



SDG 2: COST OF FOOD INSECURITY AND MALNUTRITION IN SINDH



Sindh SDGs Support Unit, Government of Sindh,
United Nations Development Programme Sindh



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Abbreviations and Acronyms

AAP	Accelerated Action Plan
FIES	Food Insecurity Experience Scale
GAM	Global Acute Malnutrition
GoS	Government of Sindh
HMIS	Health Management Information System
IFMIS	Integrated Management Information System
M&CHMIS	Maternal and Child Health Management Information System
MAM	Moderate Acute Malnutrition
MICS	Multiple Indicator Cluster Survey
NNS	National Nutrition Survey
PBS	Pakistan Bureau of Statistics
PLW	Pregnant and Lactating Women
SAM	Severe Acute Malnutrition
SDG	Sustainable Development Goal
UN	United Nations
UNICEF	United Nations International Children's Emergency Fund
UNDP	United Nations Development Programme
UNFAO	United Nations Food and Agriculture Organization
WHO	World Health Organization
WRA	Women of Reproductive Age

Executive Summary

- This report aims to provide a scientific estimate of potential public investments from 2023 to 2030 required to meet the Sustainable Development Goal “SDG-2 Zero Hunger” targets. Based on available data on the five targets of SDG-2, their indicators, and sub-indicators, the inter-temporal menu of public investments is geographically mapped at the district level with a number of target beneficiaries.
- This is the first extensive costing model geographically mapped at the district level, segregating SDG-2 targets, indicators, and sub-indicators. The costing model shows that a total sum of Rs 296.8 billion up to 2030 must be invested in multiple interventions to deal with food insecurity and malnutrition problems in Sindh.
- Sindh is the second-largest province of Pakistan in terms of population and the third-largest in the area after Balochistan and Punjab. The average inter-census population growth rate between 1998 and 2017 is 2.40 percent annually. It is important to note that Sindh is the only province with more than 50 percent of the population living in urban centers. The urban and rural inter-census growth rate reveals that the average urban and rural growth rates are 2.75 percent and 2.07 percent, respectively. The total population of Sindh is 47.85 million as of Census 2017 and is expected to be 66.12 million by 2030.
- The results of the population census 2017 have been challenged and contested by all political parties, specifically in the context of the population of the largest city, Karachi, which is the capital of Sindh. After this, the Pakistan Bureau of Statistics conducted the first GIS-based digital census in 2022. The piloting of the GIS-based Census-2022 is complete, and the Census is likely to be completed in 2022. Thus far, without reliable and uncontested data on housing and population, the population census 2017 is the only option for consideration.
- The population of women of reproductive age (WRAs) from 15 to 49 years in Sindh is 11.23 million as of 2017, and every year, around 4 percent of women become pregnant from the cohort of WRAs. The population of children under five is 6.45 million as of 2017.
- The average population density increased from 43 persons per square kilometer in 1951 to 340 persons per square kilometer in 2017. Karachi-Central, Karachi-Korangi, Karachi-East, Karachi-South, Karachi-West, and Hyderabad are in top order, respectively, from a highest of 43,064 to 2,215. In contrast, many districts in Sindh have low population density, which makes designing a social sector public policy challenging, and interventions in such areas are associated with higher costs.
- Sindh's population pyramid is symmetric, characterized by a large base and persistent high growth rates. The median age in Sindh is 18.5 years, compared to the national median age of 21 years. High growth rates and the massive base of the population pyramid contribute to a substantial annual increase in population. The large base of the younger population has been conventionally claimed to generate a demographic dividend; however, with low literacy rates and poor health facilities, low investment in education and health will lead to demographic disaster in the future.

- To assess and evaluate the situation of malnutrition in Sindh, there are two critical sources of nutrition-related indicators and variables: (i) the Multiple Indicator Cluster Survey and (ii) the National Nutrition Survey. Currently, the Multiple Indicator Cluster Survey has been conducted twice, in 2014 and 2019, and the National Nutrition Survey three times, in 2001, 2011, and 2018. The percentage of both moderately and severely stunted children in Sindh has increased from 48.0 percent in 2014 to 50.2 in 2019. However, comparative NNS data from 2011 and 2018 shows that instances of chronic malnutrition have decreased from 49.8 percent to 45.3 percent. In contrast, the trend of acute malnutrition is almost constant, i.e., 40.5 percent (2011) and 40.4 percent (2018). On the other hand, the same comparative comparison shows a sharp increase in severe acute malnutrition from 17.5 percent (2011) to 23.2 percent (2018). Due to the difference in results between the two surveys, a comparative sensitivity analysis of samples of MICS and NNS shows that prima facia, the credibility of MICS is more than that of NNS.
- Similarly, the percentage of newborns with low birth weight, households reporting open defecation, and multi-dimensionally poor households have increased significantly. A comparison of the nutrition indicators for Sindh reported in the last three National Nutrition Surveys shows that there has been a slight improvement in acute malnutrition. In contrast, there has been a sharp rise in severe acute malnutrition. Vitamin A deficiency has improved considerably, from 48 percent in 2001 to 43 percent in 2011 and 37.1 percent in 2018.
- In response to the grave malnutrition situation, the Government of Sindh (GoS) set out a comprehensive plan to significantly improve mothers' and children's health. An Accelerated Action Plan (AAP) for reducing Stunting and Malnutrition has been launched in this regard. This is a multi-sectoral programme involving eight sectors: Health, Education, Livestock, Fisheries, Agriculture, Local Government (Water, Sanitation, and Hygiene [WASH]), Population Welfare, and Social Welfare (Social Protection Strategy Unit (SPSU) at Chief Minister Sindh Secretariat.
- Under initiatives by AAP Health, five lac children under five, which is 7.8 percent of the cohort, have been screened and treated successfully and are back to everyday life. Considering the magnitude and severity of malnutrition problems in children under five, it is the need of the hour to upscale the screening and invest in more mobile screening facilities in each district.
- The GoS has established a Provincial Task Force on Nutrition to support the activities of the AAP in terms of supervision, coordination, and communication with internal and external stakeholders, as well as strategic guidance. The primary nutrition programmes in Sindh include the Nutrition Support Programme (NSP), Sindh Enhancing Response to Reduce Stunting Project (SERRSP), the Saaf Suthro Sindh (SSS) Programme, the Nutrition-Sensitive Agriculture Project, and the Programme for Improved Nutrition in Sindh (PINS). In addition, there are programmes supported by the Government's development partners, including the United Nations World Food Programme and the Expanded Programme on Immunization (EPI).

