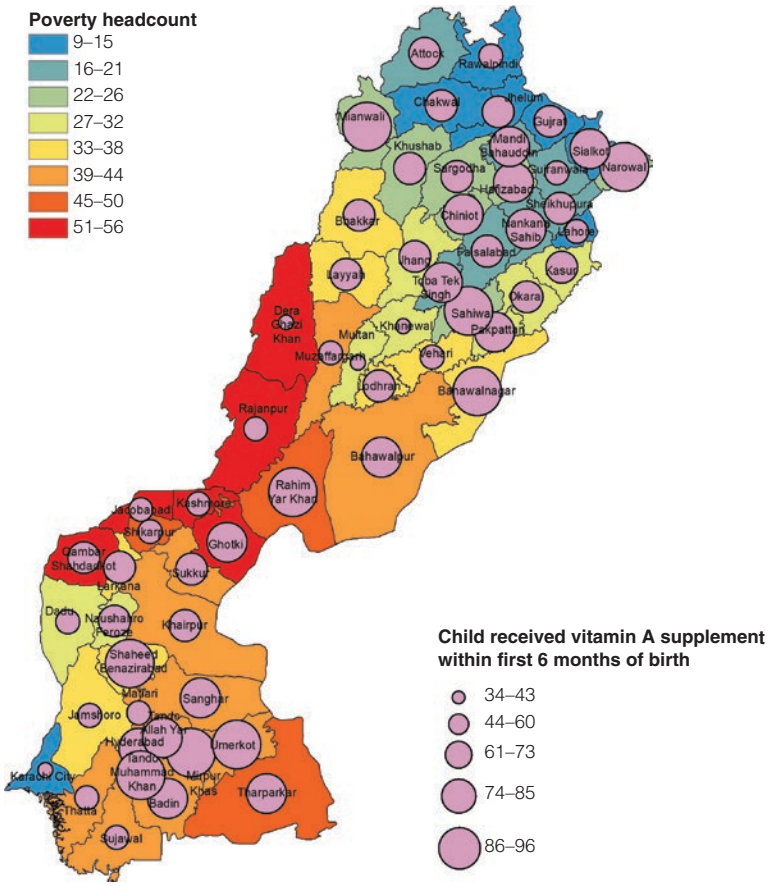
24 hours of birth, which is not a recommended practice is, in contrast, less common in the poorest districts, particularly in Sindh, which also have the highest stunting rates. Poorer districts are also less likely to give a child milk within the first three days of birth (map 3.2).

Child feeding practices in the first six months after birth show the same results. Practices are weakly correlated with poverty, but excluding Karachi and Hyderabad, which are outliers in Sindh (and look more like Punjab), infants in Sindh are more likely to be exclusively breastfed, far less likely to get baby formula, and are somewhat less likely to be given plain water to drink (map 3.3).

Access to maternal care, on the other hand, is negatively correlated with poverty. Women in poorer districts overall are less likely to receive prenatal care during pregnancy and also less likely to give birth under the assistance of a doctor, nurse, or midwife. However, poorer districts in Sindh perform better than poorer districts in Punjab (map 3.4). The proportion of children who received vitamin A is roughly equivalent or somewhat better in poorer districts (map 3.5).

In sum, child feeding and care practices are similar, and maternal care somewhat worse in poorer districts, and despite being much poorer, Sindh, particularly rural Sindh, performs better on a number of health practices than Punjab.

Map 3.5: Proportion of Children Receiving Vitamin A in Punjab and Sindh, by District Poverty Level, 2014



Sources: 2014/15 Pakistan Social and Living Standards Measurement (PSLM) Survey and the 2014 Multiple Indicator Cluster Surveys (MICS) of Punjab and Sindh and World Bank staff calculations.

This set of household health behaviors also seem to be unlikely drivers of the correlation between poverty and malnutrition.

This issue is investigated further in analysis that examines the association between child malnutrition and household health behaviors after controlling for the household's poverty, its water and sanitation infrastructure, and the poverty of the location in which the household resides. But first, it's important to look at household health behaviors related to water and sanitation. Clearly, this cannot be seen without reference to the quality of the WASH infrastructure the household has access to.

To do this, it is useful to do a quick review of the differences in infrastructure quality in Punjab and Sindh. Although Punjab has a higher rate of open defecation, the quality of toilet facilities used by individuals who do not practice open defecation is considerably higher than in Sindh. About 66 percent of Punjab's population has access to improved toilets (mainly flush toilets connected to sewers and flush toilets connected to septic tanks). Only 17 percent of households in Punjab use unimproved toilet types (flush toilets to open drains and latrine or pit latrine toilets). In contrast, more than half of the population in Sindh uses unimproved toilets, and only 37 percent have access to improved toilets. Worse still, the improved toilets in Sindh are heavily concentrated in the cities of Karachi

and Hyderabad, implying sanitation conditions in other urban areas of Sindh are not much different from those in rural Sindh.

Sindh also has weaker drainage systems. Almost 44 percent of the population still lives in dwellings not connected to any drains (the comparable number for Punjab is less than 30 percent). In rural Sindh, 83 percent of households have no drainage connection, and the 17 percent of households that are connected to drains, use toilets that flow directly into open drains. In rural Punjab 42 percent of households are not connected to drains. While 48 percent of households in rural Punjab use toilets that flow into open drains, even the open drains are not strictly comparable across the two provinces. In Punjab they mainly handle flows from septic tanks; in rural Sindh fecal matter is far more likely to flow directly into open drains.

With this context in mind, recall the primary difference between Tier 1 and Tier 3 for access to water and access to sanitation. For water it is the absence of *E. coli*. For sanitation it is the safe management of fecal waste.

E. coli contamination levels in water are not routinely monitored anywhere in Pakistan. However, there are two sources of available data that can be used to assess levels of *E. coli* contamination in water in Pakistan. The first comes from the Pakistan Council of Research in Water Resources (PCRWR) which carried out a Punjab-wide water-quality testing exercise in 2011. In addition to testing for many contaminants, including *E. coli*, this data includes the type of water source tested (hand pump, motorized pump, water and sanitation systems, and many surface and unprotected sources); the bore depth for groundwater; and the depth to the water table. The second comes from data on water quality collected in 158 villages where an impact evaluation "Mobilization for Empowerment" (MORE) was being conducted.[4] The villages are from the districts of Mianwali and Bahawalpur in Punjab, Hyderabad and Tando Mohammad Khan in Sindh and Nowshera in KP. Water quality data was collected at the midline and the endline of the evaluation, in 2013 and 2016, respectively. Fecal contamination of the environment or the presence of *E. coli* in the soil or on hands etc. has not been systematically measured in any study, yet.

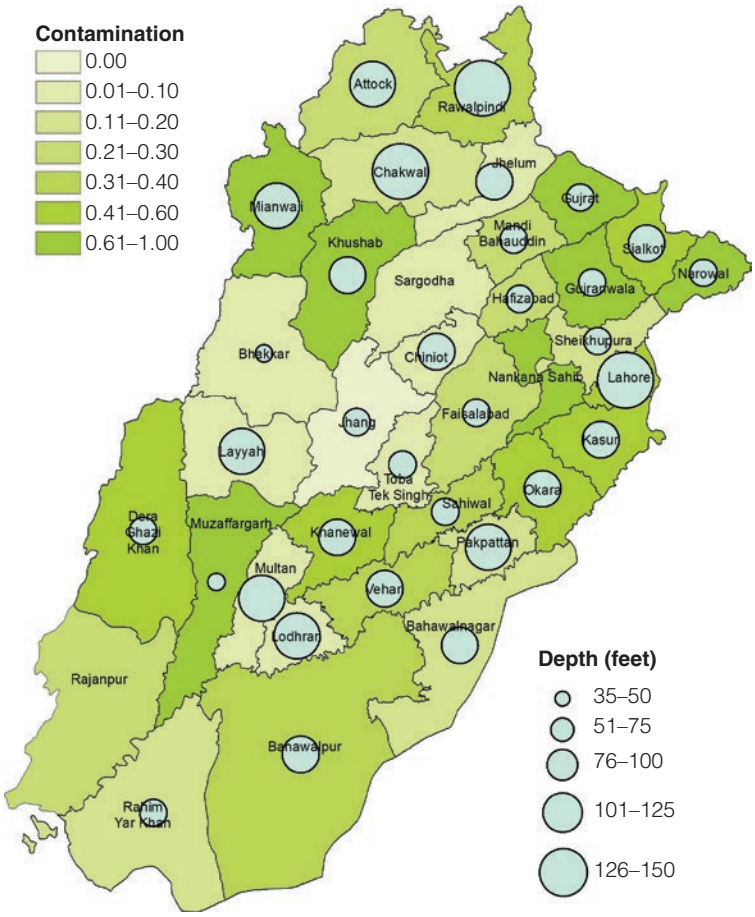
The PCRWR data shows that, across Punjab, about a third of all drinking water sources were contaminated with *E. coli*, at source. A regression that controls for bore depth (Annex table 3A.3), shows that contamination rates in public water systems were significantly higher than in water taken from motorized pumps. Hand pumps perform the worst, increasing contamination by about 9 percentage points, relative to piped water. Interestingly, the contamination from hand pumps falls as bore depth rises.

The average bore depth was 118 feet for water and sanitation systems, 100 feet for motorized pumps, and just 59 feet for hand pumps. Map 3.6 shows the relationship between source depth and contamination from *E. coli*, using PCRWR data. This indicates that contamination rates tend to be higher where water depth is shallower. Map 3.7 shows the relationship between bore depth and hand and motorized pumps. It easy to see that motorized pumps are more prevalent where ground water depth is higher, while handpumps are more prevalent where ground water depth is shallower. This confirms that the choice between the two is not just one of wealth but is importantly driven by depth to the nearest aquifer.

Water tests from the MORE villages show similar rates of *E. coli* contamination in water obtained at source in Punjab (36 percent), but find contamination rates at source as high as 57 percent in Sindh (figure 3.7).

Why are water contamination rates so much higher in Sindh? A linear regression uses the MORE data to look at the role of a household's water and sanitation sources on levels of contamination (Annex table 3.4). This shows that water contamination rates at source are 15 percentage

Map 3.6: Bore Depth and *E. coli* Contamination in Punjab, 2011



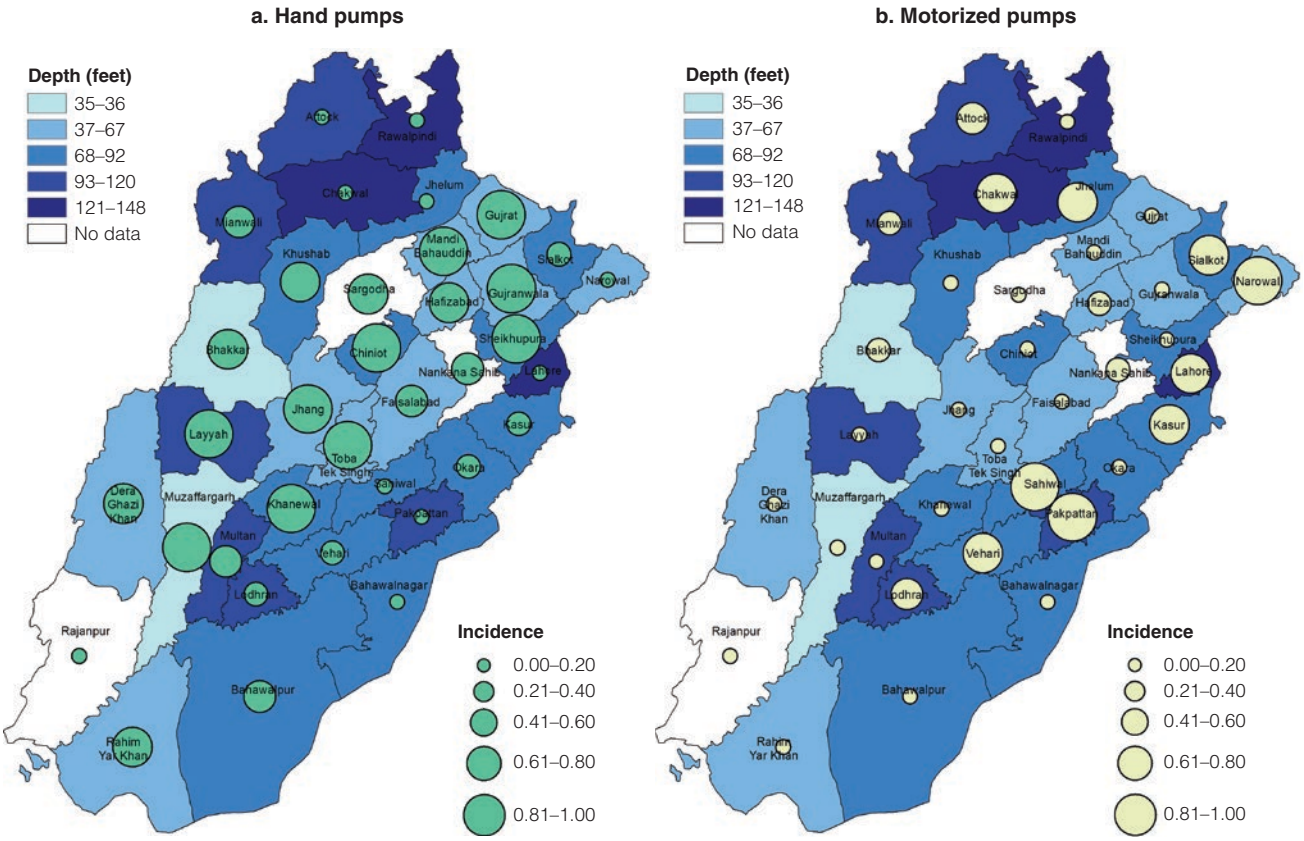
Source: Data from the Pakistan Council of Research in Water Resources (PCRWR), 2011.

points higher among households that openly defecate relative to households with a toilet with an improved flush toilet (narrowly defined as flush to sewer or septic tank). A more interesting finding is that it is the combination of water source and toilet type in the household that matters. In particular, the combination of hand pump and soak pits is associated with a 14 percentage point increase in contamination, essentially rivaling the impact of open defecation.

Why are pit latrines and hand pumps associated with greater source contamination? Pit latrines typically do not have a full physical barrier, in the form of bricks or concrete, between the stored excreta and the soil and/or groundwater (Van Ryneveld and Fourie 1997). Therefore, contaminants from latrine excreta can seep into the surrounding soil and groundwater sources, particularly when these sources are shallow. MORE data reveal that 80 percent of toilets are located within 50 feet of the drinking water source, compounding the problem.

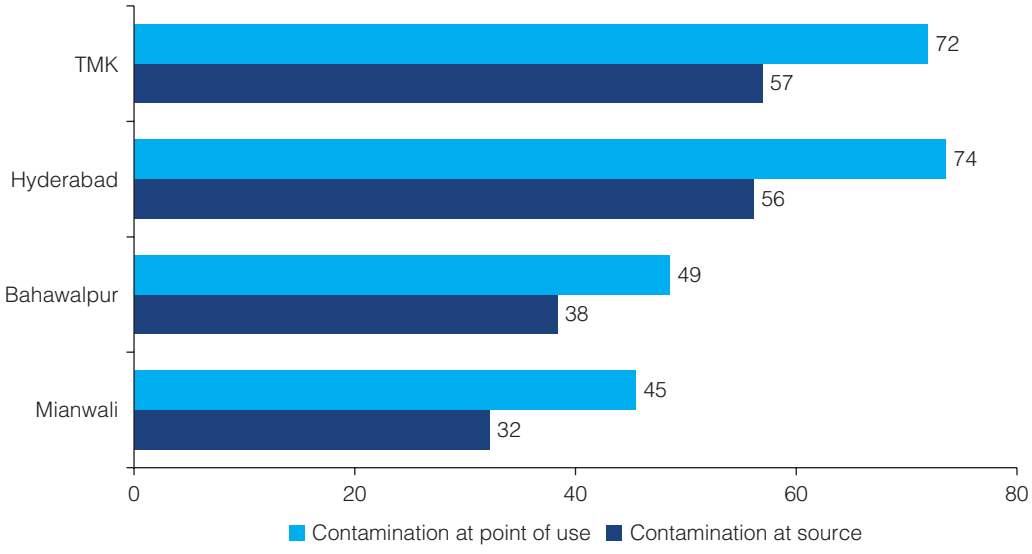
A review of studies examining the link between pit latrines and groundwater contamination finds that the use of pit latrines is strongly associated with the transport of microbes and chemicals in the surrounding soil into local water sources. Although contextual factors such as distance of the water source from the latrine lead to varying levels of contamination, studies have observed travel distances of up to 25 and even 50 meters for unsafe concentrations of bacteria, viruses, and chemicals (Graham and Polizzotto 2013). The review suggests that

Map 3.7: Hand Pumps, Motorized Pumps, and Bore Depth in Punjab, 2011



Source: Data from the Pakistan Council of Research in Water Resources (PCRWR), 2011.

Figure 3.7: *E. coli* Contamination at Source and at Point of Use, Punjab and Sindh, 2016



Source: MORE, 2016.

areas with shallow groundwater have the greatest risk of water contamination and that clear standards therefore need to be in place for constructing pit latrines with respect to groundwater sources.

Water contamination levels in Sindh are amplified by its heavier dependence on hand pumps, which typically extract water from shallower aquifers than motorized pumps, in combination with largely low quality toilets that are also constructed too close to the water source.

The enforcement of water quality regulations such as specifications about the depths of bore holes for motorized and hand pumps and their distance from settlements and toilet facilities seems to be completely absent in Pakistan. In the absence of regulatory oversight, poorly designed soak pit toilets (and non-engineered septic tanks) provides a perfect recipe for groundwater contamination, particularly where groundwater depth is shallow. In addition, once contaminated, hand pumps can serve as a reservoir of fecal bacteria independently of the quality of the pumped water (Ferguson and others 2011).

The evidence of an extremely unclean environment indicated by high rates of water contamination at source is strengthened by even higher rates of contamination at point of use. A unique feature of the MORE data is that it provides water contamination rates both at the source where the water is drawn, and at the point of use (POU), usually a storage device, for each household. Figure 3.7 shows that rates of contamination at point of use are much higher, rising from 57 percent to 74 percent in the districts of Sindh, and from 36 to 46 percent, in the districts of Punjab (figure 3.7).

While POU contamination depends heavily on source contamination (see column 2 in Annex table 3A.4), a host of other household health behaviors and hygiene practices, including ways of transferring water from the source to the point of use; water storage norms, drinking utensils used, the frequency and ways of cleaning these devices and utensils and/or their replacement, and the level of human contact at each stage also matter as does the overall level of soil and other surface contamination in the environment. Finally, it is also indicative of the extremely low incidence of water treatment. These factors together account for a 10–17 percentage point increase in the odds of finding *E. coli* in drinking water in this context.

Column two in Annex table 3A.4 highlights two important facts. As expected, once source contamination is controlled for, the water source and type of toilet in the household have no additional impact on point of use contamination, but public taps are associated with an additional 13 percentage point increase in contamination. A possible reason for this surprising result is the dismal state of water delivery in public standpipes and water and sanitation schemes, especially in Sindh and Balochistan. Water from public taps is available for very limited hours and is therefore usually stored, exposing it to the environment longer than water drawn from pumps, which is readily available as needed. Also, not surprisingly, the presence of human feces within the premise (usually around toilets) is associated with an 8 percentage points increase in water contamination at point of use. It is a direct channel for the contamination of drinking water (see also box 3.1). A recent study conducted in the Indian state of Odisha reports similar levels of contamination in tube-well water. The authors conjecture that the seepage of human and animal waste from household pour-flush latrine pits may have contributed to groundwater contamination (Schreiwer and others 2015).

E. coli contamination has a direct impact on diarrhea and, much more importantly, causes environmental enteropathy (see box 3.1) with attendant long term growth faltering that is far more insidious than diarrhea itself. Further, as is clear by now, income alone provides no protection at all from diarrhea (figure 3.6). For that, the surrounding environment needs to be free of pathogens like *E. coli* and for this the safe management of human and animal waste and safe management of water are what is key. That said, while the incidence of diarrhea does not vary by income level, the incidence of stunting, though still high, is much

Box 3.1: Fecal Contamination and Stunting: The Case for Environmental Enteropathy

Recent research is starting to confirm that fecal contamination of the environment is a primary reason behind stunting. Studies show that stunting in low income countries cannot be explained by poor diet or diarrhea, nor completely reversed by improved nutrition and reduction in diarrhea (Mbuya and Humphrey, 2016). Likewise, disease accounts for only some of the variation in stunting although repeated infection episodes have long been taken to be key to the interactive relationship between disease and nutritional status. The association between diarrhea, the most frequent infection in low income countries, and stunting is modest, although positive (Briend et al., 1990). Diarrhea causes malnutrition, but prevalent diarrhea is not always associated with poor child growth over time, because there can be catch-up growth between diarrhea episodes. These studies have led to a more recent hypothesis in the literature on malnutrition that a primary cause of stunting is subclinical gut disease. Mbuya and Humphrey (2016) hypothesize that *"Environmental enteropathy is a chronic subclinical intestinal disease common in young children in low income countries causing malabsorption and mal-digestion of nutrients and has been proposed as a major mechanism leading to stunting."* Data from Gambia shows that 43 percent of the long term growth faltering in children is explained by environmental enteropathy, while prevalence of diarrhea is not associated with such growth failures (Campbell et al. 2003).

Environmental enteropathy is a by-product of unhygienic environments in which children live and grow, primarily caused by chronic subclinical exposure to fecal pathogens (Lunn 2000). There are five key mechanisms through which fecal to oral transmissions of bacteria occur. These include food, flies, fingers, fields, and fluids. More importantly, the exact mechanisms through which bacteria is transmitted tends to be different for infants as opposed to younger children. For infants, the primary source of food and fluids is breast milk. In addition, infants regularly mouth objects picked up from the floor and elsewhere as part of their normal development. Young children however, can crawl up and play in areas where they can easily come in contact with soil possibly contaminated with animal and human feces. Further, human and animal feet can bring pathogens from feces deposited in the open into homes and immediate vicinity of infants and young children.

Further, a recent review found ingestion of soil is common among children in low income countries where pathogen densities are highest (Young et al. 2011). A study of infants and caregivers in rural Zimbabwe found that infants are frequently exposed to fecal bacteria through daily activities. Active ingestion of soil during play had the greatest risk of transmitting fecal bacteria into the infants' bodies, followed by crawling on highly contaminated soils and kitchen floors (Ngure et al, 2013). Ngure et al (2013) find that 82 percent of soil samples from kitchen yards that were within the reach of crawling infants were highly contaminated with *E. coli*. More importantly, on a per gram basis *E. coli* counts were up to 35 times higher in soil than in water. To make matters worse, 50 percent of caregiver hands were *E. coli* contaminated.

Avoiding ingestion of enteric pathogens and other causative microbes by infants and young children could prevent most of the environmental enteropathy burden (Mbuya and Humphrey, 2016).

lower in the highest income quintiles. Thus, income must be at least partially protective in blocking the pathway from an incidence of diarrhea to growth faltering that is sustained enough for stunting. Annex table 3A.5 shows this effect. It presents the results of a regression which explores the impact of a child reporting an episode of diarrhea in the past three months on the odds of the child being stunted. The results indicate an 11 percentage point increase in the odds of being stunted for children who had experienced a recent episode of diarrhea. What is interesting, though, is that once a measure of household income is included, the impact of diarrhea on stunting is more than halved. However, even after controlling for household income, the pathway from diarrhea to stunting is not fully blocked. The net impact remains significant and substantial, raising the odds of a child being stunted by 5 percentage points.