- Despite GoS' unconditional commitment and firm resolve, there are still many problems and limitations:
 - There is no proper survey for assessing and evaluating dietary patterns and diet diversity in Sindh.
 - The dropout rates of various nutrition programs are high.
 - The transaction cost of identifying target beneficiaries is exorbitantly high; therefore, a significant revisit of policy planning, design, and execution mechanism must be undertaken.
 - Multiplication of the same functions by various programs in many districts by different donors.
 - Overall, the proportion of nutrition-sensitive investments is low compared to nutrition-specific investments.
 - There has been a disproportionately exponential rise in non-development spending vis-à-vis development from 2011 to now.
- The public finance trend in nutrition programs follows a die-down curve model that starts from a high level of investment to a gradual reduction corresponding to the situation. As a result of this model, the present cycle of malnutrition is still persistent.
- This costing model and exercise for SDG-2 aims to answer the following questions:
 - (i) **What should we invest in?** This involves identifying appropriate interventions such as in-kind support, conditional cash transfer or unconditional cash, preventive measures, curative measures, and more.
 - (ii) **Where should we invest?** This requires district-wise segregation of costs based on the situation of malnutrition, food insecurity, and poverty.
 - (iii) **When should we invest?** This involves a year-wise breakdown of costs to identify short-term, medium-term, and long-term financing requirements.
 - (iv) **How should we support?** This involves creating a stepwise strategy for gradually increasing the target cohort, engaging with the community, or directly reaching out to beneficiaries.
 - (v) **For whom should we invest?** This involves identifying target beneficiaries, priority districts, areas, and population clusters.
- Being a scientific costing, this method/model accounts for:
 - **Adequacy** (interventions are financially adequate to deal with the gravity of the situation)
 - **Efficient and Effective** (interventions are linked with time-specific targets and results),
 - **Graduation Strategy** (target beneficiaries should graduate on time)
 - **Monitoring and Evaluation** (proper, timely monitoring tracking of outcomes related to objectives of programs)
 - **Targeting** (scrutiny and proper targeting while identification of beneficiaries).

1. Introduction and Background

This report aims to provide a scientific estimate of potential public investments from 2023 to 2030 required to meet the Sustainable Development Goal “SDG-2 Zero Hunger” targets. Based on available data on five different targets, their indicators, and sub-indicators, the inter-temporal menu of public investments is geographically mapped at the district level with a number of target beneficiaries.

Sustainable Development Goal 2 ‘**Zero Hunger**’ is one of the cross-cutting goals in the provincial Sustainable Development Goals (SDGs) framework due to its significant impact and multipronged interlinkages with other SDGs.

Based on mapping carried out in data gap analysis compiled at the Federal level, meta-data definitions for SDGs indicators, and further analysis by Sindh Bureau of Statistics and Sindh SDGs Support Unit, out of 14 indicators for SDG-2, 13 indicators are applicable at the provincial level. Data for these 13 indicators are either fully or partially available for 69 percent of provincial indicators of SDG 2. At the district level, data is available for only 4 out of 13 provincially applicable indicators, which is 30.7 percent only. The available data has been used to generate a prioritization process in SDGs Framework for Sindh at Goal and Target levels, respectively, and **summarizes** data availability status at different levels in Sindh.

Table 1 Indicators for SDG-2: Zero Hunger

Total Indicators	14
Provincially applicable indicators for SDG 2: Zero hunger in Sindh	13
Data availability at provincial level in Sindh	69.0%
Two-point data available for comparative years at provincial level	38.0%
Data available completely as per SDGs meta data definitions at provincial level	46.1%
Data availability at district level in Sindh	30.7 %

Source: Sindh SDGs Support Unit

Data Sources for SDG 2: Zero Hunger

There are very limited data sources for indicators of SDG-2. Primarily, data has been gathered from National/Provincial surveys and Government Institutional Data for all SDG indicators, including SDG 2: Zero Hunger Indicators. The following data sources have been used specifically for SDG 2: Zero Hunger.

Table 2 Data Sources for SDG-2: Zero Hunger

Source of Data	Years
Multiple Indicator Cluster Survey (MICS)	2013-14, and 2018-19
National Nutrition Survey (NNS)	2000-01, 2010-11, and 2017-18
ADP portfolio Sindh	Yearly data, Volume-V ADP
Institutional database of line departments	Various reports

Source: Author’s compilation

Plans and Policies related to SDG 2: Zero Hunger

In consultation with GoS Departments, Sindh SDGs Support Unit has conducted a holistic review of SDGs supportive legislations, plans, and policies in Sindh. The purpose of the review was also to take stock of existing legislative coverage and policy environment aspects, determine the extent to which they are well placed to mainstream and accelerate progress towards SDGs, and advise further actions. The table below enlists Legislation, Plans, and Policies related to SDG 2: Zero Hunger.