In short, poverty has an impact on stunting not because of hunger, but because poorer neighborhoods have poorer quality sanitation and thus higher levels of bacterial contamination of both soil and water. This is evident in Annex tables 3A.1 and 3A.2. Poorer districts and tehsils are significantly less likely to have flush to sewer or flush to septic tank toilets. We have already seen above that poorer districts also have higher levels of *E. coli* contamination. They also have fewer households where water gets treated or where soap is visible near the toilet or wash stand.

The decline in poverty over the past decade and a half has helped lower stunting in Punjab because of the expansion of flush to septic tank toilets and mechanized pumps that draw water from deeper and less contaminated aquifers, while it has merely buffered against a likely worsening of stunting in rural Sindh due to the prevalence of flush to open drain and flush to soak pit toilets combined with handpumps.

The 2011 report by PCRWR states that “since there is no proper arrangement for waste disposal (domestic, industrial, agricultural, hospital, etc.), most of the waste finds its way into the natural waterways and water storages and pollutes the fresh water resources, making water unsafe for drinking and other domestic uses. Even groundwater gets contaminated by the seepage of municipal industrial wastewater and from agricultural fields.”

Urban wastewater from domestic waste is mostly untreated and untreated municipal waste is usually discharged into the river or nearest watercourse. Only Islamabad and Karachi have any biological treatment processes, and even they treat only a small proportion of their wastewater before disposal. Some estimates suggest that even if all installed treatment plants were working at full installed capacity, only 8 percent of urban wastewater could be treated at municipal treatment plants. Given that most treatment plants are not functional, just 1 percent is estimated to be treated. Rudimentary treatment facilities exist in about a dozen major cities, but some have been built without associated sewerage networks, and plants are operating below capacity or are not functional (Murtaza and Zia 2012; Shahzad et al. 2015).

Not only is the treatment of sewage and wastewater from toilets almost entirely absent, raw sewage is used to irrigate crops, including vegetables, and untreated wastewater is used to irrigate fields. These practices are extremely harmful for the health of those who unwittingly consume these foods. In some cases, municipalities auction off sewage to the highest bidder, often farmers (Ensink and others 2004).

Where sewage lines do exist, they are of low quality. Care is not taken to separate sewer drains from water supply lines (see image 3.1 from the PCRWR report). According to the PCRWR (2011) “most of the (water) distribution pipelines have been laid in sewerage drains without using standard connecting accessories such as reducers, tee fittings, elbows and other pipeline fittings.”

Image 3.1: Water Pipelines Inside Open Sewerage Drains

Source: PCRWR (2011).

The poor quality of the water supply system and the lack of maintenance makes it easy for fecal contamination from sewer and animal waste to mix directly with the water supply. The PCRWR (2011) report states that the "distribution pipelines are very old and have completed their design life. Physical as well as hygienic conditions of surface and overhead storage tanks, are not good and mostly not maintained and cleaned…. Maintenance such as occasional cleaning, servicing of valves and hydrants, leak checking, repairs, disinfection of repaired section of the water distribution system, etc. are totally neglected by the operation staff of the water supply schemes."

The MORE (2016) survey gives further evidence of the absence of safe fecal waste treatment and management. Flush to septic tanks toilets require periodic emptying and cleaning of the pit or tank to limit re-contamination. But only 36 percent of households with septic tanks reported emptying their tank at least once. Among the tanks emptied, 95 percent were manually cleaned by household members without any protection, suggesting that these were not engineered septic tanks. Most households dump fecal waste from the tanks into nearby water bodies or open spaces (image 3.2 shows fecal waste dumped in the open).

Among households with toilets connected to soak pits (a clear majority of all households in the districts of Sindh), only 18 percent reported ever emptying their soak pits. Of those that were emptied, 85 percent were done so manually. About 83 percent of households that empty their pits dump the waste into nearby rivers and open fields; just 10 percent transfer the fecal waste to a designated treatment site. The remaining 7 percent reported that they could not recall where they disposed of the waste material.

Enumerator observation data from MORE villages provide a disturbing picture of the extent of fecal contamination in the environment. Enumerators observed whether animal or human feces were lying around anywhere within the dwelling space. and whether animals were roaming within the dwelling. The survey also gathered detailed information on the hygiene of women and children within the household. Among children under five, enumerators recorded observations of dirty appearance of hands and soil in fingernails. They observed women's

Image 3.2: Open Fecal Disposal Sites

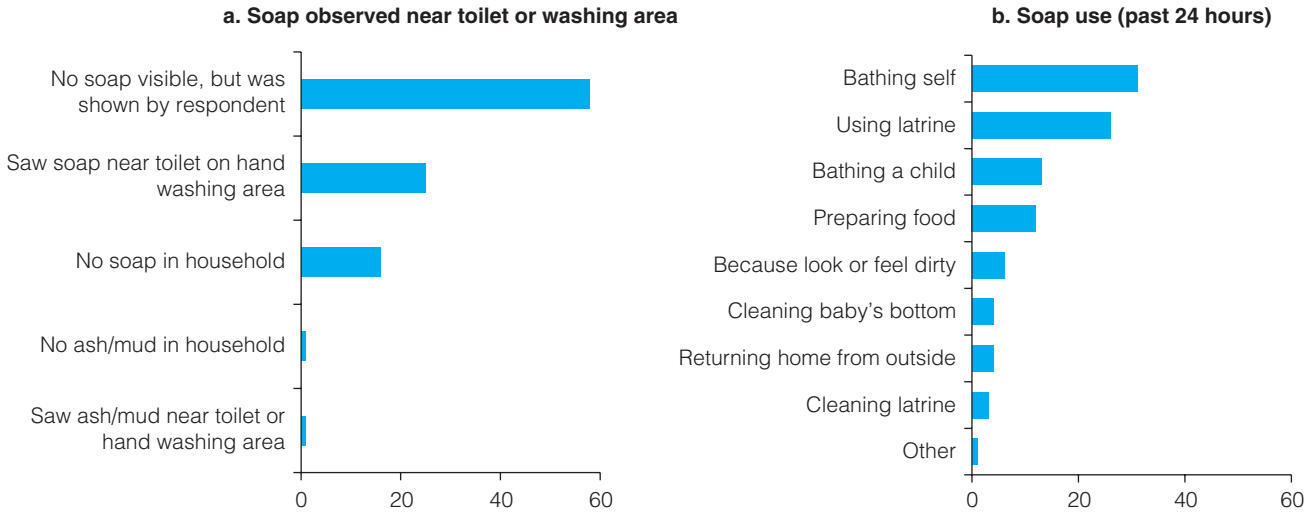
Source: MORE 2016.

hands for visible dirt and unclean appearance. They observed whether there was soap in the household and asked respondents whether they treated their water before drinking and how water was treated.

In more than half of the sampled households in both Punjab and Sindh, animal feces were lying around the living quarters and animals were roaming within the premises of the dwelling. In about 30 percent of the households in rural Sindh (Tando Muhammad Khan and Hyderabad), human feces were observed on site. Among children under five, 41 percent in Punjab and 55 percent in Sindh had soil in their finger nails and 32 percent in Punjab and 42 percent in Sindh has visibly dirty hands. As for women, 46 percent in Sindh and 33 percent in Punjab had visibly unclean hands.

Pickering and others (2010) show that in Tanzania, contamination of mothers' and children's hands through contact with fecal matter is associated with the presence of fecal bacteria in drinking water. As discussed above, water at the point of storage was up to 17 percentage points more contaminated than source water, suggesting recontamination of water by hands at the point of use.

Figure 3.8: Use of Soap in Households, 2016



Source: MORE 2016.

Table 3.1: Disposal of Organic, Recyclable, and Other Waste (Percent of Population)

Disposal method	Organic waste	Recyclable waste	Other waste
Thrown in backyard or adjacent land	53	52	51
Thrown in open space elsewhere in village	26	23	26
Burned near house or village	9	18	15
Other	11	7	7

Washing hands with soap and treating water before drinking can reduce the likelihood of fecal and other bacterial contamination. However, only 74 percent of households in Sindh were observed to have soap for handwashing (in Punjab the figure was 96 percent) (figure 3.8), and just 1 percent of households in Punjab and 14 percent in Sindh said they treated their water.

Data from the MORE survey also reveal unhygienic practices in the management of solid waste. Most households dumped their solid waste in their backyard or on adjacent land or open spaces within the village (table 3.1). Given that many households throw solid waste and fecal waste matter in the same place, these behaviors can affect the entire community's health.

The Impact of Living in a Poor Area versus Being Poor on Diarrhea and Stunting

The discussion so far shows that fecal contamination in the environment is likely a key determinant of stunting. Given this, and the correlation between district poverty and district WASH quality, it is safe to assume that some of this is likely being captured in the district poverty rate and the district's urban share of population.

Using this insight, the relative importance of location poverty can be further corroborated by checking if location of residence remains an important determinant of diarrhea and stunting once the household's own poverty status, and other household factors, like a mother's education, food intake practices and maternal and child care practices are controlled for.

The results of this multivariate regression are presented in Annex table 3A.6. Box 3.2 describes the data, the regression specification and the variables used.

Overall, the results show that an increase in household per capita consumption reduces the risk of being stunted substantially, with the effect being considerably larger among older children. As children grow and require additional nutrient intakes besides breast-milk, the household's ability to afford adequate and nutritional foods starts to play a more significant role in determining a child's nutritional status.

Importantly, however, the district poverty rate continues to matter even after household income and a large range of household characteristics and health behaviors is controlled for.

As we have seen in tables 3A.1 and 3A.2 the poverty rate of a district is highly correlated with its average quality of water and sanitation so this once again provides strong evidence of the importance of location poverty, and not just own poverty in determining nutritional outcomes.

Secondly, even after controlling for both the district's and the household's own poverty, the quality of the household's own water and sanitation continues to matter and is associated with lower diarrhea and stunting, especially among children age 3 to 5 years.

Box 3.2: Multivariate Regression Approach

To understand the impact of living in a poor area versus own poverty and other factors a regression approach is used. The data come from the Punjab and Sindh MICS 2014. The regression models predict the probability of an under 5 child being stunted, or having diarrhea within a 2-week recall from the survey, using an extensive set of independent variables.

The regression equation is: $Y_{ijh} = \alpha + \beta_1 X_{ijh} + \beta_2 + Z_{jh} + \gamma D_h + U + \varepsilon_{ijh}$

Where Y_{ijh} is an indicator variable that takes the value 1 if child *i* in household *j* and district *h*, is stunted and 0 otherwise (or if the child had an episode of diarrhea within the two weeks preceding the survey); X_{ijh} is a set of child level variables, such as age and gender, Z_{jh} is a set of household level variables, such as household's monthly per capita expenditure, household size and mother's level of schooling and D_h is the district poverty rate. *U* is an indicator that takes the value 1 if the urban share of the district is greater than 50 percent and ε_{ijh} is a random error which also captures unobserved child, household and community characteristics. The full list of variables is provided in the Annex.

The regression was conducted separately for children of different age groups to better understand the impact of each set of factors on the nutritional status of children at different phases of physical growth. The age groups are 0 to 5 months, 6 to 11 months, 12 to 35 months, and 36 to 59 months.

The impact of piped water on stunting and diarrhea, relative to other drinking water sources, however, is not robust. Piped water seems to worsen outcomes for children in certain ages which brings us back to the discussion earlier on water contamination. If piped water is contaminated, it is not truly improved water.

Several other household characteristics behave as expected. Children born to older and more educated mothers are less likely to be stunted. Children born to older mothers are also less likely to have diarrhea. Hygiene behaviors, child caring and feeding practices matter. Children living in households that use soap for hand-washing are about 3 to 6 percent less likely to contract diarrhea. Moreover, the importance of hand-washing with soap is robust across all age groups, except for infants less than 6 months old. Hand-washing with soap also helps to decrease the probability of stunting by nearly 6 percent among children between 3 and 5 years old. Since older children consume foods other than breast milk, and can crawl and play, they may be more exposed to harmful bacteria through food, and dirt on floors and hands.

Leaving a child unattended is associated with higher incidence of diarrhea in children age 6 months or older and stunting in children 12 months or older. Older children crawl, mouth objects including soil, and play in areas contaminated with fecal bacteria such as floors and yards in and near the dwelling and are more likely to be exposed to contamination when left unattended.

Disposing stool in the toilet compared to the child using the toilet is positively associated with diarrhea in children between 12–35 months old, ages where children begin to start using toilets. Disposing stool in the open or garbage versus child using the toilet has an even stronger positive association with diarrhea in the same age group compared to the effect of disposing stool in the toilet.

Breastfeeding within the first hour of birth reduces the incidence of diarrhea among children age 6 to 11 months. Consequently, delaying breastfeeding up to 24 hours after birth is positively associated with the incidence of diarrhea.

A mother receiving prenatal care is associated with lower stunting in children between 6–11 months. A child receiving vitamin A is associated with better outcomes in younger cohorts. It lowers stunting rates in children between 0-5 and 12-35 months and lowers rates of diarrhea in infants 0–11 months of age.

This analysis is complemented by two other pieces of work that take a different approach. The first is based on UNICEF's multisectoral framework that identifies three underlying determinants of nutrition namely, food security, environment and health and child care practices and emphasizes the synergies between these underlying determinants. The second analyzes how WASH related conditions and other factors, like access to care, combine to determine the distribution of burden of disease by poverty and geography (annexes 3B and 3C contain a more detailed discussion of each. Box 3.3 and box 3.4. present some highlights from both pieces of analysis. Map B3.3.1 shows the DALY rate by region, overall and for the bottom 40 and top 60. Figure B3.4.1 shows that simultaneous access to more than one nutrition dimension is positively correlated with child height. The associated background notes are listed in the references.

In conclusion, this chapter has provided evidence in support of the critical role of safely managed human waste and safely managed water in reducing child stunting and mortality. While many factors contribute to stunting, the evidence makes it clear that improving water and sanitation is what must be done, first and above all. Without this piece, a further decline in poverty will have, at best, a very limited impact on stunting and policy interventions to support child nutrition through other means will essentially amount to tinkering at the margins in the face of a maelstrom.

Box 3.3: WASH Poverty Risk Model

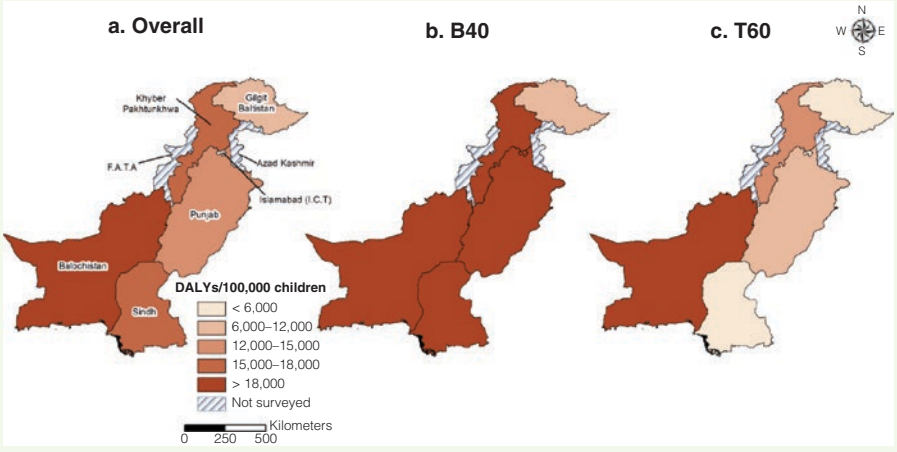
In both urban and rural settings, children in poorer households are more vulnerable to the risks posed by poor WASH due to low nutrition and access to curative ORT. In rural settings, poorer households have lower coverage of preventative vitamin A supplementation than urban settings. Children in poor households are up to 4 times more likely to be underweight and 7 times more likely to be severely underweight. There was not a large disparity with regard to curative (ORT) services between urban and rural populations, with urban populations having between 1.1–1.4 times higher coverage.

Children with poor WASH conditions also suffer from poor access to health and nutrition. Results of the WASH-PRM model show that overall measures of exposure, susceptibility and risk are positively associated. This is true in both rural and urban communities. These correlations between exposure and susceptibility add to (and are likely caused by) the underlying difference in wealth and urban-rural inequality.

The health burden of inadequate WASH is disproportionately borne by poorer children and those in vulnerable geographic areas. Nationally, the WASH enteric burden for the poorest quintile is about 10 times greater than the enteric burden for the richest quintile. WASH-related enteric burden is lower within urban than in rural populations, but the disparities in both are equivalent.

Burden for the urban poorest is 1.4 times higher than the richest and 3 times higher for the rural poorest than the richest. The highest burden associated with inadequate WASH among the poor is due to a conjuncture of vulnerabilities. They are less likely to have good WASH services, and are also more likely to be undernourished and without access to care. Child health vulnerabilities magnify the effects of inadequate WASH among the poor.

Map B3.3.1: Inadequate WASH-Attributable Enteric Burden DALY Rate by Region for Children under Five



Source: DHS, 2012–13.
Note: DALY = disability-adjusted life year; WASH = water supply, sanitation, and hygiene.

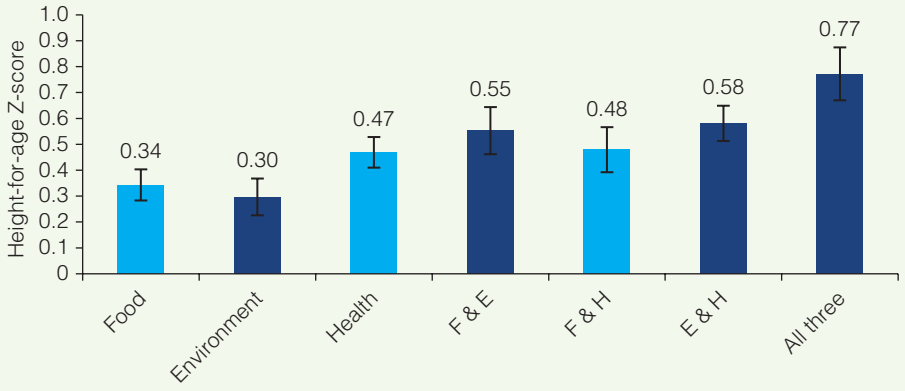
Box 3.4: UNICEF Synergies Empirical Analysis for Pakistan

A child who has either adequate food, health or WASH access is likely to be taller than a child who doesn't have access to any of these nutrition dimensions. The replication of Skoufias (2016) for Pakistan to study the three pillars of nutrition, namely food, health and environment (WASH), reveal that adequate food, health and WASH access correlate with malnutrition in Pakistan. Using data from MICS 2014 for Sindh and Punjab, the analysis showed that the height of children is strongly and positively correlated with the number of nutrition dimensions the child is adequate in.

A child who has adequate access to both food and environment is taller than a child who has access to only food or environment. Similarly, a child is taller if he has access to both adequate health and environment as compared to access to only adequate environment or health. This shows that simultaneous access to more than one nutrition dimension is positively correlated with child height (figure B3.4.1). The children who have access to all three nutrition dimensions are the tallest in the sample.

Multisectoral interventions are needed to reduce malnutrition in Pakistan. The analysis shows that if, for example, improvement in food security is accompanied with improvement in WASH access then the returns to the investment might be much higher. The result calls for multisectoral interventions in the nutrition sector with special focus on WASH access.

Figure B3.4.1: Coefficients of the Multisectoral Regression Framework Analysis: Three Nutrition Dimensions



Source: MICS, Sindh and Punjab 2014, and World Bank staff calculation.
Notes: Bars represents the coefficients of regression where dependent variable is height-for-age Z-score. Intercept of the regression is –1.405. Dark blue bars represent coefficients with environment (WASH) dimension. All coefficients are statistically significant at 5 percent.

Annex 3A Regression Results

Table 3A.1: Poverty and WASH at District Level

	PSLM 2014/15		Punjab & Sindh MICS 2014
	(1)	(2)	(3)
Dep. Var.	District poverty rate	District poverty rate	District poverty rate
Punjab	−0.2122	1.7773	
	(2.9071)	(2.6150)	
Sindh	4.1805	5.3503	2.1704
	(4.1944)	(4.1493)	(3.3165)
Balochistan	16.8614***	16.5730***	
	(3.7978)	(3.8165)	
Urban share of population	−0.2340***	−0.2579***	10.3690
	(0.0728)	(0.0715)	(8.6562)
Flush to sewer	−0.1691*	−0.2035**	−0.2535***
	(0.0874)	(0.0850)	(0.0795)
Flush to septic	−0.2364***	−0.2508***	−0.3256***
	(0.0545)	(0.0540)	(0.0510)
Piped water	−0.0546		−0.2257*
	(0.0687)		(0.1315)
Other improved water	0.0238		0.0235
	(0.0513)		(0.1318)
Improved water		0.0155	
		(0.0513)	
Soap for handwashing			−0.2767**
			(0.1131)
Treating water before drinking			−0.1338
			(0.1229)
Constant	45.2727***	44.5397***	69.8156***
	(4.8137)	(4.8192)	(14.4914)
N	116	116	64
adj. R-sq	0.730	0.727	0.791
rmse	8.1808	8.2312	6.2066
p	0.0000	0.0000	0.0000

Source: 2014/15 PSLM, 2013/14 HIES and 2014 MICS, Punjab and Sindh.

Table 3A.2: Poverty and WASH at Tehsil Level, Punjab

	(1)	(2)	(3)
Dep. Var.	Tehsil poverty rate	Tehsil poverty rate	Tehsil poverty rate
Urban share of population	–0.0305	–0.0421	–0.0310
	(0.0384)	(0.0412)	(0.0389)
Flush to sewer	–0.2514***	–0.2950***	–0.2477***
	(0.0525)	(0.0560)	(0.0539)
Flush to septic tank	–0.3388***	–0.3603***	–0.3369***
	(0.0283)	(0.0303)	(0.0290)
Soap for hand-washing	–0.3256***	–0.3140***	–0.3317***
	(0.0625)	(0.0675)	(0.0638)
Treating water before drinking	–0.3998***	–0.2620**	–0.3852***
	(0.0963)	(0.1120)	(0.1091)
Improved water	0.2576***		
	(0.0545)		
Constant	64.2311***	89.2111***	65.7187***
	(7.4488)	(5.8843)	(7.7127)
N	150	150	150
adj. R-sq	0.785	0.754	0.781
rmse	4.9912	5.3489	5.0381
p	0.0000	0.0000	0.0000

Source: 2011 Multiple Indicator Cluster Survey, Punjab.

Table 3A.3: The Effect of Water Source and Bore Depth on *E. coli* Contamination

Variables	*E. coli* contamination (1 = Present)
Bore Depth	–0.0002***
	(0.000)
Mechanized Pump	–0.120***
	(0.0173)
Hand Pump	0.0893***
	(0.0154)
Depth x Mechanized Pump	0.0000
	(0.0001)
Depth x Hand Pump	–0.0012***
	(0.0001)
Constant	0.389***
	–0.0137
Observations	33,029
R-squared	0.021

Source: PCRWR 2012 data and World Bank staff calculations.

Table 3A.4: *E. coli* Contamination in Water (1 if Contaminated, 0 Otherwise)

	Contamination at source	Contamination at point of use
Water source:		
Piped into dwelling	0.056	0.045
	(0.34)	(0.26)
Public tap	–0.088	0.125*
	(0.44)	(0.08)
Hand Pump	–0.051	0.012
	(0.19)	(0.70)
Toilet type:		
Pit Toilet	0.022	–0.007
	(0.71)	(0.85)
OD	0.151**	–0.030
	(0.01)	(0.63)
Interaction water source and		
toilet type:	0.040	0.051
Piped water* Pit Toilet	(0.70)	(0.41)
Piped water* OD	–0.028	0.067
	(0.74)	(0.43)
Public tap * Pit Toilet	0.208	–0.060
	(0.12)	(0.46)
Public tap * OD	0.048	0.035
	(0.71)	(0.74)
Hand Pump* Pit Toilet	0.137**	0.014
	(0.04)	(0.76)
Hand Pump* OD	–0.053	0.040
	(0.44)	(0.57)
Human Feces (1 if		
observed within the house,	0.062*	0.075***
0 otherwise)	(0.08)	(0.00)
Contamination at source	–	0.513***
		(0.00)
R-squared	0.022	0.294
N	2400	2200

Source: MORE midline, 2013.
Note: The regression equation is as follows: $Y_{ij} = \alpha + \beta X_{ij} + e_{ij}$ Y_{ij} is an indicator which takes the value 1 if *E. coli* is present in a household's water at source or at point of use (usually a storage device). X_{ij} are household level variables. These include the source of drinking water in the household (indicator variables for piped water, public tap, and hand pump with motorized pump being the excluded category); the type of toilet facility in the household (indicator variables for pit latrine and open defecation with flush toilet connected to a sewer or septic tank, being the excluded category) and interaction terms between each water source and toilet facility. Additional variables include an indicator for whether human feces was observed lying within the household premise. e_{ij} is a random error that captures unobserved characteristics of the household and village that influence contamination.
Standard errors clustered at village level. *** p<0.01, ** p<0.05, * p<0.1.
Each regression includes a constant term. Excluded category in toilet is Flush toilet and excluded category in water source is Motorized Pump.

Table 3A.5: Stunting, Diarrhea, and Income

	Stunting	
Diarrhea	0.111***	0.051**
	(0.00)	(0.05)
Income		-0.066**
		(0.03)
R-squared	0.011	0.006
N	3356	1818

Source: MORE 2016 and World Bank staff calculation.
Standard errors clustered at village level. *** p<0.01, ** p<0.05, * p<0.1.
Each regression includes a constant term. Income is log of per capita adult equivalent expenditure.

Table 3A.6: Relationship between Stunting/Diarrhea and Household and Community Characteristics, Punjab and Sindh

Stunting	0–5 months	6–11 months	12–35 months	36–59 months
HH p.c. expenditure (log)	–0.088	–0.133	–0.237	–0.210
	(0.029)**	(0.031)**	(0.016)**	(0.015)**
District poverty rate	0.002	0.002	0.004	0.003
	(0.001)*	(0.001)**	(0.000)**	(0.000)**
HH head age (log)	0.009	–0.059	–0.005	–0.048
	(0.028)	(0.028)*	(0.016)	(0.017)**
Multi-generational HH	0.031	–0.009	–0.019	–0.018
	(0.021)	(0.020)	(0.011)	(0.010)
Highest education attainment in the HH				
Primary school	–0.032	–0.000	0.028	–0.032
	(0.029)	(0.030)	(0.017)	(0.015)*
Middle school	–0.023	–0.024	–0.015	–0.028
	(0.034)	(0.032)	(0.019)	(0.017)
Lower secondary school	–0.043	–0.039	–0.056	–0.042
	(0.032)	(0.031)	(0.018)**	(0.017)*
Upper secondary and above	–0.034	–0.055	–0.081	–0.054
	(0.036)	(0.034)	(0.019)**	(0.018)**
Mother's education				
Primary school	–0.013	–0.019	–0.008	–0.037
	(0.024)	(0.022)	(0.014)	(0.013)**
Middle school	–0.024	–0.029	–0.028	–0.089
	(0.035)	(0.030)	(0.019)	(0.019)**
Lower secondary school	–0.024	–0.000	–0.052	–0.089
	(0.032)	(0.029)	(0.018)**	(0.018)**

table continues next page

Table 3A.6: Continued

Stunting	0–5 months	6–11 months	12–35 months	36–59 months
Upper secondary and above	−0.036 (0.037)	0.001 (0.032)	−0.076 (0.020)**	−0.124 (0.020)**
Mother's age (log)	0.030 (0.043)	−0.123 (0.042)**	−0.031 (0.023)	−0.138 (0.023)**
HH has improved toilet	−0.010 (0.019)	−0.025 (0.020)	0.001 (0.012)	−0.018 (0.011)
HH has piped and treated water	0.007 (0.050)	0.092 (0.047)	0.060 (0.025)*	0.017 (0.024)
HH has piped and untreated water	0.004 (0.023)	0.019 (0.020)	0.046 (0.013)**	0.046 (0.013)**
HH has soap for handwashing	−0.025 (0.021)	−0.017 (0.019)	−0.011 (0.011)	−0.055 (0.011)**
Male child	0.057 (0.016)**	0.025 (0.015)	0.020 (0.009)*	−0.025 (0.008)**
Child left unattended for at least 1 hour last week	0.030 (0.034)	0.015 (0.028)	0.042 (0.015)**	0.024 (0.013)
Child received vitamin A	−0.033 (0.019)	−0.015 (0.015)	−0.022 (0.010)*	
Child currently being breastfed	−0.124 (0.049)*	−0.042 (0.020)*		
Child given dairy (milk/yogurt/ cheese) yesterday	0.015 (0.017)	−0.031 (0.016)	−0.066 (0.012)**	
Child's first breastfeeding after birth				
Within 24 hours	0.039 (0.024)	0.022 (0.021)		
After 24 hours	0.014 (0.024)	0.053 (0.021)*		
Mother received pre-natal care	−0.031 (0.023)	−0.096 (0.024)**		
Stool disposal, w.r.t "Child using toilet"				
Put stool in toilet/latrine			0.003 (0.016)	
Put stool in drain/garbage/ open field			0.029 (0.018)	
_cons	1.224 (0.319)**	1.747 (0.338)**	1.430 (0.157)**	0.856 (0.117)**
R^2	0.02	0.03	0.02	0.02
N	3,573	4,326	15,835	17,586

table continues next page

Table 3A.6: Continued

Diarrhea	0–5 months	6–11 months	12–35 months	36–59 months
HH p.c. expenditure (log)	−0.084	−0.089	−0.089	−0.077
	(0.031)**	(0.035)*	(0.016)**	(0.012)**
District poverty rate	0.001	0.000	−0.001	−0.000
	(0.001)	(0.001)	(0.000)	(0.000)
HH head age (log)	−0.041	−0.066	−0.015	−0.020
	(0.031)	(0.032)*	(0.016)	(0.012)
Multi-generational HH	−0.002	−0.013	−0.013	−0.000
	(0.021)	(0.023)	(0.011)	(0.008)
Highest education attainment in the HH				
Primary school	0.038	0.035	0.014	−0.001
	(0.028)	(0.030)	(0.015)	(0.011)
Middle school	0.028	0.010	0.049	0.005
	(0.031)	(0.034)	(0.017)**	(0.013)
Lower secondary school	0.039	0.065	0.027	0.002
	(0.031)	(0.034)	(0.017)	(0.012)
Upper secondary and above	0.051	0.066	0.045	0.011
	(0.035)	(0.035)	(0.018)*	(0.014)
Mother's education, w.r.t. "No schooling"				
Primary school	0.027	0.010	0.004	0.020
	(0.025)	(0.026)	(0.013)	(0.010)
Middle school	0.014	0.014	−0.003	−0.001
	(0.035)	(0.036)	(0.018)	(0.013)
Lower secondary school	0.036	0.002	−0.007	0.005
	(0.037)	(0.037)	(0.017)	(0.013)
Upper secondary and above	0.023	−0.034	0.005	−0.007
	(0.041)	(0.040)	(0.020)	(0.016)
Mother's age (log)	−0.088	−0.150	−0.118	−0.004
	(0.043)*	(0.045)**	(0.023)**	(0.017)
Male child, w.r.t female child	0.019	0.006	0.006	0.009
	(0.017)	(0.017)	(0.009)	(0.006)
HH has improved toilet	−0.012	0.023	0.009	−0.004
	(0.021)	(0.021)	(0.011)	(0.008)
HH has piped and treated water	0.030	−0.001	0.078	0.034
	(0.052)	(0.051)	(0.027)**	(0.019)
HH has piped and untreated water	0.035	0.003	0.059	0.033
	(0.025)	(0.025)	(0.013)**	(0.010)**
HH has soap for handwashing	−0.024	−0.054	−0.034	−0.027
	(0.022)	(0.023)*	(0.011)**	(0.008)**
Child left unattended for at least 1 hour last week	0.049	0.100	0.064	0.054
	(0.036)	(0.033)**	(0.014)**	(0.010)**

table continues next page

Table 3A.6: Continued

Diarrhea	0–5 months	6–11 months	12–35 months	36–59 months
Child received vitamin A	0.065 (0.021)**	–0.044 (0.018)*	–0.010 (0.009)	
Child currently being breastfed	–0.044 (0.048)	–0.044 (0.027)		
Child given dairy (milk/yogurt/cheese) yesterday	0.043 (0.018)*	–0.028 (0.019)	–0.049 (0.011)**	
Child's first breastfeeding after birth				
Within 24 hours	0.030 (0.026)	0.068 (0.026)**		
After 24 hours	0.033 (0.025)	0.082 (0.026)**		
Mother received pre-natal care	0.062 (0.021)**	0.056 (0.024)*		
Stool disposal, w.r.t "Child using toilet"				
Put stool in toilet/latrine			0.045 (0.015)**	
Put stool in drain/garbage/open field			0.072 (0.017)**	
_cons	1.224 (0.319)**	1.747 (0.338)**	1.430 (0.157)**	0.856 (0.117)**
R^2	0.02	0.03	0.02	0.02
N	3,573	4,326	15,835	17,586

Source: MORE 2016 and World Bank staff calculations.

Annex 3B UNICEF's Multisectoral Analysis of Stunting

UNICEF (1990) proposed a multisectoral framework which identified three underlying determinants of nutrition namely, food security, environment and health, and child care practices. The framework goes beyond a unidirectional nutrition model which concentrates on food security and highlights the importance of synergies among different sectors that could be important for nutrition outcomes. Skoufias (2016) operationalized the UNICEF (1990) framework by analyzing the correlation between stunting and the three underlying determinants, food, health & environment and care, as well as their synergies across different countries. The methodology proposes a parsimonious model to identify the potential "binding constraints" in reducing malnutrition and identifies potential synergies among underlying determinants, contributing to a multifaceted approach towards reduction in stunting.

This report uses an extension of Skoufias (2016) to analyze the determinants of nutrition status in Pakistan where the nutrition components are grouped into four categories namely, food, care, environment and health. A child is adequate in food if (i) he/she satisfies the minimum dietary diversity, (ii) minimum food frequency and (iii) solid food requirements.

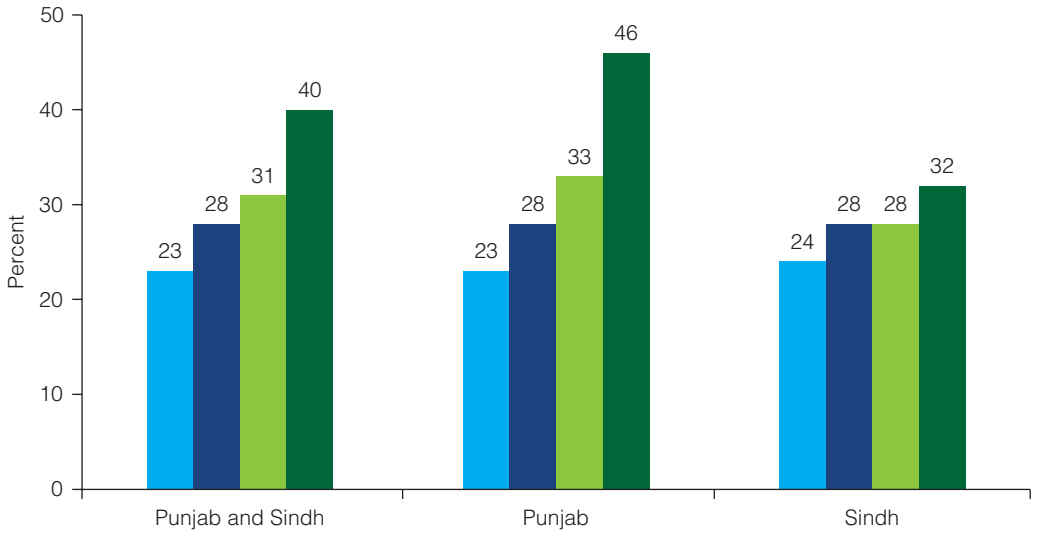
A child is adequate in care if (i) either father or mother has primary education and (ii) the household is multi-generation household. Adequacy in health requires that (i) WHO recommended vaccinations are provided, (ii) mother had at least four prenatal doctor visits and (iii) vitamin A supplements were given to a child older than 6 months old. Finally, adequacy in environment is defined as (i) access to improved water, (ii) improved sanitation, (iii) presence of handwashing facility with soap and water and (iv) if 75 percent of the community has access to improved sanitation. The analysis is based on data from MICS 2014 surveys for Punjab and Sindh. Box 3 presents a summary of main findings, and detailed results are below.

Figure 3B.1 shows the percentage of children adequate in each nutrition dimension. The highest percentage is for adequacy in health where about 40 percent children were adequate in health. As compared to the other three components, adequacy in food is the lowest, standing at 23 percent for both provinces combined. Comparing provinces, while children in both provinces seem to be equally adequate in nutrition and care, children in Punjab are more likely to be adequate in environment and health than Sindh.

A simple way to test the validity of multisectoral nutrition framework is to group children in four categories based on the number of nutrition dimensions, i.e. (i) adequate in one out of four dimensions, (ii) adequate in two out of four dimensions, (iii) adequate in three out of four dimensions, and (iv) adequate in all four dimensions, and then regress these groups on height-for-age Z-scores. It is important to point out here that the specific dimensions do not matter here, only the number of adequacies do. For example, a child adequate in food and care would be assigned to the group with two out of four adequacies same as the child who is adequate in environment and health as both categories imply adequacy in two categories. Figure 3B.2 graphically presents the results of this exercise where coefficients for each group are presented as individual bars. As the number of adequate dimensions increase, the height for age Z-score also increases. In other words, children who are adequate in more nutrition dimensions are more likely to be taller.

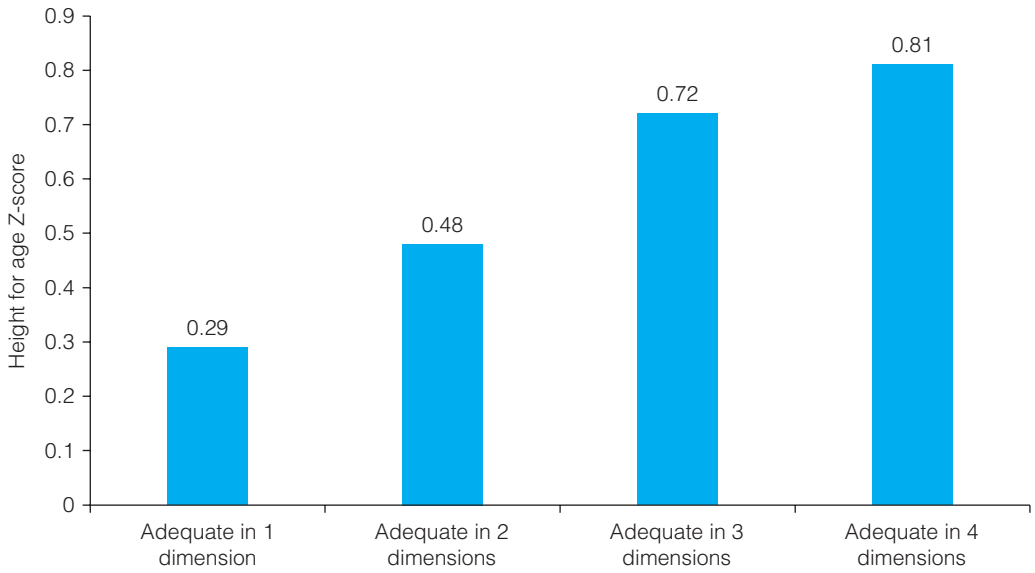
In the next exercise, the children are exclusively grouped into each nutrition dimension along with their two-way, three-way and four-way interactions. In other words, a child can only be categorized in one of the sixteen categories. For example, a child who is adequate in food and

Figure 3B.1: Adequacy in Nutrition Dimensions, 2014



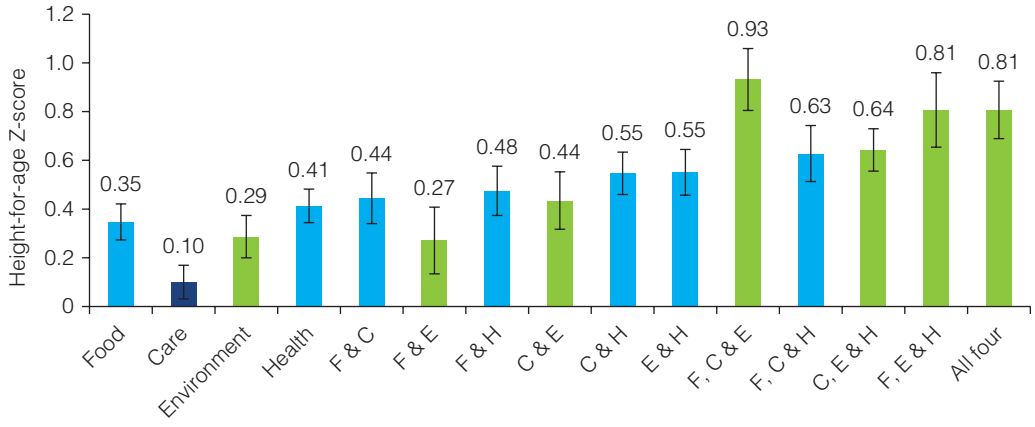
Source: MICS, Sindh and Punjab 2014, and World Bank staff calculation.

Figure 3B.2: Correlations between Adequacies and Height-for-Age Z-Scores, 2014



Source: MICS Sindh and Punjab 2014 and World Bank staff calculation.
Note: Bars represents the coefficients of regression where dependent variable is height-for-age Z-score. Intercept of the regression is −1.436.

Figure 3B.3: Coefficients of the Multisectoral Regression Framework Analysis: Four Nutrition Dimensions



Source: MICS Sindh and Punjab 2014 and World Bank staff calculation.
Notes: Bars represents the coefficients of regression where dependent variable is height-for-age Z-score. Intercept of the regression is −1.456. Green bars represent coefficients with environment (WASH) dimension. All coefficients are statistically significant at 5 percent except for the coefficient for "Care" which is statistically insignificant (Dark blue bar).

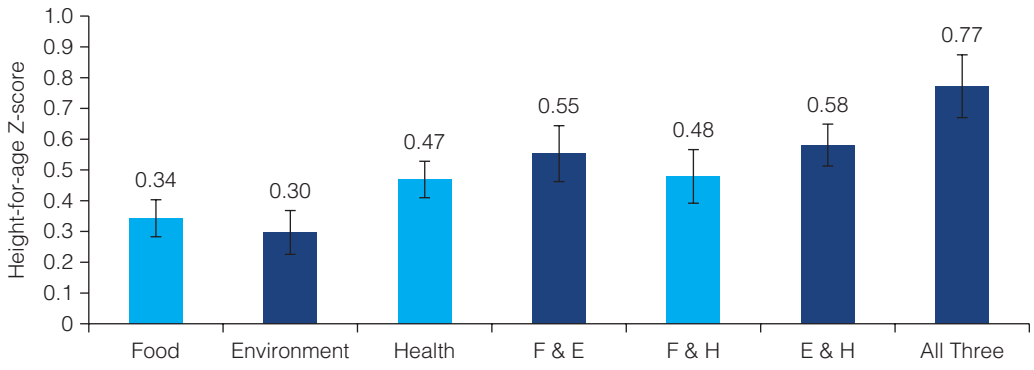
health components, would only be assigned into "Adequate in Food and Health Only" category and he would not appear in "Adequate in Food Only" and "Adequate in Health Only" categories. The results of the regression analysis on multisectoral nutrition framework are graphically presented in figure B3.3. In figure B3.3 green bars represent coefficients for "Environment" (WASH) dimension and its interactions. It can be seen from the figure that as compared to the coefficient for "Environment" alone, all the other bars are taller.

As compared to the adequacy in WASH access alone, the magnitude of the relationship between WASH and stunting is much stronger when WASH access is combined with other nutrition dimensions (green bars). In general, the bars for the two-way interactions are taller than the ones for individual dimensions. Similarly, the bars for the three-way interactions are taller than the two-way interactions and individual dimensions.

The statistically insignificant coefficient of "Care" is likely to be a result of weak variable construction. By definition, access to adequate care measures the ability of the primary caregiver to provide a safe and appropriate environment for the child to grow and develop. An ideal measure of access to adequate care would include child's caregivers' (1) knowledge, practices and beliefs regarding childcare, (2) health and nutritional status, (3) mental health, stress level, and self-confidence, (4) autonomy and control of resources, (5) workload and time constraints, (6) social support received from family and community. While measures for adequate food, health and environment in this analysis cover the essential components of their respective definitions, the access to care variable is rather weak due to data limitations. Besides, the current version of adequate care index captures the knowledge and behavioral aspects of care which are implicitly captured by food, health and environment variables. In the next set of regressions, the "Adequate in Care" dimension is excluded from the analysis to test whether the results presented in figure 3B.4 would improve. The results show, even more strongly than before, that children with multisectoral adequacies are significantly taller. Adequacy in all three dimensions has the largest coefficient showing that tallest children are on average adequate in all three nutrition dimensions. The results do not change when adequacy in care is added to the regression as a control variable.

The analysis of UNICEF (1990) nutrition framework for Pakistan shows that higher the number of adequacies in nutrition dimensions, taller the child's height. In terms of individual nutrition dimensions, children with recommended health, food and WASH access are likely to be taller while adequate care variable was statistically insignificant. Moreover, children with adequacies in multiple nutrition dimensions are taller than the ones with single adequacies. This highlights the importance of multi-sector planning for nutrition since each nutrition dimension, individually as well as jointly, correlates with the nutrition outcome.

Figure 3B.4: Coefficients of the Multisectoral Regression Framework Analysis: Three Nutrition Dimensions



Source: MICS, Sindh and Punjab 2014, and World Bank staff calculation.
Notes: Bars represents the coefficients of regression where dependent variable is height-for-age Z-score. Intercept of the regression is –1.405. Dark blue bars represent coefficients with environment (WASH) dimension. All coefficients are statistically significant at 5 percent.

Annex 3C WASH Poverty Risk Analysis

Not everyone is equally exposed to WASH-related risks; significant disparities exist across population groups and geographies in terms of the relative risk. Within a population that lacks access to safe WASH, some face greater health risks due to factors that render them more vulnerable or susceptible to adverse effects. The WASH Poverty Risk model combines the risk of exposure and susceptibility to compute an overall Relative Risk Index.

The WASH Poverty Risk Model (PRM) is describes these overlapping risk factors to understand the consequences of their unequal distribution to support WASH investment strategies that more effectively target the areas of greatest need.

The WASH PRM focuses on one health outcome—diarrhea—as the most important outcome in terms of attributable disease burden. This approach explores how poor WASH service conditions and these other factors combine to determine the distribution of the disease burden within populations, stratified by wealth and by geography. The PRM uses nationally representative data on these different factors, combined with literature-based estimates of the associated risk of diarrheal disease, to estimate how the WASH-related diarrheal disease burden is distributed geographically and by wealth groups. A summary of results of the analysis are in box 3.4.