Table 3 Legislations and Policies for SDG-2 in Sindh

SDG 2	Legislations	Policies & Plans
Goal 2: Zero Hunger	• The Sindh Food Authority Act, 2016	
	• The Sindh Livestock Breeding Act, 2016	
	• The Sindh Seed Corporation (Amendment) Act, 2010	• Sindh Agriculture Policy, 2018
	• The Sindh Wholesale Agricultural Produce Markets (Development and Regulation) Act, 2010	• Sindh Drought Management Plan
	• The Agricultural Produce Markets (Amendment) Act, 2019	

Source: Author's compilation

The Sustainable Development Goal-2 Zero Hunger is focused on addressing food insecurity, malnutrition in children under the age of five, multiple deficiencies in women of reproductive age, pregnant and lactating women, livestock suitability, agriculture productivity, and food price anomalies. This report will provide an in-depth analysis of the SDG-2 indicators for malnutrition and hunger, based on the available data and within the scope limitations. For district-wise food security and malnutrition, please refer to the recommended indicators.

Table 4 Sustainable Development Goal-2: Baseline Assessment and Targets

SDG-2	SDG-2 Indicators	Priority level	Baseline 2014	Current 2018	Sindh Target 2030	Source
SDG 2.1.1	Prevalence of undernourishment (%)	High	29.9	29.9	0.0	2015 estimates based on Pakistan Overview of Food Security and Nutrition Report Ministry of National Food Security and Research
SDG 2.1.2	Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES)	High	50.6	36.0	0.0	National Nutrition Survey 2011 and 2018
SDG 2.2.1	Prevalence of stunting (height for age <-2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age	High	48.5	50.2	27.5	MICS 2014 and 2018-19
SDG 2.2.2	Prevalence of malnutrition (weight for height >+2 or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age, by type	High	22.9	17.5	3.0	MICS 2014 and 2018-19
SDG 2.2.3	Prevalence of anemia in women aged 15 to 49 years, by pregnancy status (percentage)	High	59.7	38.2	0.0	National Nutrition Survey 2011 and 2018
SDG 2.3.1	Volume of production per labour unit by classes of farming/ pastoral/ forestry enterprise	High	-	-	50.0 increase	Data not available
SDG 2.3.2	Average income of small-scale food producers, by sex and indigenous status	High	-	-	50.0 increase	Data not available

SDG-2	SDG-2 Indicators	Priority level	Baseline 2014	Current 2018	Sindh Target 2030	Source
SDG 2.4.1	Proportion of agricultural area under productive and sustainable agriculture	High	36.7	36.7	55.8	Land utilization statistics (2018), Development Statistics 2014-15
SDG 2.5.1	Number of plant and animal genetic resources for food and agriculture secured in either medium or long-term conservation	Very high	Data not available	Data not available	-	Data not available
SDG 2.5.2	Proportion of local breeds classified as being at risk, not-at-risk or at unknown level of risk of extinction	Very high	Plant: All local breeds at risk Animal: All Local breeds at risk		Secure all animal and plant resources in medium or long-term conservation facilities	Livestock and Agriculture Department, Sindh (2015)
SDG 2.a.1	The agriculture orientation index for government expenditures	Very high	Data not available	Data not available	-	Data not available
SDG 2.a.2	Total official flows (official development assistance plus other official flows) to the agriculture sector	Very high	USD 0.89 million Sindh ADP 2014-15	USD 47 million Sindh ADP 2020-21	Input indicator which will support achievement of agriculture productivity focused outcome indicators/targets	Sindh ADP
SDG 2.c.1	Indicator of food price anomalies	High	Data not available	Data not available	-	Sindh Bureau of Supply and Prices