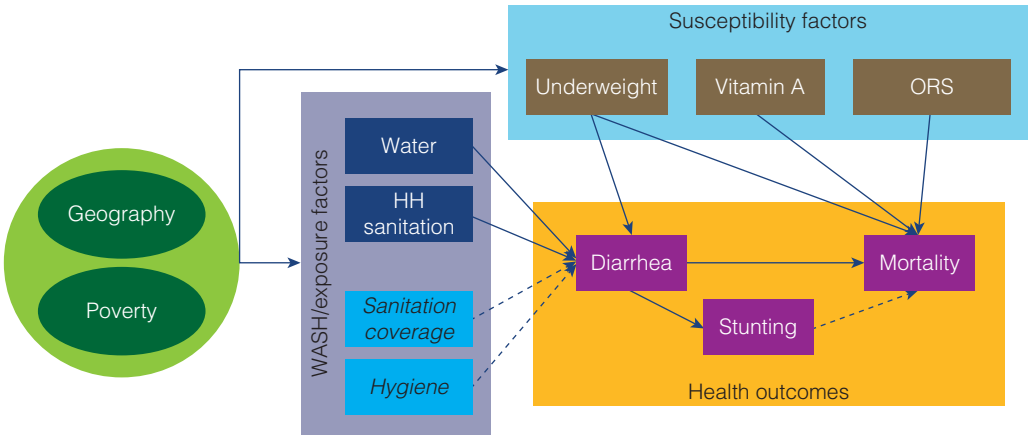
Overview of the WASH PRM Model

The WASH-PRM assesses patterns of disease risk across economic and geographic sub-populations by combining 1) rigorous estimates of the effects of exposure and susceptibility factors on disease with 2) country specific data on the distribution of these risk factors. The PRM model combines key "susceptibility factors" and "exposure factors" that are most relevant to the health outcome of interest: diarrhea. The relative risks associated with these exposure and susceptibility factors are derived from published systematic review based meta-analyses as per conventional practice.[5] Relative risk represents the level of disease risk among "exposed" individuals, those with a particular risk factor (e.g. *not* having safe drinking water) compared to "unexposed" individuals, those without that risk factor (e.g. *having* safe drinking water). A relative risk greater than 1.0 therefore shows a greater risk of a given disease among the exposed versus the unexposed and a relative risk of less than 1.0 by contrast shows that the risk factor among the exposed is protective against the disease.

The conceptual framework for the WASH-PRM is depicted in figure C3.1—the "Exposure factors" section of the diagram includes WASH-related elements that influence the risk of diarrheal disease. Relative risks are developed from the literature for different levels of these WASH services. Relative risks for individual exposure risk factors are combined into a single "Exposure index." The "Susceptibility factors" section of the conceptual framework addresses individual risk factors that have been identified through rigorous evaluations and meta-analyses (figure C3.1). Quantitative risk estimates for each factor are combined into a single "Susceptibility index." We also include explorations of other potentially important exposure factors (shown in bright blue in figure C3.1) that are not included in the bases model. They are not included in the base model due to inconclusive evidence of the magnitude of excess risk or lack of data on conditions and behaviors.

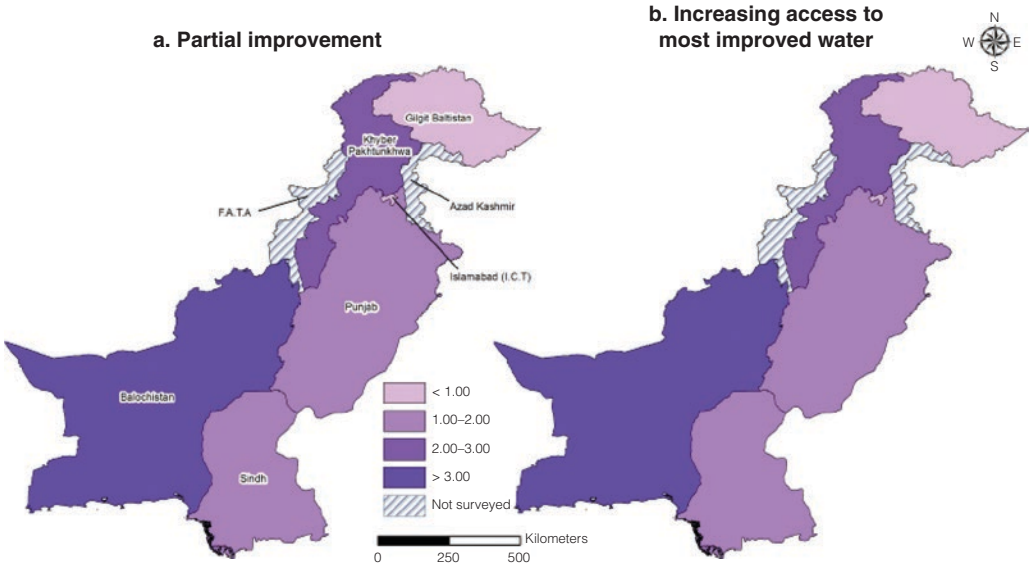
Exposure: Nationally, the richest households in Pakistan have up to 60 percent more access to the highest level of improved sanitation sources than the poorest households, and are up to six times more likely to report improved handwashing and up to ten times more likely to report safe water treatment compared to the poorest households. In urban and rural settings, WASH related exposure variables are strongly associated with economic status, with the exception of improved water sources, and disparities are often larger between the rural wealth quintiles than the urban wealth quintiles.

Figure 3C.1: WASH Poverty Risk Model Conceptual Framework



Note: WASH/Exposure Factors in bright blue are not included in the Exposure Index.

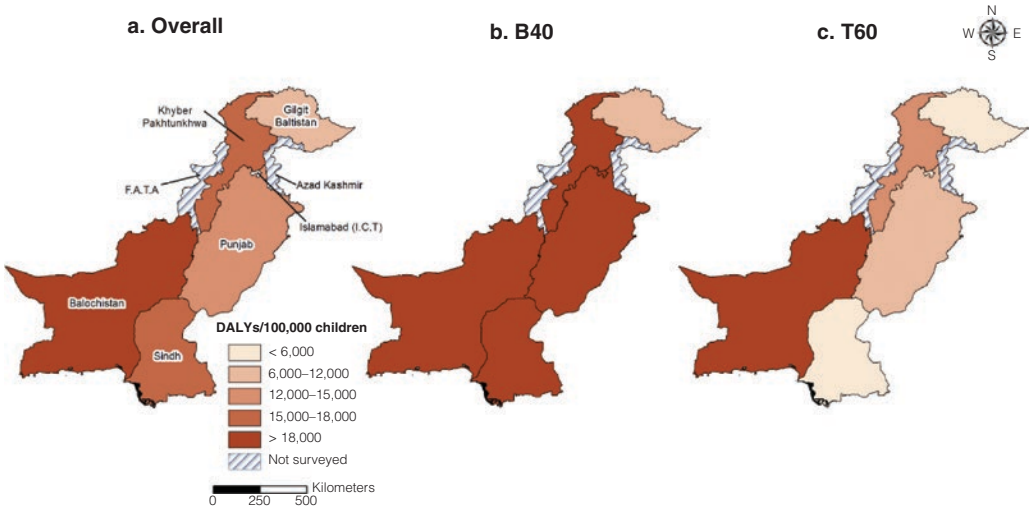
Map 3C.1: Effect of Water Access Improvement on WASH Risk Reduction by Region



Source: DHS, 2012–13.
Note: Map A partial improvement in water access (unimproved Category A to improved Category B), Map B increasing household access (Category A or B) to the most improved water source (Category C).

Susceptibility. In both urban and rural settings, children in poorer households are more vulnerable to the risks posed by poor WASH due to low nutrition and access to curative ORT. In rural settings, poorer households have lower coverage of preventative vitamin A supplementation than urban setting. Children in poor households are up to 4 times more likely to be underweight and 7 times more likely to be severely underweight. There was not a large disparity in regards to curative (ORT) services between urban and rural populations, with urban populations having between 1.1–1.4 times higher coverage. Rural households had a higher coverage of vitamin A

Map 3C.2: Inadequate WASH-Attributable Enteric Burden DALY Rate by Region for Children under Five



Source: DHS, 2012–13.
Note: DALY = disability-adjusted life year; WASH = water supply, sanitation, and hygiene.

than urban households across wealth quintiles; children in rural households are 1.2–1.3 times more likely to receive vitamin A supplementation than urban children.

Overall measures of exposure, susceptibility and risk are positively associated. Children with poor WASH conditions also suffer from poor access to health and nutrition. This is true in rural and urban communities. These correlations between exposure and susceptibility add to (and are likely caused by) the underlying difference in wealth and urban-rural inequality.

WASH related risk of disease varies significantly across regions and economic groups in Pakistan. The reasons for this are threefold: (1) the variability in WASH related exposures—with children in poorer households having higher exposures; (2) these same children are likely to be much more vulnerable due to underlying poor nutrition and access to basic health services; and (3) both WASH and health vulnerabilities are the product of underlying economic and geographic inequalities. Regions of Pakistan with the largest disparity in disease risk between the poorest (B20) and richest (T20) quintiles are Sindh and the Punjab region. Children with the highest risk index values are concentrated in the southwestern part of Pakistan, with children from Balochistan being particularly vulnerable in regards to disease risk. According to the water improvement maps, children from Balochistan would experience the highest risk reduction in response to water access improvements, but all regions would benefit from improvements.

DALY burden of inadequate WASH in Pakistan

The health burden of inadequate WASH is disproportionately borne by poorer children and those in vulnerable geographic areas. Nationally, the WASH enteric burden for the poorest quintile is about 10 times greater than the enteric burden for the richest quintile.

WASH-related enteric burden is lower within urban than in rural populations, but the disparities in both are equivalent. Burden for the urban poorest is 1.4 times higher than the richest and 3 times higher for the rural poorest than the richest. The highest burden associated with inadequate WASH among the poor is due to a conjuncture of vulnerabilities. They are less likely

to have good WASH services, and those that do not are also more likely to be undernourished and without access to care. Child health vulnerabilities magnify the effects of inadequate WASH among the poor. Overlapping inequalities in WASH and child health suggest that careful targeting to those in greatest need can increase the impact of improving water and sanitation on reducing diarrheal incidence.

Notes

1. This chapter draws heavily from a background paper produced for this report (Mansuri 2017).
2. Mansuri Ghazala, Freeha Fatima and David Newhouse. Forthcoming. Revisiting the Poverty Debate in Pakistan: Forensics and the Way Forward, World Bank Policy Research Paper (forthcoming).
3. The World Health Organization (WHO) recommends exclusive breastfeeding for the first six months for optimal growth and development (WHO 2011). A systematic review of evidence on the topic supports its recommendation (Kramer and Kakuma 2012). It finds that exclusive breastfeeding of infants, and no other foods or liquids for six months, has benefits that include a lower risk of gastrointestinal infection for the baby.
4. This is an evaluation of the third phase of the Pakistan Poverty Alleviation Fund (PPAF). An umbrella organization focused on the economic and social empowerment of poor communities through a community driven development approach. The evaluation focused on one of the main partner NGOs organizations that work with PPAF, the National Rural Support Program (NRSP).
5. Murray and Lopez 1997.

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Chapter 4
Governance and Institutional Challenges: Evidence from Punjab and Sindh

Key Messages

- The water and sanitation sector lacks coherence at several levels: lack of a robust interinstitutional coordination mechanism; short-term planning horizons; deteriorating technical capacity, weak monitoring systems, which limit accountability; a lack of resources; and the poor allocation of available resources.
    - Multiple institutions have overlapping policy and institutional roles, leading a to competition for resources, lack of accountability, and dismal service delivery.
    - The most recent phase of decentralization (the 18th Constitutional Amendment, which became effective in 2011) severely weakened the coordinating role of the federal government, without an adequately developed countervailing structure of responsibility at the provincial level, exacerbating the situation.
    - Sector planning frameworks at the provincial level are weak, and resource allocations are not aligned with policy priorities.
    - Local governments, charged with considerable responsibilities under decentralization, lack both the technical capacity and the tools to track service delivery problems or ensure accountability.
- These factors have contributed to the service delivery challenges of the sector discussed throughout the report.

The Institutional Architecture of Pakistan's Water and Sanitation Sector

This chapter focuses on the water and sanitation sector, which is a provincial responsibility. It begins by providing a brief overview of the structure of government in Pakistan and then describes the institutional and governance history of the water and sanitation sector. It underscores the lack of coherence in the sector, both at the institutional and governance levels and identifies the key binding constraints that need urgent attention for the sector to perform at the level required for adequate service delivery.

Background on the Structure of Government in Pakistan

The federation of Pakistan comprises four provinces (Balochistan, Khyber Pakhtunkhwa, Punjab, and Sindh); the Federal Capital of Islamabad; Gilgit-Baltistan; and Azad Jammu and

Kashmir. In 2017 a decision was taken to merge the Federally Administered Tribal Areas (FATA) into the Khyber Pakhtunkhwa province.

The parliament of Pakistan is a bicameral federal legislature. It consists of the 342-member National Assembly, headed by a prime minister, who commands the confidence of the majority of its members, and a 104-member Senate, which is elected indirectly. The legislature chooses the president, who is the head of the state.

The government has three major tiers: federal, provincial, and local government. Local governments are further divided into two tiers, district and union council governments. These local councils are the core units of representative governments. They have legislative authority within their jurisdiction for matters relating to land use planning and land zoning, acquisition, assignment, and use. District councils also have full autonomy to regulate local tourism, cultural activities, and most local businesses. They share regulatory authority with provincial and federal legislatures over education, health, environmental protection, social protection, maintenance of law and order, and crisis management (Aslam and Yilmaz 2011).

Although there is a well-defined division of responsibilities between federal and provincial governments, certain functions can be jointly managed, normally by making clear laws, demarcating responsibilities, and establishing separate departments for their execution. For instance, provincial governments provide most health, education, agriculture, and road services, but the federal government maintains the right to legislate in these sectors.

Pakistan has a long history of experimentation with decentralization, but its implementation has remained mostly incomplete (see box 4.1). Local governments were first introduced during the era of General Ayub Khan (circa 1958), as the system of basic democracies. The major purpose of the basic democracies was to serve as the electoral college for presidential elections. They were dismantled with the end of his regime. The system was revived under

Box 4.1: History of Decentralization in Pakistan

- **First Local Government System, 1959–71:** The first system of local governments was established under the Basic Democracies Ordinance of 1959 and the Municipal Administration Ordinance of 1960. It comprised a hierarchical system of four connected tiers of government: divisions, districts, *tehsils*, and union councils. The lowest tier comprised members elected on the basis of adult franchise They elected a chair. At higher tiers of local government, some officials were elected indirectly, others were elected directly, and yet others (who served as chairs) were nominated by the government.
- **Second Local Government System, 1979–87:** After a gap of eight years, a second attempt at devolution was made. Local government elections were held throughout the country, and local government laws were redrafted. One of the salient features of this wave of devolution was the clear demarcation of urban and rural local governments in all provinces. Urban local governments were defined based on the size of each settlement. Wards were introduced under the union councils as subunits.

box continues next page

Box 4.1: Continued

- **Third Local Government System, 2001–08:** In response to the Local Government Ordinance of 2001, a third attempt at devolution was made. Elections were held between 2000 and 2001, and local governments were established throughout the country. The new system comprised three tiers of government: district, *tehsil*, and union council. Under this system, Union Councils were set up as corporate bodies under a Nazim (Chairman or Mayor) and Naib-Nazim [Vice or Deputy Chairman or Mayor] with authorization to generate finances at the union council level by levying local taxes, fees, and user charges.
- **Fourth Local Government System, 2013–present:** Following the 18th Amendment to the Constitution, local government acts were passed throughout the country. The latest amendment came in 2016. Unlike the Local Government Ordinance of 2001, the local government acts devolved sufficient functions and powers to lower tiers of government. Under them, all provincial governments retain the authority to suspend or remove the heads of an elected local government. The system was established through party-based elections in all four provinces. The provinces of Balochistan, Punjab, and Sindh have union councils and district councils in rural areas and union councils/committees and municipal committees in urban areas. In Khyber Pakhtunkhwa the act also provides for *tehsil* councils and village and neighborhood councils in rural areas, as well as neighborhood councils in urban areas.

General Zia ul Haq, through the Local Government Ordinance of 1979. That system lasted nine years. In 2001 Pakistan underwent a major devolution of powers, enshrined in the Local Government Ordinance.

In December 2009 the law that protected the Local Government Ordinance of 2001 expired. At this point local governments were effectively in hiatus. In 2011, the passing of the 18th Constitutional Amendment shifted policy making, planning, and service provision responsibilities for key service delivery sectors from the federal to the provincial and local level. Following this, provincial governments enacted their own Local Government Acts between 2013 and 2015. These have by an large restored the rural urban divide, with union councils and district (*zila*) councils in rural areas and metropolitan corporations, municipal corporations, municipal committees, and town committees in urban areas.

The History of the Water and Sanitation Sector in Pakistan

From the perspective of the sector, the 2001 Local Government Ordinance, abolished the rural-urban divide and prescribed the dissolution of the Public Health Engineering Department (PHED), the department responsible for rural water and sanitation. In its place, Tehsil Municipal Agencies (TMAs) were established to plan and operate water and sanitation in rural areas. To provide the technical back-bone for these entities, the PHED staff was absorbed into the TMAs. Elected *tehsil* councils were vested with powers to allocate financial resources for WASH from their own-source revenues as well as the provincial grants provided through the Provincial Finance Commission. This decentralization did not work, and as early as 2003,

PHED staff reverted to the parent department, with the department taking over WASH service delivery in the rural sector.

The takeover led to the erosion of technical capacity of the TMAs and a lack of clarity regarding the responsibilities of the respective PHEDs. The lack of clarity on the responsibilities of respective PHEDs and differing de jure and de facto scenarios resulted in PHEDs operating in rural areas and TMAs operating in the non–Water and Sanitation Agency urban areas in each province.

Under the 18th amendment, the federal government has no role at all in the delivery of water and sanitation services at the grassroots level. The role of federal entities has been limited to the management of the facilities owned by the federal government, at both the national and the provincial level. Annual allocations for water and sanitation have been eliminated from the federal budget, making the sector a constitutional responsibility of provincial governments. All policy making, planning, regulation, financing, capacity building, service delivery, and monitoring and evaluation of water and sanitation are now provincial responsibilities, a role that provincial governments are still struggling to embrace.

A vacuum has been created at the federal level, because the national government cannot legally play its role of setting common standards of reporting, coordinating, or conducting monitoring and evaluation. The situation has bred conflict and divergence among provinces, as provincial governments have started setting their own standards and promoting provincial reporting at the international level.

Governance in the Water and Sanitation Sector: Overlapping Policy and Institutional Roles

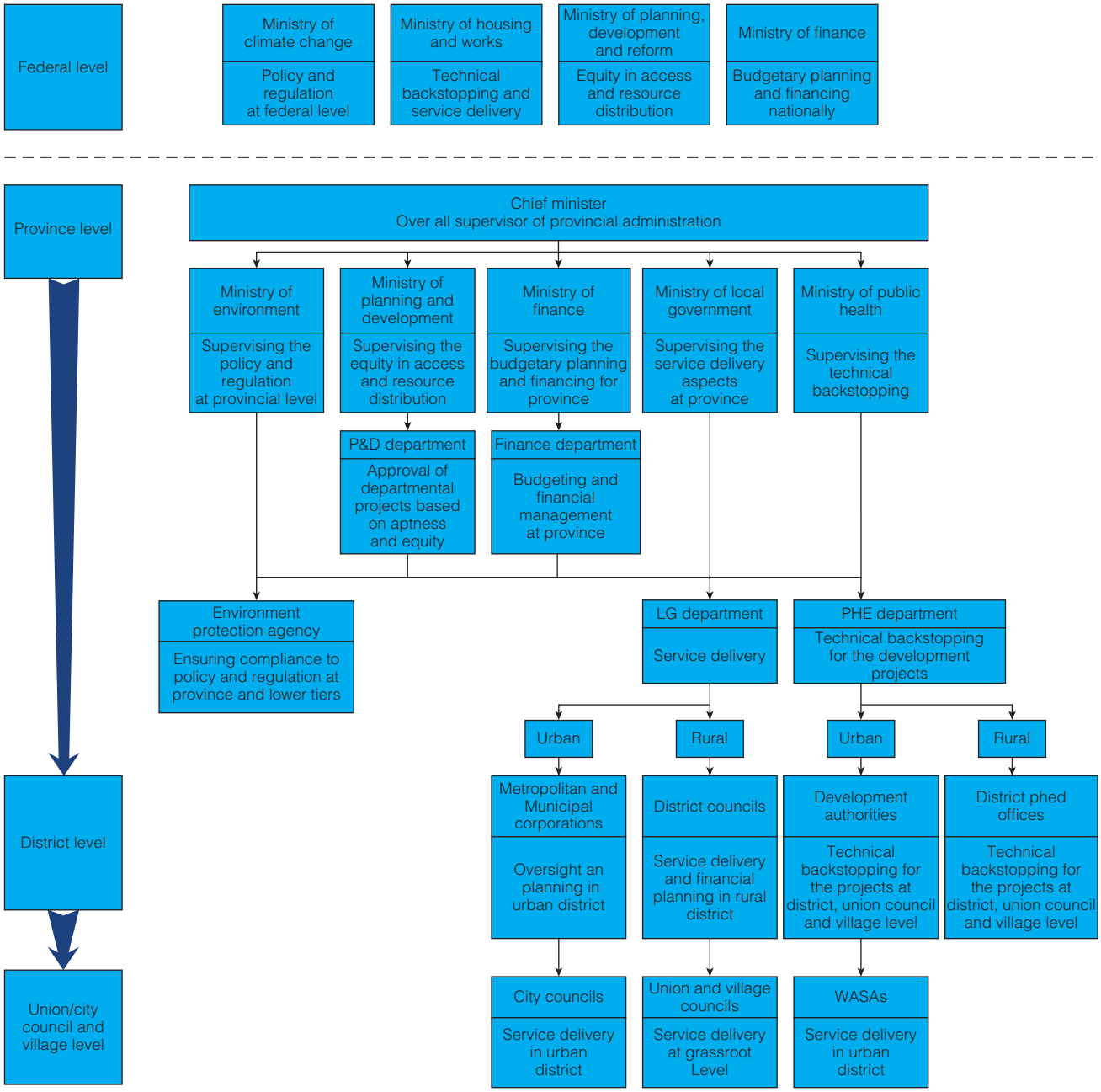
Significant overlaps exist between policy and institutional roles across all provinces in the water and sanitation sector. Policy overlaps lead to multiple agencies creating mandates for themselves to obtain more resources. Policy commitments are often not backed by technical capacity in provincial departments. Each policy directive is implemented under a different modus operandi, depending on the priorities and operational norms of the department, which creates further confusion and conflict. Policy overlaps breed institutional overlaps, which are worsened when political leaders strategically delegate responsibilities to departments they are more comfortable with. To make matters worse, donor funds are assigned to institutions that do not have the legal mandate to carry out the functions for which the funds are designated. Figure 4.1 lays out a basic organogram of Pakistan's water and sanitation sector.

In the remainder of this section, the issues raised above are taken up and discussed in more detail in the context of two of Pakistan's most populous provinces; Punjab and Sindh.

The Management of Water and Sanitation in Punjab

The policy environment in Punjab has shifted with amendments to the governance structure. The Local Government Department with responsibility for developing water supply and sanitation policies under the Local Government Ordinance of 2001 did not formulate any policies for six years. In 2007 the Urban Unit in Punjab was assigned a water policy mandate. This policy was led by a new stakeholder with no experience or capacity in leading a water and sanitation program and was focused solely on urban areas (the definition of what constitutes "urban" areas continues to be contested in Punjab). Later, when PHED became an autonomous department, it developed a drinking water policy (in 2009) and a sanitation policy (in 2015), both of which are the responsibility of the local government, which has yet to implement the policy.

Figure 4.1: Organogram of Pakistan's Water and Sanitation Sector



Intricacies in the institutional arrangements remain a challenge. The Local Government Ordinance of 2001 transferred responsibility for water and sanitation service delivery to local governments. PHED was to be merged within the local government structure and to act as its technical arm. The merger did not materialize, however, and, despite fiscal challenges, PHED continued to coexist as a separate unit under executive orders for more than a decade, until it reemerged as a stand-alone department in 2009.

In parallel, in 2014 the provincial government established a new special purpose organization, the Punjab Saaf Pani Company (PSPC), to improve service delivery standards in water and sanitation. Despite some initial achievements, the institutional arrangements and parallel

mandates did not allow the PSPC to deliver. In 2017 it was broken into two entities, North and South PSPC, exacerbating institutional proliferation.

PHED and the local government have parallel roles in major recent policy initiatives, such as the Punjab Municipal Water Act (PLGA) and the Punjab sanitation policy (figure 4.2).

The Management of Water and Sanitation in Sindh

Multiple departments in Sindh have put forth policies. None has been implemented. Halcrow (a UK based engineering consulting firm) crafted a policy for drinking water in 1998, but it was never implemented. Ten years later, in 2008, the local government crafted its own policy, which was also not implemented. After another gap of almost nine years, the Urban Unit issued the Sindh Water Policy in 2017. Under it, PHED has the sole mandate for water service delivery in both urban and rural Sindh. The overarching problem with all these efforts is that the department that develops the policy puts itself at center stage, ignoring all legal constitutional mandates that should in principle guide the policy.

Sanitation policies have not been much different from water policies in Sindh. The Sindh Sanitation and Solid Waste Strategy was developed in 2011 but shelved. In 2017 the Urban Unit developed a new sanitation policy. Its implementation has not yet begun.

Like Punjab, Sindh has witnessed multiple institutional authorities in the water and sanitation sector, with powers vested in them through a loose and unaccountable system that can be bypassed by strategic resource allocation decisions and executive orders. Institutional anomalies are evident from the fact that the Department of Special Initiatives was assigned the megaproject of installing filtration plants (reverse osmosis) across Sindh, while the local government remained on the sidelines. Similarly, PHED is granted vast funding for erecting water supply schemes but no funds for operation and maintenance (O&M). For this reason, it continues to transfer O&M responsibilities to local governments, which have neither ownership over nor the technical capacity for O&M.

The institutional structure of the government of Sindh was modified for an Asian Development Bank project called the Northern Sindh Urban Services Corporation (NSUSC) by assigning the staff (with their salaries) of selected TMAs for the management of this project. In 2017 a Supreme Court Order halted the project. Such unaligned policy priorities have continued to hamstring even basic service delivery to the citizens of Sindh and have led to an enormous waste of resources.

In Karachi city, the Karachi Water and Sewerage Board (KWSB), which was established in 1996, was given the mandate for water and sanitation service delivery in Karachi and its suburbs. To date, the city is run in part by the cantonment board and in part by the Karachi Port Trust (KPT) and in part by the Defense Housing Authority (DHA). This institutional fragmentation has created direct competition for funds (figure 4.3).

The Need to Rethink Policies and Strategies in Light of the Local Government Act of 2015

With the devolution of power, national players in policy making have lost their impetus to deliver, but the contours of responsibility at the provincial and local levels remain murky, with the roles of provincial versus local governments poorly defined. All four provinces have approved their Local Government Acts, but provincial policies have not yet been aligned with them, creating anomalies. For instance, district governments that serve as extended arms of the provincial governments are approving project proposals at the union council level—a decision that defeats the concept of self-governance at the grassroots level.

Figure 4.2: Institutional Roles, Policies, and Legislation in Punjab's Water and Sanitation Sector

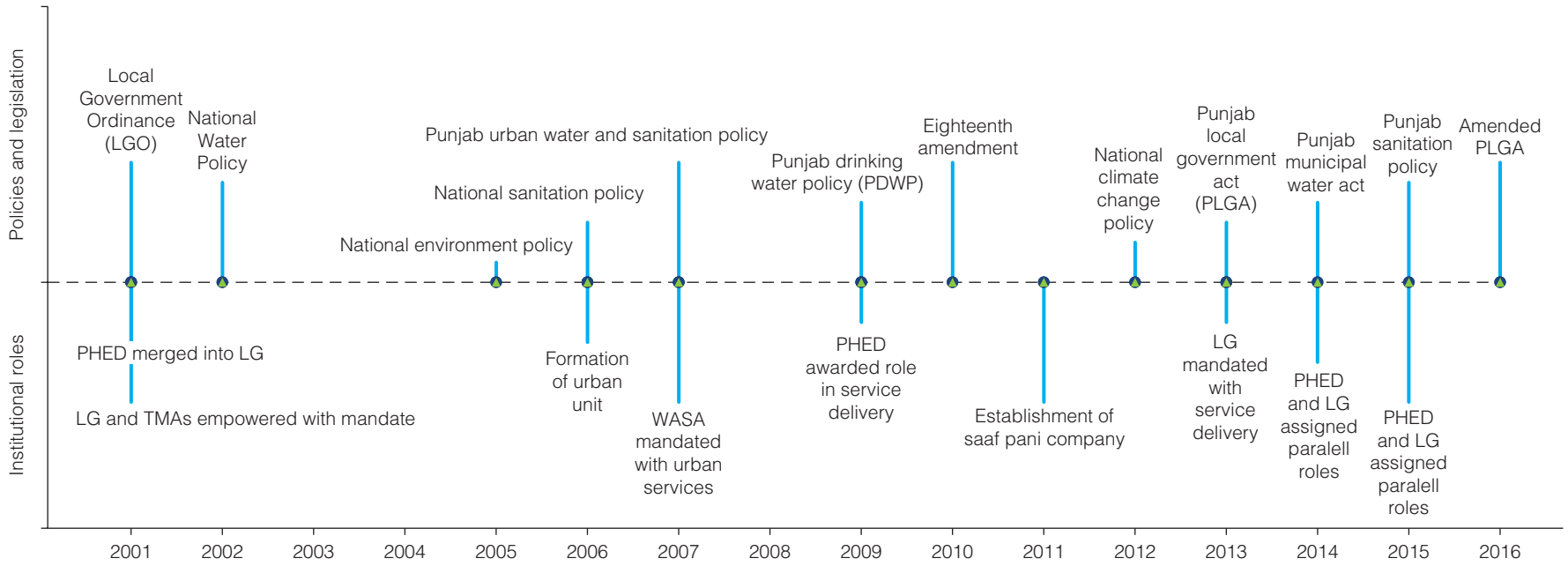
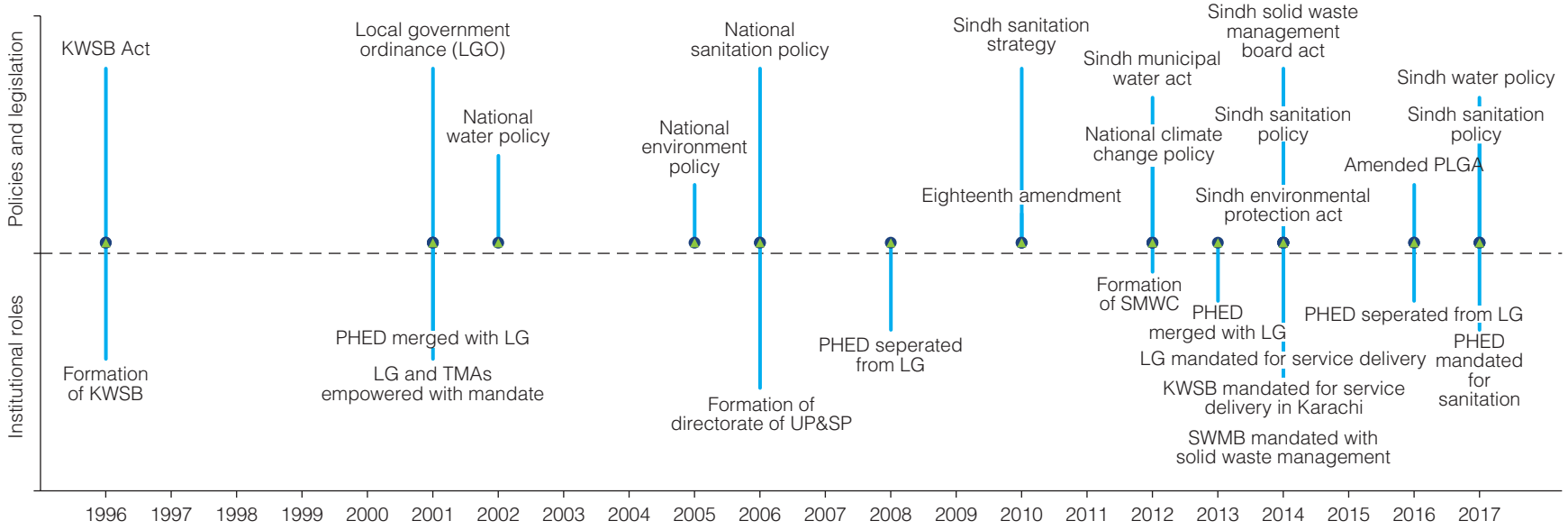


Figure 4.3: Institutional Roles, Policies, and Legislation in Sindh's Water and Sanitation Sector



At the provincial level, sector planning frameworks are weak, and resource allocations are not aligned with policy priorities. Operationally, no sector wide approach or multiyear planning and budgeting initiative is being implemented. Vision 2025[1] targets have yet to be internalized at the provincial level, and broad targets and goals have yet to translate into planning efforts that make them achievable. De facto, the planning horizon is limited to annual development plans, with political push factors, rather than sector needs driving initiatives. Resource allocation is often outside the ambit of the policy of both government and nongovernment actors, making policy meaningless.

Box 4.2: Why Rural Water Supply Has Failed: A Case Study of Punjab's Public Health Engineering Department (PHED)

The Social Action Program (a World Bank supported effort to improve basic services) introduced a community-based model for drinking water provision in Punjab in the 1990s. The model was later replicated in other provinces, going through various transformations over time.

In its current form, PHED designs, constructs, and owns drinking water schemes. Once they are constructed, it hands over the O&M of the schemes to local communities, typically through community-based organizations (CBOs).

Although this model appears to perform better than similar models in other provinces in terms of financial viability (generating enough revenue to pay for O&M expenditures), an estimated 35 percent of these schemes are nonfunctional, according to the Punjab Housing, Urban Development and Public Health and Engineering Department (HUD-PHED), largely because of institutional problems.

About 47 percent of the rural population in Punjab resides in rain-fed (*barani*) regions and areas with brackish water. Despite the need for public water supply schemes in these areas, only 9 percent of the population has access to public water supply. Most of the schemes that that are functional cater to communities of 1,000–4,999 people.

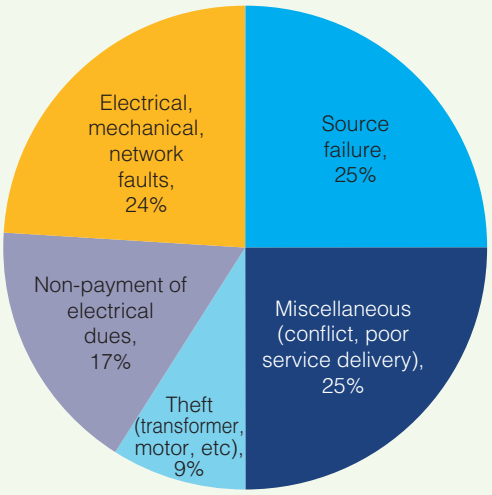
Nonfunctional schemes are out of order primarily because of technical (design life), financial (O&M costs), social (theft and legitimacy of community organizations), and managerial (operation and maintenance mandate) issues (figure B4.2.1):

- Lack of rehabilitation: Water supply schemes typically have a design life of 20 years, after which the system requires a major rehabilitation effort. In the absence of O&M responsibilities, the line agencies focus on development of new schemes while ignoring existing ones.
- Design failures: More than 25 percent of PHED schemes in Punjab were reported to be defunct because of engineering lapses overlooked during the design phase.
- Lack of viability of operating expenditures and a focus on capital expenditures: The agencies responsible for building drinking water schemes are not responsible for their O&M. Because they do not operate under a hard budget constraint and

box continues next page

Box 4.2: Continued

Figure B4.2.1: Dysfunctional Schemes, by Reason for Failure



are not responsible for operational expenditures, they have no incentive to build commercially viable schemes. Instead of fixing and maintaining existing schemes, they tend to build new and more expensive ones.

- Giving communities responsibility for operating expenses: The O&M of water supply schemes in Punjab is predominantly a community responsibility. However, local communities do not have the technical capacity or the funds to bear major O&M costs, such as the replacement of pipelines, pumping machinery, and electrification arrangements. The problem leads to a significant number of defunct schemes across community-managed systems in Punjab.
- Abdication of responsibility for O&M: PHED owns the water (and land) assets, but it has in practice abdicated responsibility for the quality of services from its assets, offloading all responsibility for O&M to the CBO. Nonetheless, both *de jure* and *de facto* liabilities for any failures of the scheme still lie with PHED, which exposes it to legal challenges.
- Lack of legitimacy and fund-raising ability of CBOs: As CBOs are not legally registered entities accountable to the government, their ability to obtain funds from the government remains limited, preventing them from adequately maintaining the water supply schemes under them.
- CBOs are also unaccountable to any external authority, including the government, making it extremely difficult for PHEDs and local government entities to transfer any performance-based grants or maintenance funds to the CBOs even when they are available. The absence of any formal delegation of powers also limits the CBOs from instituting accountability and punishment mechanisms, such as disconnecting households for nonpayment of bills or stopping farmers from tapping into the scheme for agricultural purposes.

Water and sanitation policies recognize the role of the private sector but fail to provide an enabling environment in which it can perform. The belief that only the public sector has the technical capacity to deliver water and sanitation infrastructure and services is unfounded; if sufficiently incentivized, the private sector can play a key role in providing both. The overall policy framework endorses private sector involvement, but private stakeholders have not been adequately brought into the policy framework for water and sanitation.

Private provision is common in other sectors, such as health and education, where private provision sometimes enhances competition and increases service quality. The lack of a coherent regulatory structure for water and sanitation, combine with the lack of an enabling environment for the private sector limits the ability of local communities to attract possible sources of investment for high quality private provision.

In rural areas, low quality self-provision has become the norm, instead. What little is publicly provided, quickly becomes dysfunctional because of inadequate O&M. See Box 4.2 for a case study of Punjab's PHED. Estimates suggest that one- to two-thirds of public water supply schemes are dysfunctional. Occasionally, substantial subsidies are injected into the system, to meet short-term imperatives, while little or no funds are kept for long-term maintenance and/or public investments. In rural Punjab, for instance, there is no allowance for a recurrent water and sanitation budget. It is conveniently assumed that once the schemes are in place, rural communities will manage them, because they have a long-term incentive to self-regulate these schemes. This bizarre practice makes three untenable assumptions: that communities (often poor and poorly educated) have the technical capacity to maintain such schemes; that they have the resources to self-provide O&M needs; and that they have no coordination problem. This set of assumptions is not unique to Pakistan—efforts to hand over the management of infrastructure to communities have failed almost everywhere in the world because of them.[2] Community engagement is, of course, important. The question is what type of community engagement improves service delivery by holding service providers accountable.[3]

In urban areas, O&M costs are financed through subsidized tariffs, with financing gaps covered through provincial subsidies. Despite the imposition of tariffs in urban areas, revenues barely cover the costs of O&M,[4] because water is provided at a flat rate, and a proper and sustainable water metering infrastructure does not exist. Inadequate billing and metering as well as corruption in tariff collection contribute to the revenue shortfall from government-managed schemes in urban areas. Unmetered services with low tariffs directly benefit wealthier households, which are more likely to have a water supply connection and consume more water per capita than poorer households. In the face of these problems with public delivery, nongovernmental and community-based organizations try to fill the void through short-term solutions and piecemeal interventions.

Binding Constraints to Service Delivery

This institutional and governance structure has created some critical constraints to service delivery that must be dealt with to generate any significant improvement in the dismal state of water and sanitation services in much of the country.

Overlapping and Competing Institutional Roles

A disconnect exists between de jure and de facto institutional responsibilities. As currently designed and legislated, the institutional architecture does not ensure a clear and well-defined structure for planning, coordination, or service delivery. Multiple institutions are mandated with overlapping roles, and several pieces of legislation exist in parallel. In Punjab, for instance, the Punjab Local Government Act (PLGA) of 2015, tasks the local government with responsibility for water service delivery, but the Punjab Drinking Water Policy of 2010 assigns a similar role to the HUD-PHED. Lack of clarity on specific roles and responsibilities has kept

these institutions inefficient, particularly in urban areas not governed by water and sanitation agencies.

Institutional roles clearly need to be updated at the provincial level in light of the 18th Amendment and the expected changes in the local government framework. Key areas of concern are the separation of responsibilities for policy making, regulation, and service provision.

Lack of Coordination and Long-Term Planning

No formal and consistent mechanism exists to coordinate the planning of water and sanitation sector investments. Quarterly and annual departmental reviews take place at the level of water and sanitation agencies, Local Government and Community Development (LG&CD), PHED, and Planning and Development department (P&D). However, there is no evidence of a structured water and sanitation institutional group for a sector-wide review, coordination of fund flows, or joint reviews of progress across domains. The water policy does provide a basis for a sector-wide approach, but it has not yet been operationalized.

In rural areas, vertical programs designed independently by donors and NGOs dominate the sector. These programs often fail to address the objectives outlined in national and provincial policies.

There is a real need for an institutional review to enhance functional coordination and rationalize service delivery. An intra-institution coordination mechanism also needs to be defined, whereby each institution works to deliver a clear set of goals.

Budget support to the sector is fragmented and poorly coordinated. Multiple agencies and tiers of government, including the large water and sanitation agencies, PHEDs, TMAs, and communities struggle and compete for the small annual budget that in many cases is only enough to cover salary costs. Alongside selected donor projects and special initiatives, projects funded through members of the national and provincial assemblies (MNAs and MPAs) and senators, add to the distortion of resource allocation.

Limited and Deteriorating Technical Capacity

Many schemes are performing below capacity because of design failures. Many schemes do not take proper account of the distance between the water source and the locality (PCRWR 2011). The size of the motors used to pump water from the source to the locality is usually inadequate, and there is no provision for booster pumping when needed. Few schemes provide overhead tanks to store water. All these design failures point to the lack of technical capacity displayed by PHEDs across provinces.

Local governments have limited capacity for community engagement, O&M, and monitoring and evaluation. They are also incapable of efficiently implementing a proper revenue collection system to sustain these schemes. Without the help of local government, it is not possible for the provinces to engage with local communities and small-scale independent providers. Capacity gaps at the local level have kept this engagement limited.

Weak Monitoring Systems

Capacity to monitor sector performance is extremely weak, because of the lack of an adequate information management system for the sector. Data on service delivery sits with individual providers and is not systematically gathered or analyzed by the department as a whole. A few water and sanitation agencies maintain their own databases, and PHED keeps a record of its assets in relation to its investments in rural infrastructure schemes, but there is no integrated database that can be used to analyze public delivery of water and sanitation. Reporting and accountability structures within the local government remain weak. Local Government Boards

and monitoring committees exist for oversight, but the lack of systematic data on service delivery, staffing, management, and complaint redressal limits timely responses from the local government in the short run and constrains its ability to plan in the long run.

Outcomes of Policy and Institutional Failures

The policy and institutional failures discussed above have led to the crisis of water and sanitation service quality and access that Pakistan faces today. As shown in chapter 3, drinking water, particularly in rural Pakistan, is severely contaminated and unsafe to drink. A large fraction of it contains bacterial and chemical contaminants and has become the leading cause of diarrhea, child stunting and numerous health issues in adults. Inadequate sanitation infrastructure is a major contributor to both source and point-of-use contamination. Domestic waste containing household effluent and human waste is discharged directly into sewer systems, natural drains, water bodies, internal pits, septic tanks, or fields. Drinking water supply lines are laid alongside sewerage drains or run parallel to open drains.[5] As a result, water is frequently contaminated when pipes erode. Most main sewers lie 30–50 feet below ground level and are made of 10-foot cement sections linked to one another without proper safety seals. Poor connections combined with low-quality sewerage pipes can cause leakage of fecal sludge, as discussed in box 4.3. The outflow from these sewer lines

Box 4.3: The Sorry—or Nonexistent—State of Fecal Sludge Management in Pakistan

Pakistan's Urban Wastewater Treatment Master Plan for 2003–23 is designed to treat 339 million liters of sewage a day—less than 1 percent of the total domestic sewage generated in urban areas today.

At the primary level, about 8 percent of wastewater is supposed to be treated through sedimentation ponds, but because most of the plants are dysfunctional, the actual percentage is less than 1 percent. There are essentially no treatment mechanisms at the secondary or the tertiary levels.

Of the few sludge and waste water treatment schemes that exist in major cities, some have treatment plants that were installed without a network of sewerage lines; others are either underloaded or have been abandoned (World Bank 2006). The dysfunctionality of some schemes causes others to become overloaded. In Islamabad, for instance, only one of the three wastewater treatment plants is functional. As a result, that plant is overloaded and only partially treating the city's effluents. Karachi has two trickling filters, which subject effluents to only basic screening and sedimentation, before being discharged into the receiving water bodies. Lahore has screening and grit removal systems in a few of its outfall stations, but they are not in working order. Faisalabad has only a primary treatment plant. Even the small amount of water that is treated, is not reused for agricultural or other municipal purposes; instead most of it is discharged into open drains.

In rural areas wastewater management is nonexistent. Throughout the country rural wastewater either percolates to contaminate the groundwater or enters the drains to finally meet the canal water system.

contaminates the substrate, contaminating groundwater with *E. coli*, PCBs, lead, cyanide, mercury, solvents, and hydrocarbon compounds, making it completely unsafe for drinking purposes. Finally, as discussed in Chapters 2 and 3, in the absence of water and sanitation infrastructure, households in Pakistan are self-providing service, particularly in rural areas, but also in a mega city like Karachi where access to piped drinking water has declined dramatically, with many households on piped connections getting less than one hour of water daily and relying mainly on tanker provided water. Self-provision creates two major challenges. Self-provision, leads to excessive groundwater extraction, which depletes underground water and jeopardizes the sustainability of water resources in the long run. Second, there is no way to ensure that the groundwater being extracted is safe to drink. The development of proper drainage and sewerage infrastructure is rarely prioritized in rural areas, resulting in the mismanagement of fecal sludge and, as discussed in chapter 3, the pervasive substrate contamination of groundwater.

Notes

1. This document presents the country's strategy and road-map to reach national goals and aspirations. At its core, Vision 2025 stands upon the target fulfilment of the MDGs and SDGs by 2030.
2. Mansuri and Rao, 2013, Localizing Development: Does Participation Work? Policy Research Report, World Bank. (http://econ.worldbank.org/localizingdevelopment).
3. Ibid. See also Gine, X, G. Mansuri and S. Khalid, 2018, The impact of social mobilization on health service delivery and health outcomes: Evidence from rural Pakistan, WIDER Working Paper 2018/30 (also a World Bank Policy Research Paper, 8313, January 2018).
4. Pakistan WASH Status Report, 2012.
5. Drinking Water and Sanitation Status Report, 2012.

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Chapter 5
Does Public Spending across Districts Reflect WASH Needs?[1]

Key Messages

- Public resources, including expenditures on water and sanitation, are heavily concentrated in provincial capitals, which are among the wealthiest areas in Pakistan. Decentralization has not reduced the heavy concentration of resources in provincial capitals.
- Among districts other than those with provincial capitals, public finance seems to be highly dependent on legacy: Districts receive pretty much what they received in previous years, regardless of need.
- Even after controlling for past allocations, resource allocation is regressive: Poorer districts and districts with worse access to improved water and sanitation receive far less per capita than wealthier districts, and districts with better access.
- Very little funding is allocated to operations and maintenance, despite the poor condition of public water supply schemes and fecal waste management systems.

In order to begin to come to grips with the appalling state of water and sanitation across Pakistan, particularly in rural areas, it is important to unpack the extent to which resources are a binding constraint on the sector. Has the sector been starved of resources, or have the resources allocated been poorly used?