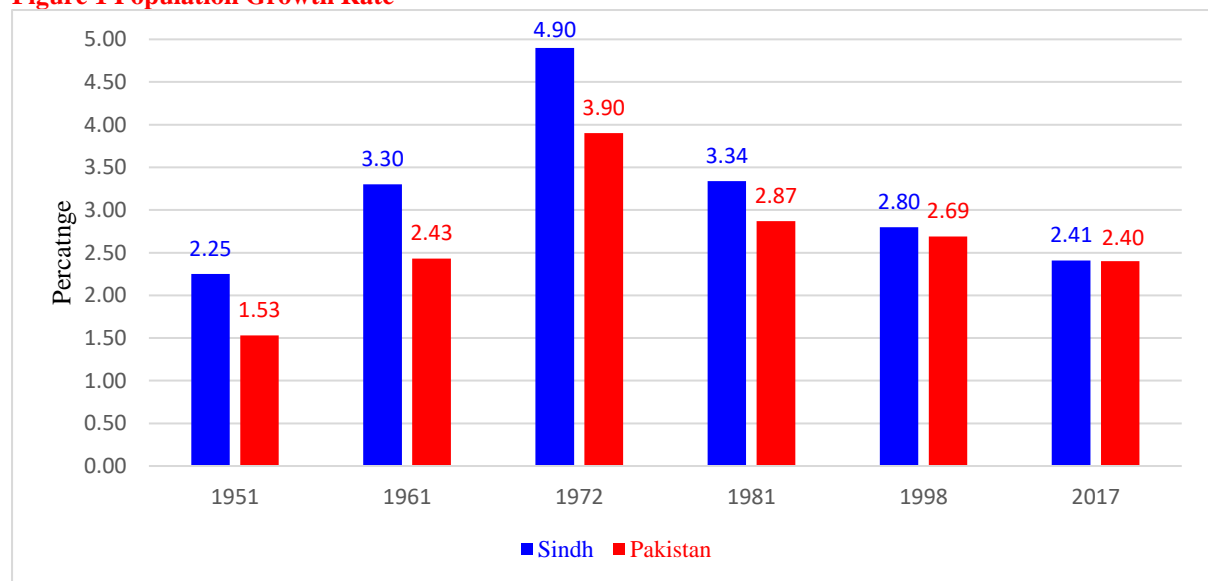
Source: Author's compilation

2. Demographic Progression 1951-2017

The population of Sindh is 47.85 million as of 2017, and it is essential to note that Sindh is the only province with 52 percent of the population living in urban centres. The inter-census growth rate between 1998 and 2017 reveals that the average urban and rural growth rates are 2.75 percent and 2.07 percent, respectively. The overall average inter-census growth rate is 2.41 percent, almost equal to the national average of 2.40 percent – see [Figure 1](#).

Despite a decrease over time, the population growth rate in Sindh remains one of the biggest challenges for policymakers, having declined from its highest of 4.90 percent in 1972 to 2.41 percent in 2017.

Figure 1 Population Growth Rate



Source: Census Reports, Pakistan Bureau of Statistics, Islamabad

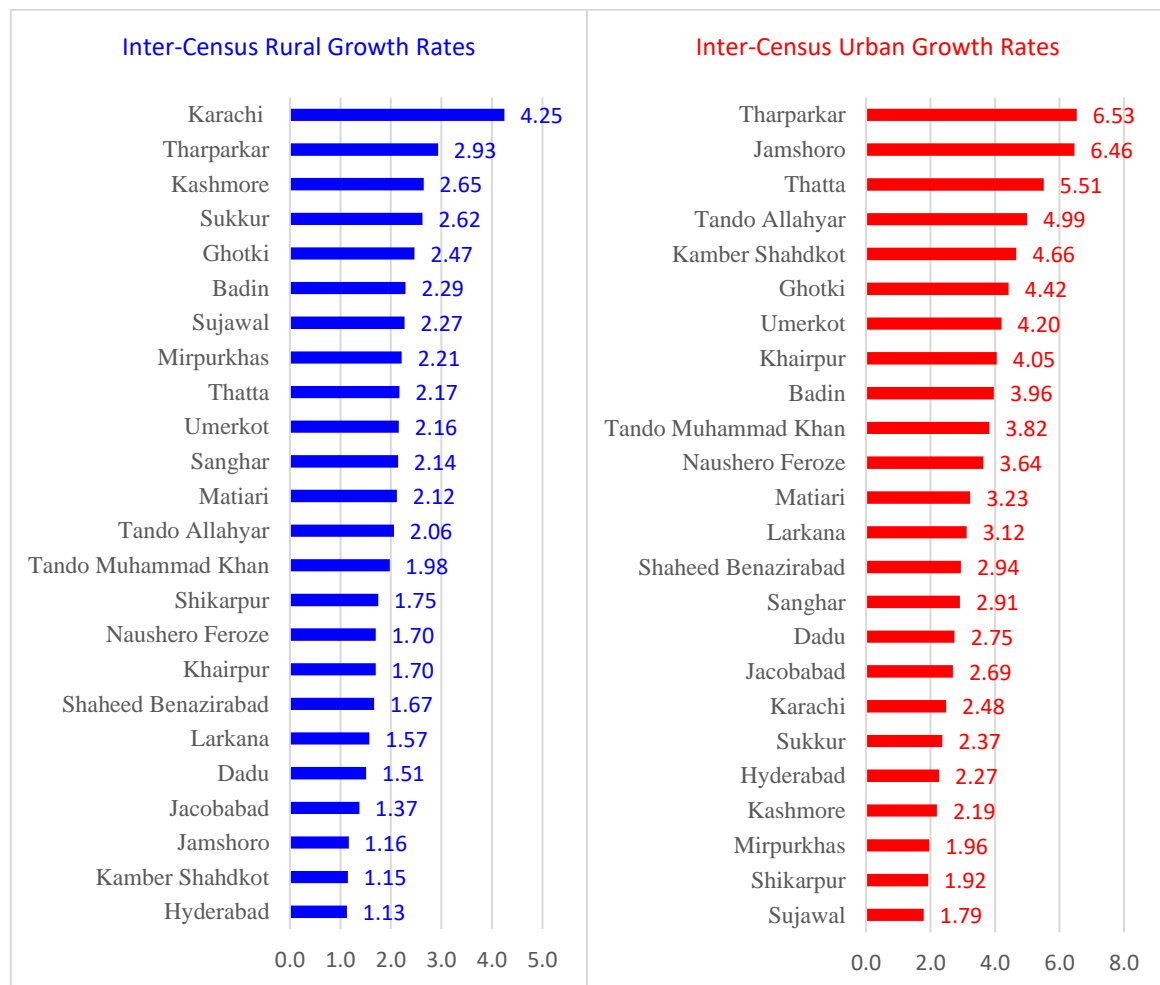
The persistently high growth trajectory warrants analyzing the growth pattern based on the district-wise urban and rural classification to account for the difference between natural growth, migration-led growth, and the effect of economic transformations, if any.

In [Figure 2](#), you can find a detailed breakdown of the growth rates of urban and rural areas between the census periods at the district level. The districts have been ranked in ascending order. Among them, Hyderabad Rural had the lowest growth rate of 1.13 percent, whereas Karachi Rural had the highest growth rate of 4.25 percent, which is unprecedented. On the other hand, Sujawal Urban had the lowest growth rate of 1.79 percent, while Tharparkar had the highest growth rate of 6.53 percent. It's worth mentioning that such significant growth patterns require an in-depth assessment.

Out of 30 districts in Sindh, the annual growth rates for rural areas of 19 districts are more than 2 percent. In contrast, the urban areas of districts show unprecedented growth – for details of growth ranges of urban and rural areas of districts, refer to [Table 5](#).

Table 5 Growth Ranges of Urban and Rural Areas of Districts

Figure 2 District-Wise Inter-Census Population Growth Rates

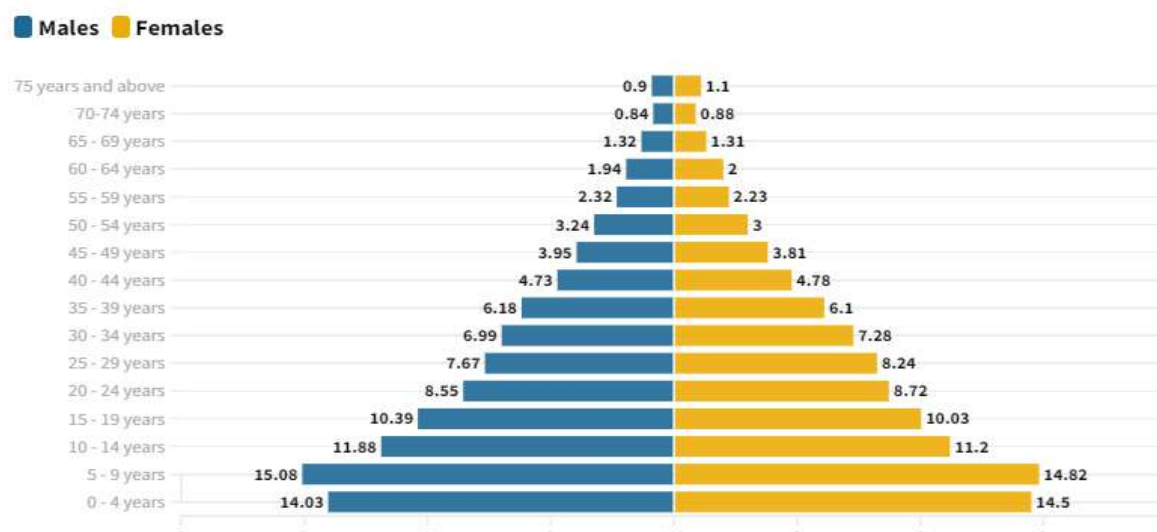


Source: Author's computation from 2017 Census Reports, Pakistan Bureau of Statistics, Islamabad

It is not just the high growth rates but also the massive base of the population pyramid which contributes to the fast increase in population in Sindh. Sindh's population pyramid is symmetric, meaning it has a large base and persistent high growth rates. The median age in Sindh is 18.5 years [Figure 3](#), which is lower than the national median age of 21. The large base of the younger population is usually considered a demographic dividend. However, low literacy rates, poor health facilities, and low investment in education and health might lead to a demographic disaster in the future.