The severe problems of overlapping and unclear channels of accountability, poor enforcement of laws and regulations, and the depletion of technical capacity identified in chapter 4 suggest that part of the story may lie in the allocation of available resources. Because water and sanitation are now squarely the responsibility of local governments, the analysis explores the extent to which resource allocation decisions have been sensitive to either poverty or water and sanitation outcomes.

The analysis is based on district financial data from 2009/10 to 2014/15.[2] Federal, provincial and district resources are aggregated for this purpose. Data for 2009/10 and 2010/11 capture the pre-decentralization period; data for 2011/12–2014/15 reveal post-decentralization allocations. For some of the analysis, the post-decentralization period is broken up into two periods, 2011/12–2012/13 and 2013/14–2014/15. District allocations include allocations for wastewater management, water supply, and water and sanitation agencies (WASA).[3] To facilitate comparability, all values are expressed in 2005 rupees.

The first section of the chapter looks at total public per capita expenditure across districts. The second section looks at public per capita expenditure on water and sanitation.

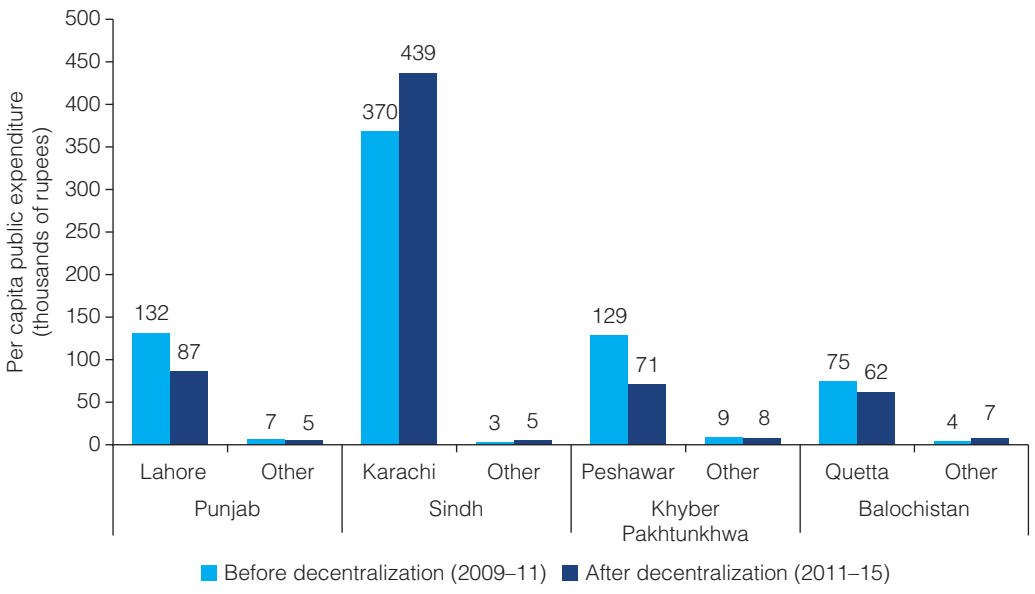
Poverty and Public Spending across Districts

Across Pakistan, provincial capitals received the lion's share of total public spending, as well as spending on water and sanitation, both before and after decentralization (figure 5.1 and map 5.1). Decentralization has mitigated this to a degree, particularly in KP and Balochistan, where the share of the capital fell from 15 and 19 times as much, per capita, relative to other districts in the province, to some 9 times the share of other districts. In Punjab and Sindh decentralization had a smaller impact on the share of the total budget allocated to the provincial capital. The share of Lahore fell from 20 times per capita relative to other districts to about 17 times per capita the share of other districts. Sindh clearly does the worst here. The share of the budget allocated to Karachi was 121 times the average per capita share of other districts in Sindh. While this fell to 83 times the share of other districts, post decentralization, allocations remain grossly skewed toward the provincial capital. This at least suggests that the use of resources allocated to Karachi need to be given more serious attention.

Even after excluding provincial capitals, there appears to be little targeting of resources to places most in need. Annex table 5A.1 shows the relationship between the allocation of resources to a district and the district's past poverty rate. The results show that poorer districts get a significantly smaller allocation, per capita, than the better off ones. This is particularly the case for Punjab and Sindh, which show a clear regressive trend.

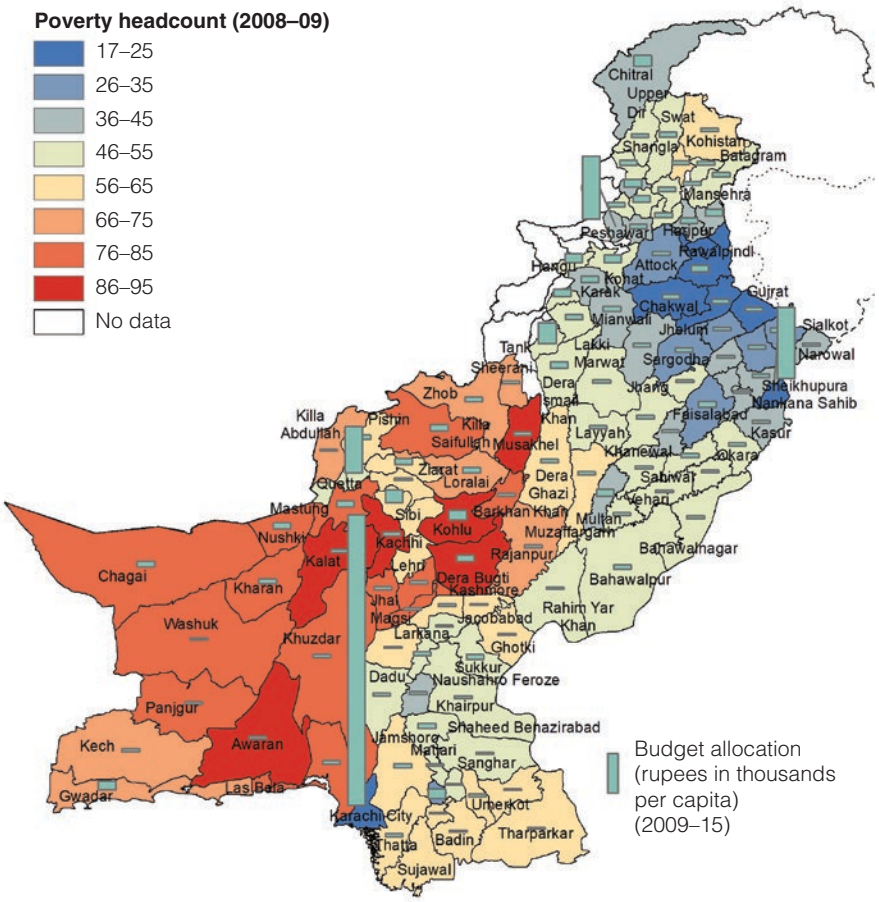
Once past allocations are controlled for, however, it is evident that current allocations are driven almost entirely by previous year allocations (figure 5.2 and annex table 5A.2). In fact, public finance seems to be highly dependent on legacy: In all provinces, districts receive, more or less, what they received in previous years, in real terms, and decentralization has had very little impact on this pattern so far. Figure 5.3 shows this pattern visually. Districts are ranked by their poverty status in 2010/11, from the poorest to the richest. It confirms that expenditures in 2011/15 remained closely aligned with expenditures in 2009/11.

Figure 5.1: Resource Allocation to Provincial Capitals versus All Other Districts before and after Decentralization (in '000 Rs.)



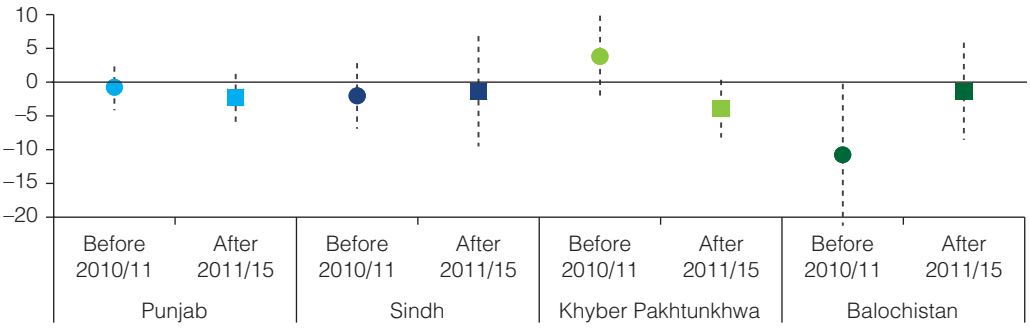
Source: 2009–15, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank Staff Calculations.

Map 5.1: Poverty Headcount (Percent) and Average Public Expenditure Per Capita, by District, 2009–15



Source: Household Income and Expenditure Survey 2007–08; Pakistan Living Standards Survey 2008–09, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank staff calculations.
Note: Budget Allocation is the six-year average of allocations from 2009–15. All values are expressed in 2005 rupees.

Figure 5.2: District Allocation of Public Expenditure (Average, Per Capita, 2005 Rupees), before and after Decentralization, and District Poverty Status, Controlling for Past Allocation Levels



Source: Household Income and Expenditure Survey 2007–2014; Pakistan Living Standards Survey 2008–2015, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank staff calculations.

Figure 5.3: Total Per Capita Expenditure by District, Excluding Provincial Capitals, before and after Decentralization

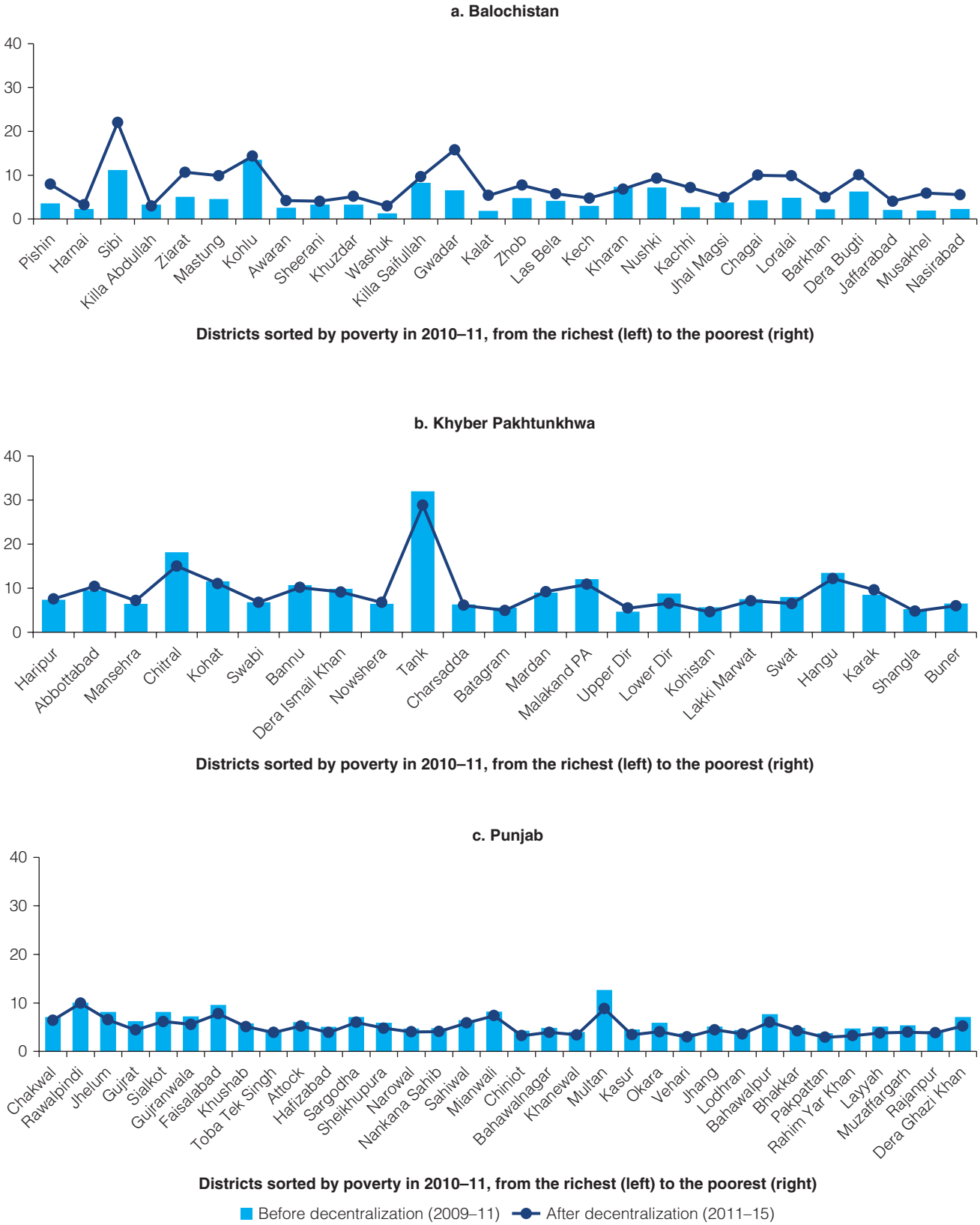
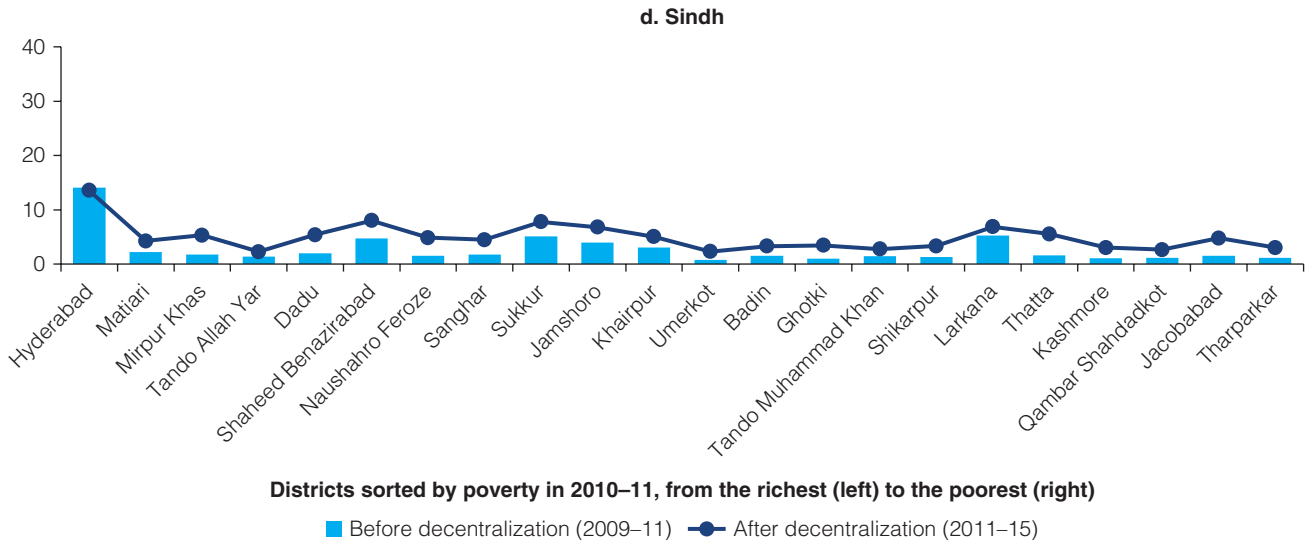


figure continues next page

Figure 5.3: Continued



Source: Household Income and Expenditure Survey 2005–2014; Pakistan Living Standards Survey 2008–2015, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank staff calculations.
Note: Districts are ranked by 2010/11 poverty status, from poorest to richest.

From an equity perspective, this is a much bigger concern in Punjab and Sindh where poorer districts have historically received significantly smaller per capita transfers. It is particularly so in Punjab, where allocations appear to have become significantly more regressive after decentralization, even after controlling for historical allocations. As figure 5.3 shows, some of the poorest districts got a resource cut immediately after decentralization.

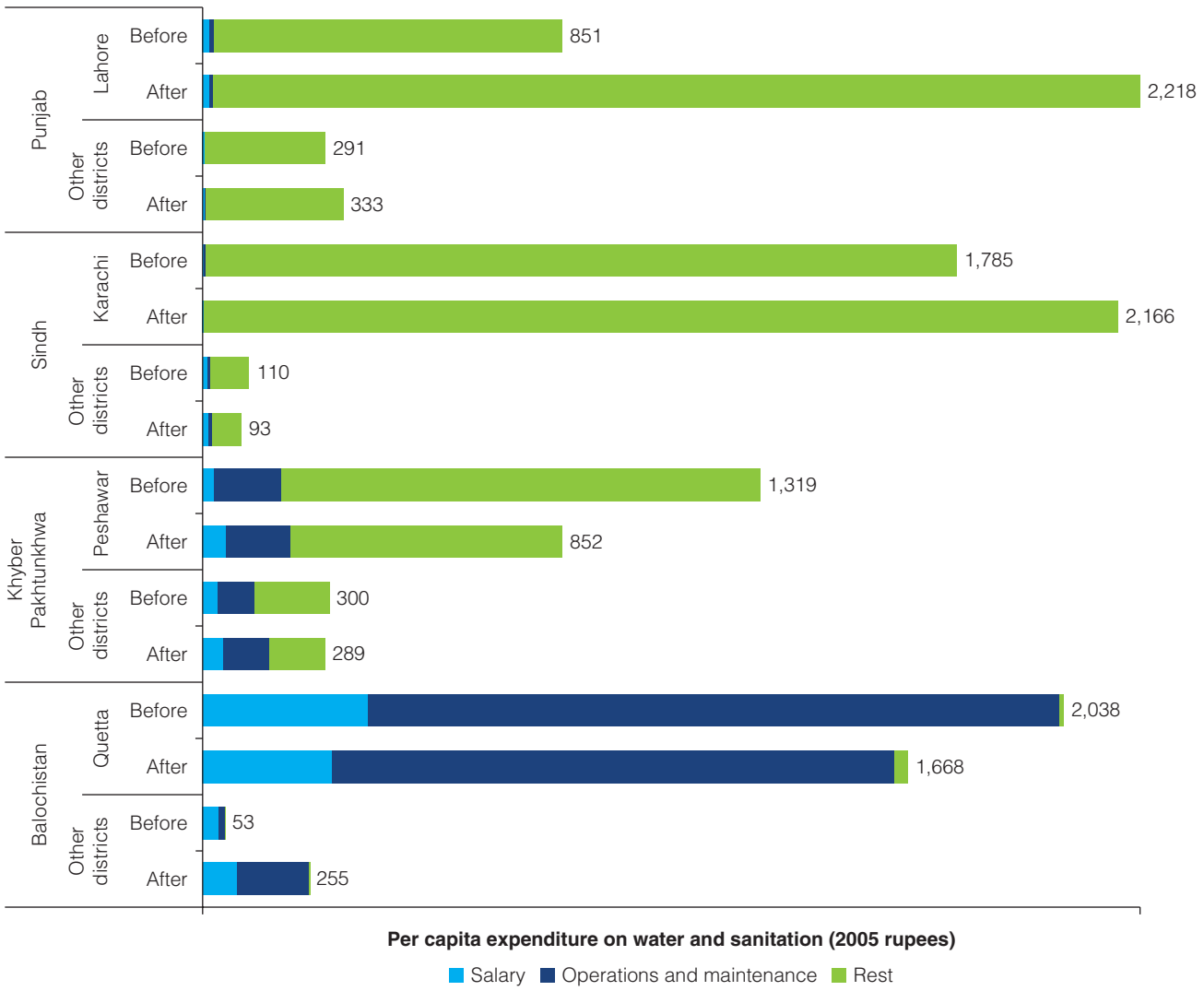
Poverty and Public Expenditures on Water and Sanitation

The resource allocation pattern discussed above remains broadly the same if the allocation of WASH budgets is considered instead (figure 5.4). Water and sanitation expenditures are concentrated in provincial capitals. Balochistan and Sindh look the worst on this front, Quetta got 38 times the budget per capita as compared to other districts in the province, and Karachi got 16 times as much per capita as all other districts in Sindh. WASH budget allocations in Punjab were the least concentrated before decentralization, with Lahore getting almost 3 times as much per capita as other districts in the province, and KP looks similar, with Peshawar getting 4 times as much per capita as other districts in KP.

After decentralization, resource allocation for WASH changed quite a bit. In Sindh and Punjab, per capita WASH allocations became more skewed. Karachi's per capita WASH allocation rose from 16 to 23 times the allocation of other districts, while Lahore's per capita allocation rose from 3 to 7 times the average per capita allocation of other districts. In Balochistan and KP, in contrast, allocations became less skewed. Quetta's per capita allocation fell from 38 times that of other districts in Balochistan to just under 7 times, while Peshawar's allocation declined from 4 time per capita to about 3 times per capita, relative to other districts in KP.

Further, in Punjab and Sindh, resources seem to go almost entirely to new projects rather than to the operations and maintenance (O&M) of existing ones. This should come as no surprise

Figure 5.4: Per Capita Public Expenditure on Water and Sanitation in Provincial Capitals and other Districts, before and after Decentralization, by Spending Category



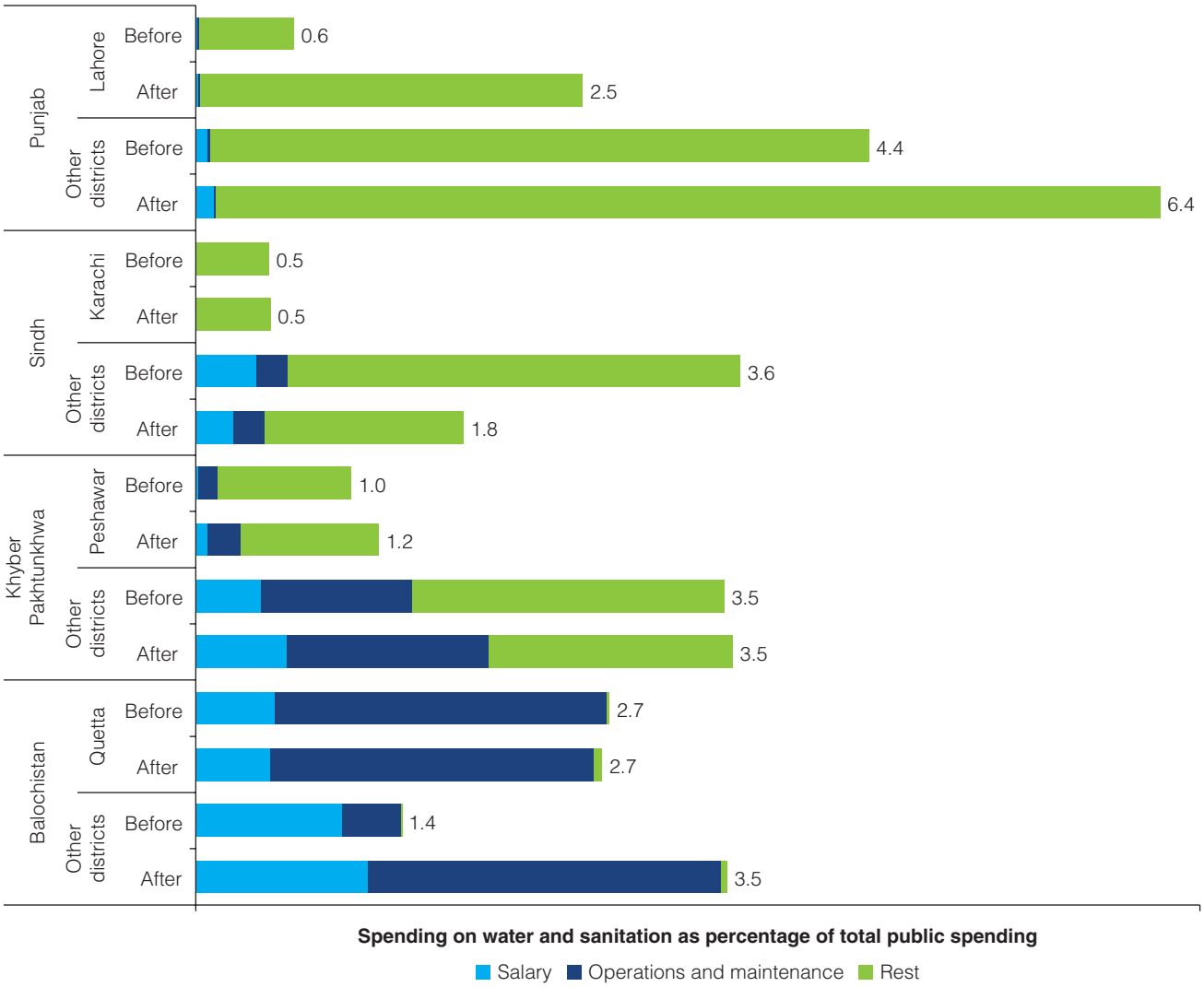
Source: Data from the Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank staff calculations.

given the discussion in Chapter 4 about the institutional gaps in both provinces. In Sindh, for example, PHED gets substantial funds for building schemes but nothing for their maintenance and operations. It consequently transfers all O&M responsibilities to local governments, which have neither ownership over nor the technical capacity for O&M. KP seems to be the most balanced in its allocations, while Balochistan spends almost all of its water and sanitation resources on O&M and salaries.

Before decentralization, districts other than provincial capitals spent larger shares of their budgets on water and sanitation than their capitals did, except in Balochistan (figure 5.5). After decentralization, these shares rose further, except in Sindh, where districts outside the capital reduced the share of their budget allocated to the sector.

Turning to the relationship between district poverty and district spending on WASH, once again, the data shows that the poorest districts spent the least on water and sanitation (map 5.2). Given the disparities in both WASH access and WASH quality in poorer districts, this is worrying.

Figure 5.5: Per Capita Public Expenditure on Water and Sanitation as Share of Total Spending in Provincial Capitals and Other Districts, before and after Decentralization, by Spending Category



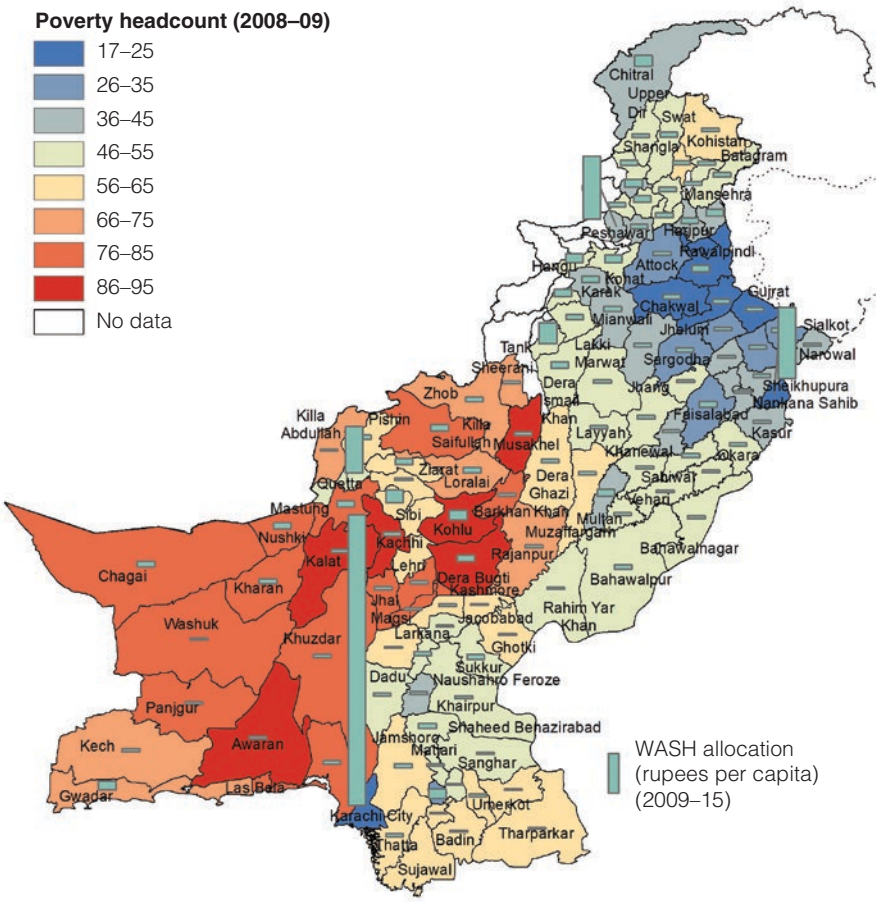
Source: Data from the Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank staff calculations.

Also, as with total resource allocation, past WASH allocation levels remain key in all provinces, except Balochistan. In Punjab and Sindh, things worsened immediately after decentralization. Poorer districts got significantly smaller WASH budgets per capita, even after controlling for previous year allocations. This tendency is more muted in the latter period of decentralization (between 2013 and 2015), particularly in Sindh, with the relationship between current and past allocations, as well as district poverty, becoming quite a bit weaker (figure 5.6 and table 5A.3).

Once might argue, however, that public spending on WASH should reflect district WASH needs, and not necessarily poverty, which may also be difficult to observe.

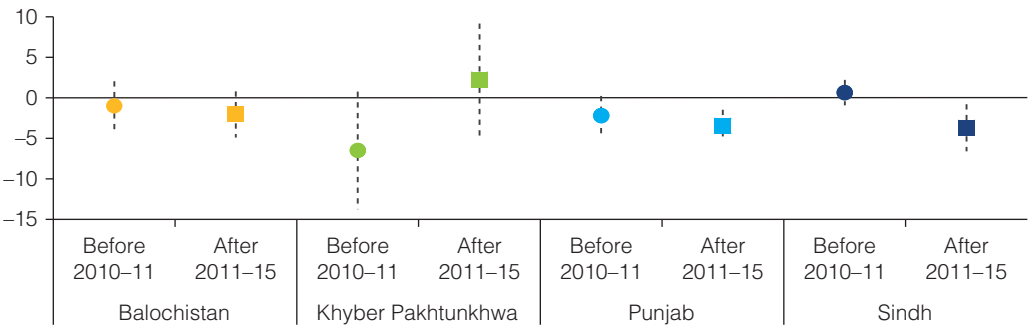
As map 5.3 and map 5.4 show, districts with prior higher access to improved toilets and improved water, get more resources per capita in future allocations. This pattern is further intensified if we look at higher quality WASH infrastructure: piped water and flush to sewer toilets.[4]

Map 5.2: Average Poverty and WASH Public Expenditure Per Capita, by District, 2009–15



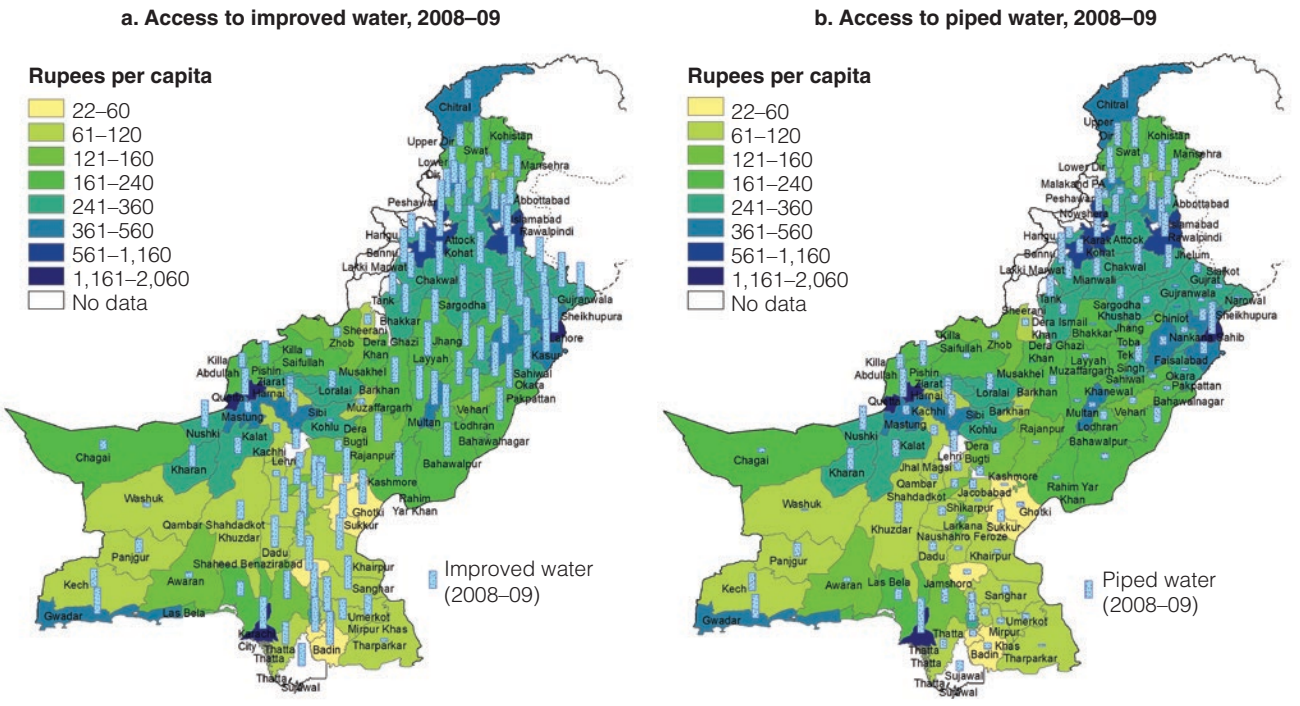
Source: Household Income and Expenditure Survey 2007–08; Pakistan Living Standards Survey 2008–09, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank staff calculations.
Note: WASH Allocation is the six-year average of WASH allocations from 2009–15. All values are expressed in 2005 rupees. Blue bars indicate allocations measured in the Pakistan Living Standards Survey 2008-09. WASH = water supply, sanitation, and hygiene.

Figure 5.6: Relationship between WASH Expenditure Per Capita and Poverty Status, by District, Controlling for Previous Allocations, before and after Decentralization



Source: Household Income and Expenditure Survey 2005–14, Pakistan Living Standards Survey 2008–15, Project to Improve Financial Reporting and Auditing (PIFRA), and World Bank staff calculations.

Map 5.3: Average WASH Allocations Per Capita and Access to Improved Water Sources, by District, 2009–15

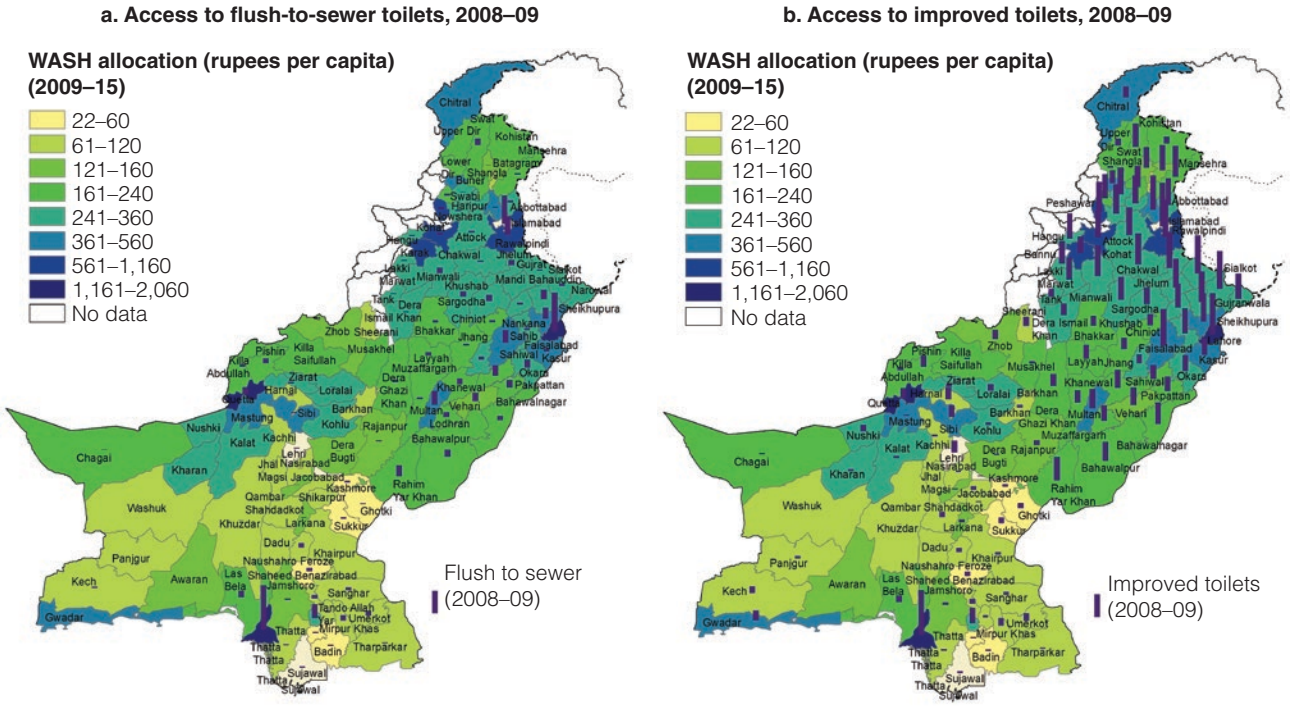


Source: Household Income and Expenditure Survey 2007–08; Pakistan Living Standards Survey 2008–09, Project to Improve Financial Reporting and Auditing (PIFRA), and World Bank staff calculations.
Note: WASH allocation is the six-year average of WASH allocations from 2009–15. All values are expressed in 2005 rupees. Blue bars indicate allocations measured in the Pakistan Living Standards Survey 2008-09. WASH = water supply, sanitation, and hygiene.

This is not surprising given the analysis discussed in chapters 2 and 3 and the resource allocation process discussed above. As annex tables 5A.5 and 5A.6, and figure 5.7 show, this situation improved only a little some years after decentralization (2013–15).

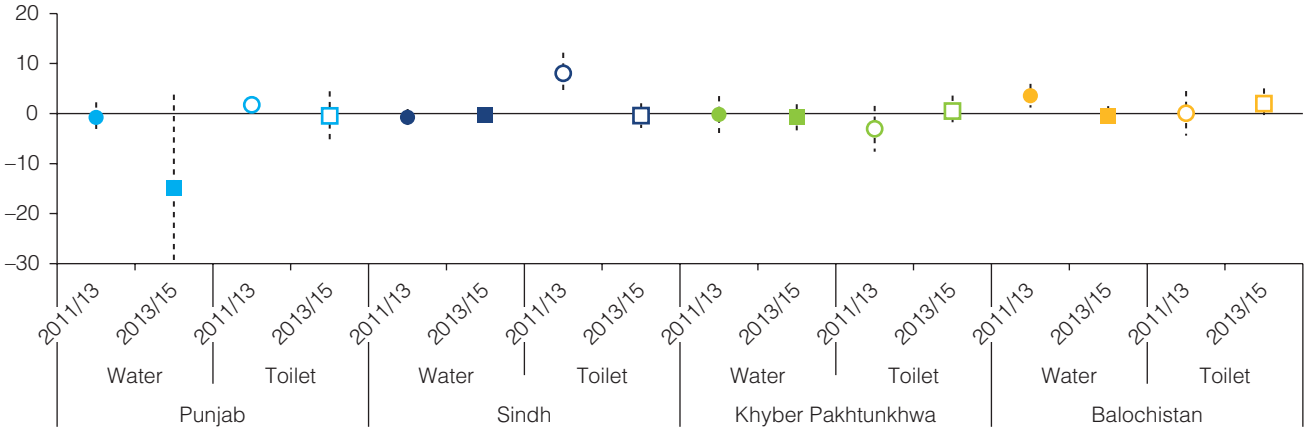
In KP there is still no evidence of positive targeting of WASH budgets to districts with low access. In Balochistan, past allocations matter less, and in the 2013–15 period, resources are no longer targeted to districts with better prior WASH access. In Punjab and Sindh, districts with better prior access to improved toilets initially get more WASH resources (2011–13), but this is not the case by 2013–15 and past allocations also matter less in Sindh. These shifts may signal a small step in the direction of a more pro-poor allocation, as also confirmed in annex table 5A.3.

Map 5.4: Average WASH Allocations Per Capita and Access to Improved Toilets and Flush-to-Sewer Toilets, by District, 2009–15



Source: Household Income and Expenditure Survey 2007–08; Pakistan Living Standards Survey 2008–09, Project to Improve Financial Reporting and Auditing (PIFRA), and World Bank staff calculations.
Note: WASH Allocation is the six-year average of WASH allocations from 2009–15. All values are expressed in 2005 rupees. Purple bars indicate allocations measured in the Pakistan Living Standards Survey 2008–09. WASH = water supply, sanitation, and hygiene.

Figure 5.7: Relationship between WASH Expenditure Per Capita and Prior WASH Access by District, Contolling for Previous Allocations, before and after Decentralization



Source: Household Income and Expenditure Survey 2005–2014; Pakistan Living Standards Survey 2008–2015, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank staff calculations.
Note: Figures for all provinces exclude the capital.

Annex 5A Regression Results

Table 5A.1: Relationship between District Budgets and Lagged District Poverty, before and after Decentralization

	Public expenditure (in per capita 2005 rupees)			
	Before decentralization	After decentralization		
	2009–11	2011–15	2011–13	2013–15
Balochistan (excluding Quetta)				
Poverty 2008–09	−0.037			
	(0.062)			
Poverty 2010–11		−0.075	−0.093	
		(0.058)	(0.059)	
Poverty 2012–13				−0.275**
				(0.114)
KP (excluding Peshawar)				
Poverty 2008–09	−0.084			
	(0.232)			
Poverty 2010–11		−0.103	−0.099	
		(0.119)	(0.126)	
Poverty 2012–13				−0.032
				(0.133)
Punjab (excluding Lahore and Rawalpindi)				
Poverty 2008–09	−0.083**			
	(0.030)			
Poverty 2010–11		−0.082***	−0.073**	
		(0.027)	(0.029)	
Poverty 2012–13				−0.082***
				(0.024)
Sindh (excluding Karachi)				
Poverty 2008–09	−0.255**			
	(0.054)			
Poverty 2010–11		−0.252***	−0.303***	
		(0.061)	(0.066)	
Poverty 2012–13				−0.303**
				(0.059)

Source: Household Income and Expenditure Survey 2005–2014; Pakistan Living Standards Survey 2008–2015, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank Staff calculations.
Note: * $p<0.10$; ** $p<0.05$; *** $p<0.01$.

Table 5A.2: Relationship between District Budgets and Lagged District Poverty, before and after Decentralization, Controlling for Previous Year Allocations, by Province

	Public expenditure (in per capita 2005 rupees)			
	Before decentralization	After decentralization		
	2009–11	2011–15	2011–13	2013–15
Balochistan (excluding Quetta)				
Poverty 2008–09	−0.109			
	(0.054)			
Allocation 2009–10	1.159***			
	(0.195)			
Poverty 2010–11		−0.014	−0.039	
		(0.037)	(0.044)	
Allocation 2009–11		1.195***	1.082***	
		(0.181)	(0.215)	
Poverty 2012–13				−0.048
				(0.105)
Allocation 2011–13				0.738***
				(0.179)
KP (excluding Peshawar)				
Poverty 2008–09	0.038			
	(0.031)			
Allocation 2009–10	1.169***			
	(0.031)			
Poverty 2010–11		−0.040	−0.024	
		(0.022)	(0.024)	
Allocation 2009–11		0.951***	0.905***	
		(0.034)	(0.037)	
Poverty 2012–13				−0.001
				(0.034)
Allocation 2011–13				0.885***
				(0.050)
Punjab (excluding Lahore and Rawalpindi)				
Poverty 2008–09	−0.008			
	(0.010)			
Allocation 2009–10	1.013***			
	(0.055)			
Poverty 2010–11		−0.023**	−0.009	
		(0.010)	(0.009)	
Allocation 2009–11		0.753***	0.802***	
		(0.049)	(0.040)	

table continues next page

Table 5A.2: Continued

	Public expenditure (in per capita 2005 rupees)			
	Before decentralization	After decentralization		
	2009–11	2011–15	2011–13	2013–15
Poverty 2012–13				–0.022***
				(0.008)
Allocation 2011–13				0.910***
				(0.047)
Sindh (excluding Karachi)				
Poverty 2008–09	–0.021			
	(0.025)			
Allocation 2009–10	1.212***			
	(0.080)			
Poverty 2010–11		–0.014	–0.025	
		(0.042)	(0.032)	
Allocation 2009–11		0.810***	0.946***	
		(0.102)	(0.078)	
Poverty 2012–13				–0.059
				(0.055)
Allocation 2011–13				0.635***
				(0.108)

Source: Household Income and Expenditure Survey 2007–2014; Pakistan Living Standards Survey 2008–2015, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank Staff calculations.
Note: * $p<0.10$; ** $p<0.05$; *** $p<0.01$.

Table 5A.3: Relationship between District WASH Budgets and Lagged District Poverty, before and after Decentralization, Controlling for Previous Year WASH Allocations, by Province

	WASH expenditure per capita (rupees in 2005 terms)			
	Before decentralization	After decentralization		
	2009–11	2011–15	2011–13	2013–15
Balochistan (excluding Quetta)				
Poverty 2008–09	−0.989 (1.560)			
Allocation 2009–10	0.034 (0.201)			
Poverty 2010–11		−2.068 (1.471)	−3.600 (2.265)	
Allocation 2009–11		0.018 (0.698)	−0.300 (1.074)	
Poverty 2012–13				−1.168 (2.232)
Allocation 2011–13				0.165 (0.103)
KP (excluding Peshawar)				
Poverty 2008–09	−6.557 (3.753)			
Allocation 2009–10	0.628*** (0.151)			
Poverty 2010–11		2.287 (3.585)	3.856 (4.059)	
Allocation 2009–11		0.744*** (0.260)	1.116*** (0.294)	
Poverty 2012–13				−0.011 (3.118)
Allocation 2011–13				0.517*** (0.117)
Punjab (excluding Lahore and Rawalpindi)				
Poverty 2008–09	−2.209 (1.256)			
Allocation 2009–10	0.360*** (0.121)			
Poverty 2010–11		−3.468*** (1.020)	−4.193*** (1.149)	

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Table 5A.3: Continued

	WASH expenditure per capita (rupees in 2005 terms)			
	Before decentralization	After decentralization		
	2009–11	2011–15	2011–13	2013–15
Allocation 2009–11		0.708***	0.415***	
		(0.116)	(0.130)	
Poverty 2012–13				−1.314
				(2.242)
Allocation 2011–13				0.677**
				(0.285)
Sindh (excluding Karachi)				
Poverty 2008–09	0.660			
	(0.809)			
Allocation 2009–10	0.494***			
	(0.100)			
Poverty 2010–11		−3.732**	−8.080***	
		(1.498)	(2.363)	
Allocation 2009–11		0.592**	0.807**	
		(0.208)	(0.328)	
Poverty 2012–13				0.876
				(2.593)
Allocation 2011–13				0.156
				(0.144)

Source: Household Income and Expenditure Survey 2005–2014; Pakistan Living Standards Survey 2008–2015, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank Staff Calculations.
Note: * $p<0.10$; ** $p<0.05$; *** $p<0.01$.