Figure 3 Population Pyramid of Sindh

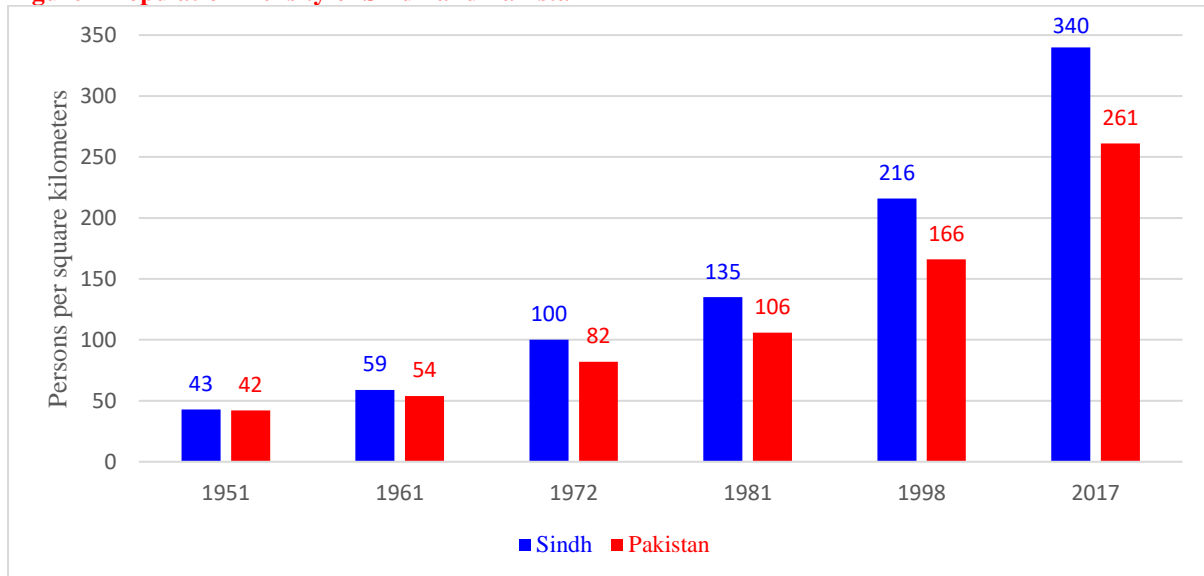
Population Pyramid of Sindh - 2017



Due to the high growth rate, the average population density in Sindh increased from 43 persons per square kilometer in 1951 to 340 persons per square kilometer in 2017. The top five densely populated districts are Karachi-Central with 43,064 persons per square kilometer, followed by Karachi-Korangi with 23,866 persons per square kilometer, Karachi-East with 14,502 persons per square kilometers, Karachi-South with 4,206 persons per square kilometer, and Hyderabad 2,215 persons per square kilometers. Other than these districts, the average population density is less than 1,000 persons per square kilometer, and for Jamshoro, Sujawal and Tharparkar, the thickness is even less than 100 persons per square kilometer; for details, refer [Figure 4](#) and [Figure 5](#). The thin population density, especially in rural areas, is one of the biggest challenges for policy makers in terms of outreach, identifying target beneficiaries, cost of intervention, returns on public investment, etc. For nutrition-sensitive interventions like the provision of safe drinking water, not only the cost of provision of the supply line is high, and the beneficiaries are sparsely located. The situation sometimes results in the unanticipated failure of policy interventions.

Identifying median location for public intervention is always challenging in areas where population density is low. In many cases, the cost of intervention increases due to the high operating costs of working in far-flung areas. But governments are always under an obligation to provide public goods and services and provide the citizens with necessary interventions for problems of malnutrition.

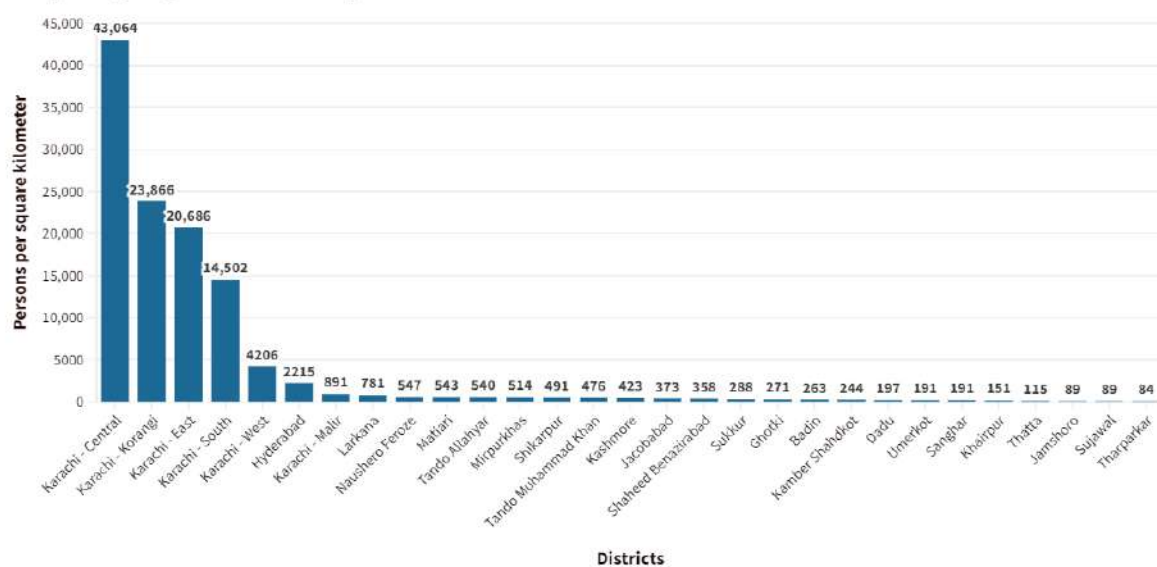
Figure 4 Population Density of Sindh and Pakistan



Source: Census Reports, Pakistan Bureau of Statistics, Islamabad

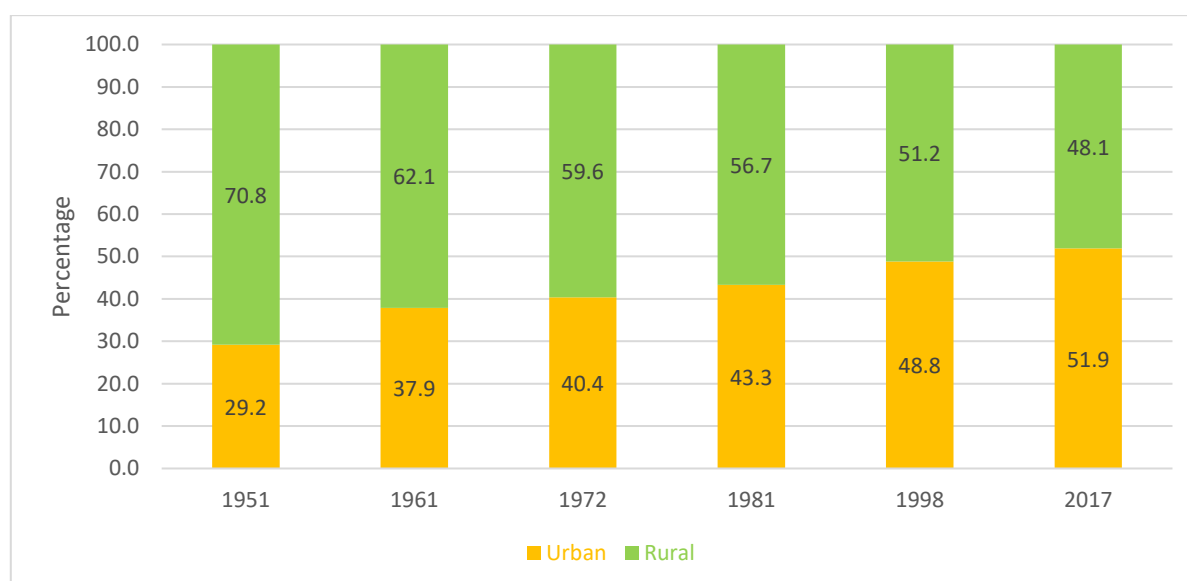
Figure 5 District-Wise Population Densities

Comparing Population Density Across Districts in Sindh 2017



Source: Census Reports, Pakistan Bureau of Statistics, Islamabad

Figure 6 Urban and Rural Population in Sindh



Source: Author's computation and compilation from Census Reports, Pakistan Bureau of Statistics, Islamabad

The most important phenomenon that deserves the importance of policymakers is high urban growth rates; the percentage of the urban population as of 2017 stands at approximately 52 percent. As discussed in [Table 5](#) not only the urban growth rates have surpassed rural growth in general, but the magnitude of growth is unprecedented; more importantly, that is based on the Population and Housing Census 2017, where the urban population of Sindh is grossly undercounted and underreported.

3. Malnutrition and Food Insecurity in Sindh - Situation Analysis

To assess and evaluate the situation of malnutrition in Sindh, there are two critical sources of nutrition-related indicators and variables: (1) the Multiple Indicator Cluster Survey and (2) the National Nutrition Survey. Currently, the Multiple Indicator Cluster Survey has been conducted twice, in 2014 and 2019, and the National Nutrition Survey three times, in 2001, 2011, and 2018. The percentage of moderately and severely underweight children and moderately and severely stunted children in Sindh has increased from 48.0 percent in 2014 to 50.2 percent in 2019 – see [Figure 8](#). However, comparative NNS data from 2011 and 2018 shows that instances of chronic malnutrition have decreased from 49.8 percent to 45.3 percent. In contrast, the trend of acute malnutrition is almost constant, i.e., 40.5 percent (2011) and 40.4 percent (2018).

On the other hand, the same comparative comparison shows a sharp increase in severe acute malnutrition from 17.5 percent (2011) to 23.2 percent (2018). Due to the difference in results between the two surveys, a comparative sensitivity analysis of MICS and NNS samples shows that the credibility of MICS is more *prima facie* than the NNS. Although this study primarily does not aim to provide inter-temporal evolution or situational analysis of malnutrition in Sindh, [Figures 7 to Figure 16](#), which are self-explanatory, provide a secondary source (MICS and NNS) assessment of malnutrition.

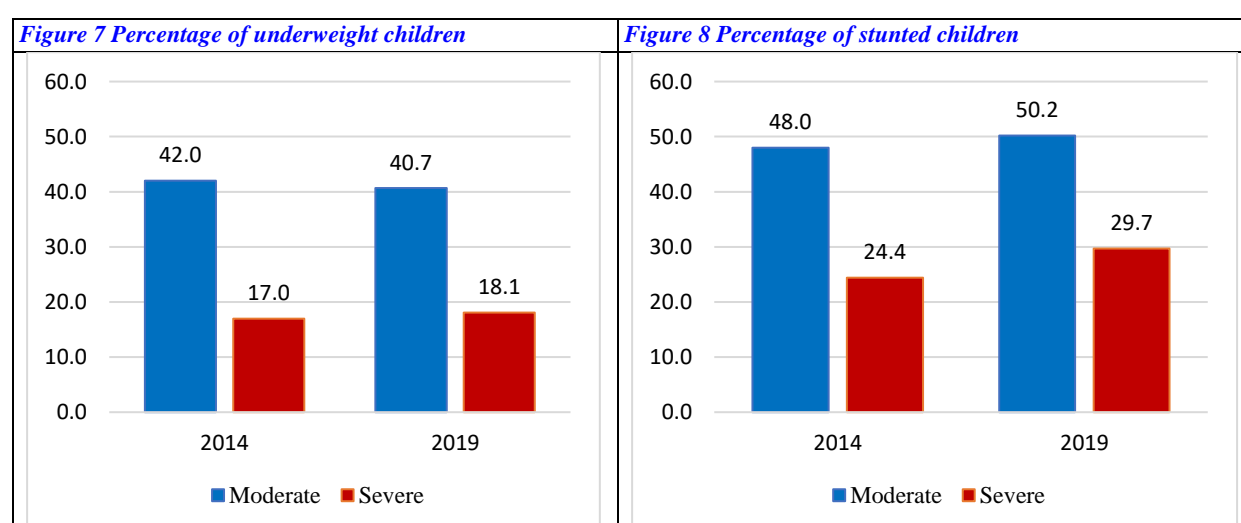
The percentage of newborns with low birth weight, households reporting open defecation, and multi-dimensionally poor households have increased significantly. A comparison of the nutrition indicators for Sindh reported in the last three National Nutrition Surveys shows that there has been a slight improvement in acute malnutrition. In contrast, there has been a sharp rise in severe acute malnutrition. Vitamin A deficiency has improved considerably, from 48 percent in 2001 to 43 percent in 2011 and 37.1 percent in 2018 – see [Figure 15](#).