Table 5A.4: Relationship between District WASH Budgets and Lagged WASH Access, before and after Decentralization, by Province

	WASH expenditure per capita (rupees in 2005 terms)			
	Before decentralization	After decentralization		
	2009–11	2011–15	2011–13	2013–15
Balochistan (excluding Quetta)				
Improved water 2008–09	0.141			
	(0.336)			
Improved toilet 2008–09	0.161			
	(0.821)			
Improved water 2010–11		1.962**	3.254**	
		(0.793)	(1.203)	
Improved toilet 2010–11		−0.378	−0.350	
		(1.477)	(2.241)	
Improved water 2012–13				0.959
				(0.670)
Improved toilet 2012–13				0.182
				(1.262)
KP (excluding Peshawar)				
Improved water 2008–09	0.104			
	(1.730)			
Improved toilet 2008–09	0.795			
	(1.708)			
Improved water 2010–11		−0.592	−0.876	
		(1.893)	(2.367)	
Improved toilet 2010–11		−0.236	0.138	
		(2.269)	(2.837)	
Improved water 2012–13				−1.274
				(1.732)
Improved toilet 2012–13				2.316
				(1.985)
Punjab (excluding Lahore and Rawalpindi)				
Improved water 2008–09	−0.489			
	(2.156)			
Improved toilet 2008–09	1.506**			
	(0.689)			
Improved water 2010–11		−8.315	−1.895	
		(4.526)	(1.796)	

table continues next page

Table 5A.4: Continued

	WASH expenditure per capita (rupees in 2005 terms)			
	Before decentralization	After decentralization		
	2009–11	2011–15	2011–13	2013–15
Improved toilet 2010–11		3.850**	2.456***	
		(1.810)	(0.718)	
Improved water 2012–13				–23.715**
				(11.328)
Improved toilet 2012–13				2.958
				(2.915)
Sindh (excluding Karachi)				
Improved water 2008–09	–0.062			
	(0.496)			
Improved toilet 2008–09	2.021			
	(1.590)			
Improved water 2010–11		–0.642	–0.967	
		(0.640)	(0.976)	
Improved toilet 2010–11		5.177***	9.823***	
		(1.531)	(2.334)	
Improved water 2012–13				–0.401
				(0.539)
Improved toilet 2012–13				0.337
				(1.150)

Source: Household Income and Expenditure Survey 2005–2014; Pakistan Living Standards Survey 2008–2015, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank Staff Calculations.
Note: * $p<0.10$; ** $p<0.05$; *** $p<0.01$.

Table 5A.5: Relationship between District WASH Budgets and Lagged WASH Access, before and after Decentralization Controlling for Previous Allocations: Balochistan and KP

	WASH expenditure per capita (rupees in 2005 terms)			
	Before decentralization	After decentralization		
	2009–11	2011–15	2011–13	2013–15
Balochistan (excluding Quetta)				
Improved water 2008–09	0.621			
	(0.952)			
Improved toilet 2008–09	1.458			
	(1.677)			
Allocation 2009–10	0.079			
	(0.195)			
Improved water 2010–11		1.909**	3.223**	
		(0.841)	(1.276)	
Improved toilet 2010–11		–0.430	–0.291	
		(1.556)	(2.361)	
Allocation 2009–11		0.039	–0.289	
		(0.673)	(1.021)	
Improved water 2012–13				0.246
				(0.835)
Improved toilet 2012–13				0.700
				(1.294)
Allocation 2011–13				0.170
				(0.123)
KP (excluding Peshawar)				
Improved water 2008–09	–1.373			
	(1.189)			
Improved toilet 2008–09	1.037			
	(1.168)			
Allocation 2009–10	0.765***			
	(0.143)			
Improved water 2010–11		0.045	0.051	
		(1.596)	(1.810)	
Improved toilet 2010–11		–2.552	–3.227	
		(2.039)	(2.312)	
Allocation 2009–11		0.804***	1.168***	
		(0.259)	(0.294)	

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Table 5A.5: Continued

	WASH expenditure per capita (rupees in 2005 terms)			
	Before decentralization	After decentralization		
	2009–11	2011–15	2011–13	2013–15
Improved water 2012–13				–0.774
				(1.294)
Improved toilet 2012–13				0.652
				(1.529)
Allocation 2011–13				0.507***

Source: Household Income and Expenditure Survey 2005–2014; Pakistan Living Standards Survey 2008–2015, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank Staff Calculations.
Note: * $p<0.10$; ** $p<0.05$; *** $p<0.01$.

Table 5A.6: Relationship between District WASH Budgets and Lagged WASH Access, before and after Decentralization Controlling for Previous Allocations: Punjab and Sindh

	WASH public expenditure per capita (rupees in 2005 terms)			
	Before decentralization	After decentralization		
	2009–11	2011–15	2011–13	2013–15
Punjab (excluding Lahore and Rawalpindi)				
Improved water 2008–09	−1.007			
	(1.708)			
Improved toilet 2008–09	2.055***			
	(0.559)			
Allocation 2009–10	0.361***			
	(0.105)			
Improved water 2010–11		−5.425	−0.741	
		(3.886)	(1.538)	
Improved toilet 2010–11		2.144	1.775***	
		(1.590)	(0.629)	
Allocation 2009–11		1.379***	0.550***	
		(0.366)	(0.145)	
Improved water 2012–13				−14.823
				(9.430)
Improved toilet 2012–13				−0.582
				(2.511)
Allocation 2011–13				2.456***
				(0.585)
Sindh (excluding Karachi)				
Improved water 2008–09	−0.469			
	(0.266)			
Improved toilet 2008–09	−0.322			
	(0.876)			
Allocation 2009–10	0.488***			
	(0.089)			
Improved water 2010–11		−0.489	−0.746	
		(0.527)	(0.829)	
Improved toilet 2010–11		3.975***	8.093***	
		(1.311)	(2.061)	
Allocation 2009–11		0.618***	0.889***	
		(0.193)	(0.304)	

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Table 5A.6: Continued

	WASH public expenditure per capita (rupees in 2005 terms)			
	Before decentralization	After decentralization		
	2009–11	2011–15	2011–13	2013–15
Improved water 2012–13				–0.379
				(0.532)
Improved toilet 2012–13				–0.304
				(1.252)
Allocation 2011–13				0.131
				(0.108)

Source: Household Income and Expenditure Survey 2005–2014; Pakistan Living Standards Survey 2008–2015, Project to Improve Financial Reporting and Auditing (PIFRA) and World Bank staff calculations.
Note: * $p<0.10$; ** $p<0.05$; *** $p<0.01$.

Notes

1. This chapter draws heavily from a background paper produced for this report (Mansuri 2017).
2. The data come from the Financial Accounting and Budgeting System (FABS), an Integrated Financial Management Information System (IFMIS) being run at government offices at the federal, provincial, and district level in Pakistan. FABS was initiated and established under a government of Pakistan and World Bank–funded Project to Improve Financial Reporting and Auditing (PIFRA). PIFRA was implemented in three phases between 1996 and 2014. After it closed, at the end of 2014, FABS was mainstreamed into the MIS system.
3. Resources allocated to water and sanitation include the following categories (codes are in parentheses): transfer to Tehsil municipal agencies (014103); cantonment board (014106); transfers to nonfinancial institutions (014202); sewerage system (052101); urban (052102) and rural (052103) works under wastewater management; urban planning (062103); rural works under community development (062202); administration (063101); construction and operations (063102); and grants, loans, and subsidies (063103) under water supply. Employee-related expenses are identified through the classification system codes (A01 and A04) as are expenditures under O&M (A03 and A13).
4. Improved water includes piped water, hand pumps, motorized pumps, and covered wells. Improved sanitation includes flush-to-sewerage and flush-to-septic tank toilets.

Reference

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Chapter 6
Policy Recommendations

Key Messages

To achieve its national targets and the sustainable development goals (SDGs), Pakistan must address the institutional and implementation challenges within the water and sanitation sector. Steps it could take to do so include the following:

1. Reduce the overlap of responsibilities and narrow the coordination gap.
    - Clearly demarcate the responsibilities of each water and sanitation department by establishing accountability structures to ensure responsiveness to the needs of various constituencies.
    - Have every province craft an umbrella policy to improve coordination among players in the water and sanitation sector.
    - Replace vertical grants with sector-specific funds that are conditional on performance.
    - Make responsibility for operations and maintenance (O&M) a key part of institutional accountability.
    - If community engagement is seen as part of the solution, mobilize communities to enhance accountability, not to provide O&M.
2. Improve technical capacity.
    - Develop the capacity of public sector staff, including at the local government level.
    - Involve the private sector to help fill the technical capacity gap.
3. Monitor the sector.
    - Fast-track the development of a sector management information system (MIS).
    - Improve the quality of survey data collected for monitoring SDGs related to water and sanitation by the national and provincial bureaus of statistics.
    - Ensure definitional consistency between MIS and survey data.
4. Improve water quality on an urgent basis.
    - Invest in point-of-use water treatment (chlorination or other method), with the use of subsidies as needed, to prevent stunting and other health hazards while more comprehensive solutions are being implemented.
    - Target 100 percent piped water supply in the long run, with metering and realistic tariffs to cover O&M.
    - Develop a regulatory framework for groundwater.
5. Improve sanitation infrastructure.
    - Invest immediately in fecal waste management (treatment of sludge and wastewater).

- Regulate drainage systems and septic tank designs and enforce a safe distance from water sources.
- Create a regulatory body to set and enforce standards for both public and private providers.

6. Rationalize the allocation of district budgets for WASH.
   - Reallocate existing spending toward districts with the greatest needs and review budget use with a view to increasing efficiency. Increase spending, where needed.
   - Use multisectoral planning to maximize the benefits from investments.
   - Establish a clear allocation system for sanitation-related schemes in the budgeting process.
   - Budget for O&M upfront.

This report documents the catastrophic costs of untreated fecal sludge and wastewater in Pakistan—costs that include both current and future loss of life and productivity and the downstream costs of managing ill health. The calamitous consequences of inadequate water and sanitation underscore the need to improve drainage and the disposal and treatment of sludge in order to reduce the contamination of drinking water, ensure that food production is safe, and protect the environment.

If it is to move the needle on its national targets and the Sustainable Development Goals (SDGs), Pakistan must address the institutional and implementation challenges within its water and sanitation sector. The evidence on the performance of the sector and the institutional analysis presented in this report suggest the need for action in seven main areas.

Reducing the Overlap of Responsibilities and Narrowing the Coordination Gap

- The institutional responsibilities of water and sanitation departments need to be clarified. To overcome the overlapping responsibility structures and the gap between de jure and de facto responsibilities within the institutional architecture, the Provincial Rules of Businesses should be reviewed and additions/modifications made and enforced. The institutional responsibilities of departments should be clarified in light of the recent Local Government Acts passed by each province.

- An umbrella policy framework should be set up at the provincial level to improve coordination among players in the sector. Better coordination would also enable the sector to use the technical capacities within its subsectors and increase efficiency and accountability.

- A multiyear planning horizon needs to replace ad hoc reliance on annual development plans, in which the planning horizon is generally just a sum of the individual schemes proposed by politicians and bureaucrats. Lack of a multiyear horizon leads to scattered efforts that are not aligned with larger policy objectives and increases wastage and inequity in sector allocations. Within a multiyear planning framework, all projects must be planned and designed before they are approved by provincial budgets; and funded only if they are part of the policy framework. Block allocations and supplementary projects should be discouraged. Periodic performance reviews

under senior political leadership should be conducted to ensure accountability and compliance with commitments.

- Vertical grants should be replaced by sector-specific funds that are conditional on performance. To increase accountability and create incentives for yardstick competition across local government constituencies, these grants should be attached to specific projects identified by local governments. Donors and NGOs should be required to follow the same process, and their proposals should be approved only if they are consistent with the policy and regulatory framework. The system for monitoring performance (discussed below) should be part of the mandate of the regulator.

Improving Technical Capacity

- A human resources audit should be conducted, in order to identify the precise needs for technical and management staff. Many water and sanitation institutions are overstaffed with political appointees who lack the requisite technical skills. Technical capacity building following such a process would not only foster confidence, it would reorient water and sanitation institutions toward service delivery.

- The private sector should be involved to fill the technical capacity gap. The sector currently has almost no private sector engagement. The designs of schemes as well as their operation and maintenance (O&M) could be improved by exploiting the technical and managerial capacity of the private sector. Doing so would not only improve the sustainability of water and sanitation schemes, it would also create knowledge spillovers that would improve the technical quality and capacity of public sector employees. To involve the private sector, the government needs to create an enabling policy environment to support public-private partnerships and/or private sector–led services and rationalize tariff structures.

- Communities should not be in charge of the O&M of water schemes. If community engagement is seen as part of the solution, communities should be mobilized to enhance accountability, not provide O&M (see box 6.1 for evidence on the use of community organizations to enhance accountability of local public service providers).

Box 6.1: Community Organizations as Monitors of Public Service Provision[a]

In response to the perception that top-down, centralized development policies are divorced from the needs of the poor and disenfranchised, there has been a surge of interest in community driven development programs (CDD). The Social Mobilization for Empowerment (MORE) Program is a large scale randomized impact evaluation (IE) of CDD in rural Pakistan, with the objective of investigating whether greater community participation in local decision making will result in improved public service delivery outcomes. During the initial period of social mobilization which was close to 2.5 years, no financial resources were provided to mobilized communities. In the absence of complementary investments, any improvements in service delivery from social mobilization should occur through the channels of improved accountability at the grassroots level and greater efficiency in the ability of service providers to respond to local preferences. The Basic Health Unit (BHU) is the local health

box continues next page

Box 6.1: Continued

institution that forms the first point of access to government provided health care. Given that the BHU is instituted at the Union Council level, and contains 7–10 villages in its catchment, of which only 2–3 are treatment villages where mobilization was induced, it is likely that the impact of community mobilization on BHU provided health services would be muted since the line of accountability between treated villages and their BHU is not direct. On the other hand, villages are allocated one or more Lady Health Workers (LHW) – trained field workers tasked with basic health monitoring, counselling and referrals for women of reproductive age and young children. Since the position of the LHW is instituted at the level of the community, it is more reasonable to expect that the channels of local accountability would be strongest for this level of public service delivery. The evidence from the midline survey for the MORE IE strongly supports this hypothesis. As expected, there is little overall improvement in BHU performance, across a range of indicators. However, the performance of LHWs improves significantly along several dimensions in treated villages, LHWs are more likely to visit pregnant mothers, more likely to be the provider of antenatal care services and more likely to provide follow up care visits to new born children to monitor growth. There are also significant improvements in child vaccination rates and the availability of complete vaccination records. This suggests that mobilized communities can support service delivery efforts, but only if they have the ability to hold providers accountable.

a. Xavier Giné, Salma Khalid, and Ghazala Mansuri, 2018, The impact of social mobilization on health service delivery and health outcomes: Evidence from rural Pakistan, WIDER Working Paper 2018/30.

Monitoring the Sector and Assessing Performance

- Development of a sector management information system (MIS) that is fully integrated with planning and implementation processes should be prioritized and fast-tracked, and local government incentive structures should be linked to the system.

- Improve the quality of data collected on water and sanitation by national and provincial statistics agencies to ensure that sector SDGs can be adequately monitored. These are Tier 3 and higher WASH outcomes, as discussed in chapters 2 and 3. **The main sources of data on the sector include** the Multiple Indicator Cluster Survey (MICS), the Pakistan Social and Living Standards Measurement (PSLM) Survey, the Demographic and Health Survey (DHS), and the Population Census.

Improving Water Quality

- Massive information campaigns are needed to encourage chlorination (or other effective point of use treatment) of drinking water, particularly for infants, and the use of soap for handwashing, particularly for mothers, young children and toddlers (see box 6.2 for a randomized evaluation of a water treatment encouragement campaign).

Box 6.2: Using Community Groups to Encourage Point of Use Water Treatment[a]

Point of Use (POU) water treatment has been shown to reduce self-reported diarrheal incidence by between 20 and 70 percent. However, the willingness to pay for POU water treatment (and other preventive health products) lies below the market prices at which they are available. Water testing conducted as part of the Mobilization for Empowerment (MORE) impact evaluation (IE) in rural Pakistan revealed *E. coli* contamination rates between 50 and 70 percent in stored drinking water, combined with a conspicuous absence of water treatment before use.

box continues next page

Box 6.2: Continued

Organized communities in the MORE project areas were provided information on the prevalence of water contamination in their village and the health consequences of drinking contaminated water, with an emphasis on the link between poor water quality, diarrheal diseases and child stunting and mortality. Information was also provided on the use of chlorine (in tablet form-Aquatabs) for water disinfection and a demonstration was done to clarify the process of using this product effectively. Group members were also provided chlorinated water to drink to reassure them about the taste and safety of the product.

One of the three guiding pillars of the World Development Report 2015 is "thinking socially"—the recognition that individual decision making is framed by social norms, preferences, identities and networks. In this project, POU water treatment uptake was encouraged through a series of behavioral interventions that encourage pro-sociality.

We find that individuals exhibit conformity to their beliefs regarding social norms but conformity can have negative repercussions on individual behavior if there are poor norms – in this case the belief that average willingness to pay for POU water treatment products is low. However, when actions are perceived as having social repercussions, with individuals being explicitly informed regarding the impact of their health practices at the societal level, people are more likely to engage in more socially desirable behavior and demonstrate higher willingness to pay in public. We find that individuals are also likely to "lead by example" in demonstrating higher willingness to pay for POU water treatment products when they are specifically primed regarding the social benefits of individual actions. Overall, our results allow us to conclude that individuals exhibit strong social preferences and the design of incentives and mechanisms involving social environments, such as community groups, should account for these preferences and can even harness them towards achieving better social outcomes, particularly when individual incentives to adopt are weak. We also show that subsidies can be effective in encouraging adoption of POU water treatment, provided they are carefully designed.

a. Khalid, S. & G. Mansuri, 2018a, Leading by Example? The Impact of Sequential Decision Making on the Willingness to Pay for Preventative Health Care, World Bank; Khalid, S. & G. Mansuri. 2018b, The Impact of Individual versus Altruistic Subsidies on Willingness to Pay for Water Treatment, World Bank. Khalid, S., 2018, Buying Clean to be Seen? Image Motivation and the Willingness to Pay for Preventative Health Care Products; IMF Working Paper.

- There is a growing sense within the public sector of the importance of ensuring that water satisfies the WHO standard for quality. This is evident in The Supreme Court Order in Sindh to ensure safe drinking water for all citizens, and in Punjab through the overhaul of the Saaf Pani Company to ensure WHO quality water in rural areas. However, the goal of getting safe (WHO standard) piped water to all will take several years, or even a decade or more, Efforts to improve sanitation will also have large payoffs in the improvement of source water quality (principally *E. coli*, but also other chemical and biological contaminants), but this will also take time. In the interim, the next generation needs to be protected.

- If chlorination is to be used, it can be done at point of use (by chlorinating storage devices) or through filters on pumps (as several countries, including Bangladesh, have

done). Making chlorine and filters universally available, with subsidies if needed, in local markets is essential (see evidence on using subsides to encourage water treatment in box 6.2).

- Poor revenue generation and tariff collection are the key bottlenecks to the institutional and financial sustainability of water and sanitation services. The sector is highly subsidized, and any discussion of tariff reform meets with political opposition. Achieving the recommended long-run target of 100 percent piped and safe water supply will require water meters and tariffs that cover O&M costs and ensure sector sustainability.

- Public sector provision of piped water can replace self-provision only if water that meets World Health Organization quality standards is guaranteed—something that is not possible without metered systems and continuous piped water, to prevent contaminants from entering the piping networks. Vision and policy must support an architecture that leads to 100 percent safe water supply, which will require customized solutions based on the type and quality of water source and size of villages.

- A regulatory framework for groundwater—the primary source of drinking water in most parts of Pakistan—needs to be developed at the provincial level. Lack of regulation has led to the depletion and contamination of ground water aquifers. A safe depth of private boreholes and hand pumps should be established. Enforcement of safe depth needs to be phased in, based on the provision of safe public-sector water supply systems as an alternative. Relevant government departments need to collectively draft the regulatory framework, which will need approval by provincial assemblies and cabinets.

Improving Sanitation Infrastructure

- Quality guidelines for toilet construction should be strictly regulated and enforced. Construction of soakage pits should be strongly discouraged and engineered septic tanks recommended with well-defined, context-specific design guidelines. The government should introduce incentives to upgrade to safer sanitation technologies.

- Most water from shallow hand pumps is contaminated, because of its proximity to pit latrines or septic tanks that are not correctly engineered. The lack of drainage systems (in rural areas) and lack of treatment of water and fecal sludge worsens this problem. A safe distance between underground water sources and toilets should be defined and enforced to reduce groundwater contamination.

- Drainage and fecal waste management systems urgently need to be created, as even safer toilets will not do much good if post-toilet management of human waste is inadequate. The vast expense of building and maintaining such systems needs to be prioritized, as a key component of preventive health care which would yield large savings in the health sector and increase the quality of life for Pakistanis.

Creating a Regulatory Body to Set and Enforce Standards

- A regulatory body should be created to set guidelines for infrastructure for both public and private providers. It should be responsible for

    - Setting the standard for infrastructure and design

    - Setting and imposing penalties for noncompliance

- Regulating the use of groundwater and setting standards for the minimum depth of boreholes in specific areas
- Creating performance-based incentives
- Managing and ensuring the use of the sector MIS for performance management and review.

Redirecting Existing Financial Allocations toward Districts with the Greatest Needs and Increasing Allocations

- Budget allocations should target areas with the greatest need. Ideally, a formula should be devised and used for the distribution of water and sanitation funds at the district and regional (divisional) levels and planning should be done for at least a three-year period, with rolling investment plans. This formula should include a weight for poverty, water and sanitation quality and access (using equity-based SDG targets), and the geographical size of the district. Local governments should be involved in identifying and overseeing water and sanitation schemes, in order to ensure both accountability and targeting.
- Districts with high stunting rates should be prioritized for water quality, drainage, and sanitation interventions.
- Drainage and toilet-related schemes need to be given a separate head and their own budget code. Currently, water and sanitation use the same budget code, making separate budget estimations impossible. Officials believe that at least 90 percent of sector spending goes to water supply, with less than 10 percent allocated to sanitation. Even funds marked for sanitation are often spent on rural roads or other village civil works.
- The budget for the sector needs to be increased (see box 6.3) Providing "safely managed" water and sanitation to the entire population would require spending at least Rs. 393 billion a year (1.4 percent of GDP) until 2030—an injection of Rs. 4.7 trillion.

Box 6.3: Financial Needs of the Water and Sanitation Sector

The sector's investment needs in Pakistan are sizable, and considerably greater than current government spending. Even though the budget allocation for water and sanitation has increased over the years, capital budgets have shrunk relative to population growth and represent a major challenge for any service expansion or improvement in the quality of existing services. The lack of safe water and sanitation is costing Pakistan greatly. The economic burden of poor sanitation in Pakistan is Rs. 1.25 trillion which is about Rs. 6,305 per capita. Despite such a high economic cost, public expenditures on water and sanitation are still much less than required. Currently, about Rs.1390 per capita is being spent on water and sanitation in

box continues next page

Box 6.3: Continued

Pakistan (in 2015 Rs), which is about 1 percent of the GDP However, to provide "safely managed" water and sanitation to the underserved, at least Rs. 393 billion per annum (1.4 percent of GDP) is needed until 2030. This means that, in the next 12 years, Pakistan will have to inject at least Rs. 4.7 trillion in the water and sanitation sector to make adequate progress towards universal safe water and sanitation access by 2030. Safely managed water supply means an on-plot water supply for every household and for sanitation it includes a toilet with safe management of fecal waste. Although capital costs reflect immediate financing needs and are an urgent priority, it is critical to consider the ongoing finances required to ensure the proper operation of these services because they represent a growing financial commitment over time. As the year 2030 approaches, the costs of operating the new infrastructure built will exceed the annual capital cost requirements to meet those remaining unserved.

Sources: Khalid (2018); Khalid and Mansuri (2018a, 2018b).

References

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