The Government of Sindh set out a comprehensive plan to improve mother and child health in response to the grave malnutrition situation. An Accelerated Action Plan (AAP) for reducing Stunting and Malnutrition has been launched in this regard. This is a multi-sectoral programme involving eight sectors: Health, Education, Livestock, Fisheries, Agriculture, Local Government (Water, Sanitation, and Hygiene [WASH]), Population Welfare, and Social Welfare (Social Protection Strategy Unit (SPSU) at Chief Minister Sindh Secretariat.

Under initiatives by AAP Health, five lac children under five, which is 7.8 percent of the cohort, have been screened and treated successfully, and they are back to everyday life¹. Considering the magnitude and severity of malnutrition problems in children under five, it is the need of the hour to upscale the screening. It invests in more mobile screening facilities in each district.

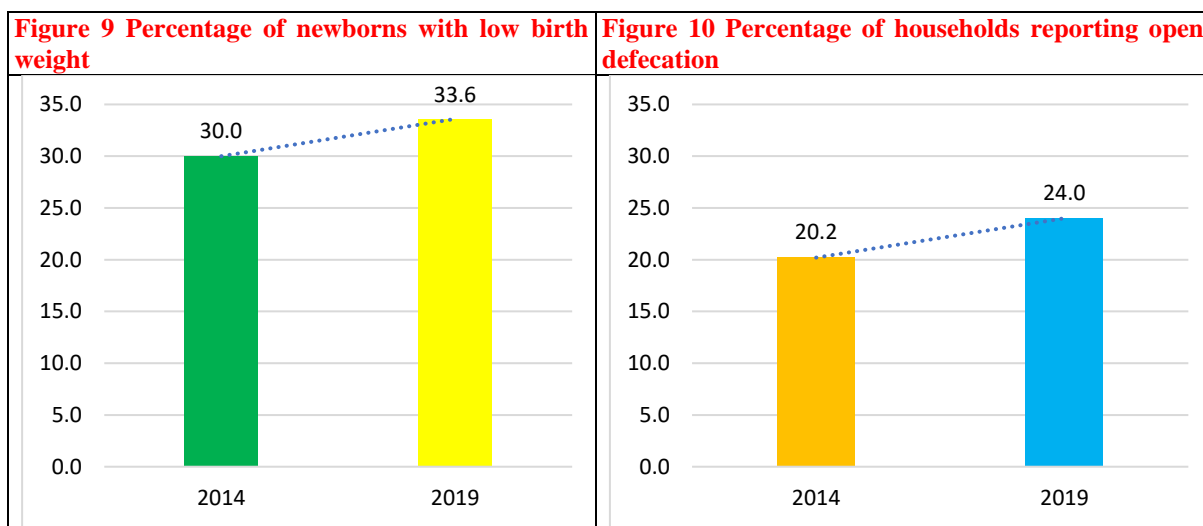
The GoS has established a Provincial Task Force on Nutrition to support the activities of the AAP in terms of supervision, coordination, and communication with internal and external stakeholders, as well as strategic guidance. The major nutrition programmes in Sindh include the Nutrition Support Programme (NSP), Sindh Enhancing Response to Reduce Stunting Project (SERRSP), the Saaf Suthro Sindh (SSS) Programme, the Nutrition-Sensitive Agriculture Project, and the Programme for Improved Nutrition in Sindh (PINS). In addition, there are programmes supported by the Government’s development partners, including the United Nations World Food Programme and the Expanded Programme on Immunization (EPI).

3.1 Malnutrition Indicators – Multiple Indicator Cluster Surveys



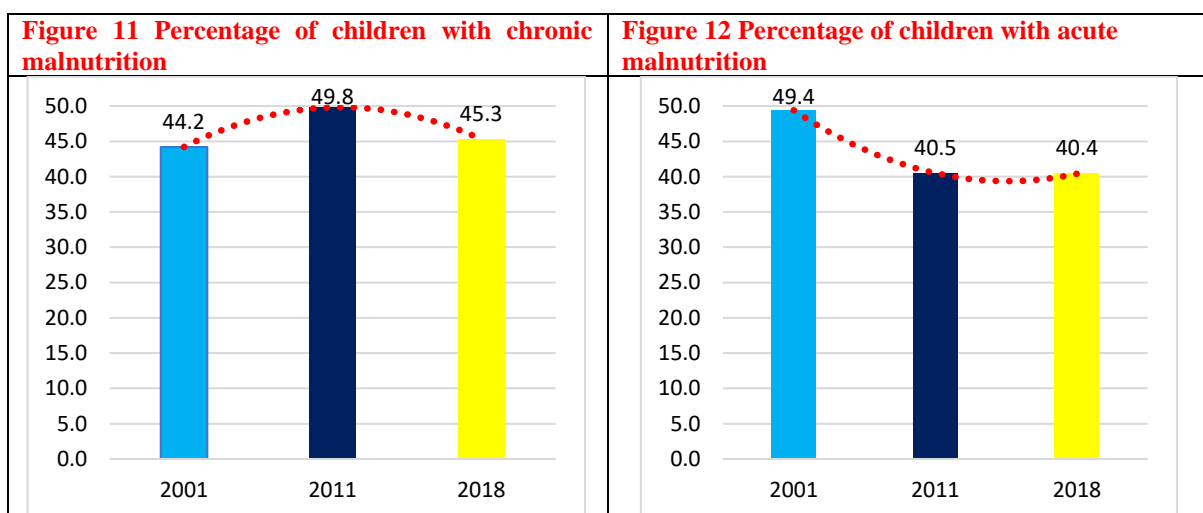
Source: Multiple Indicator Cluster Surveys 2014 and 2019

¹ During the interview with the author of this report, Dr. Sahib Jan Badar shared the following statistics.

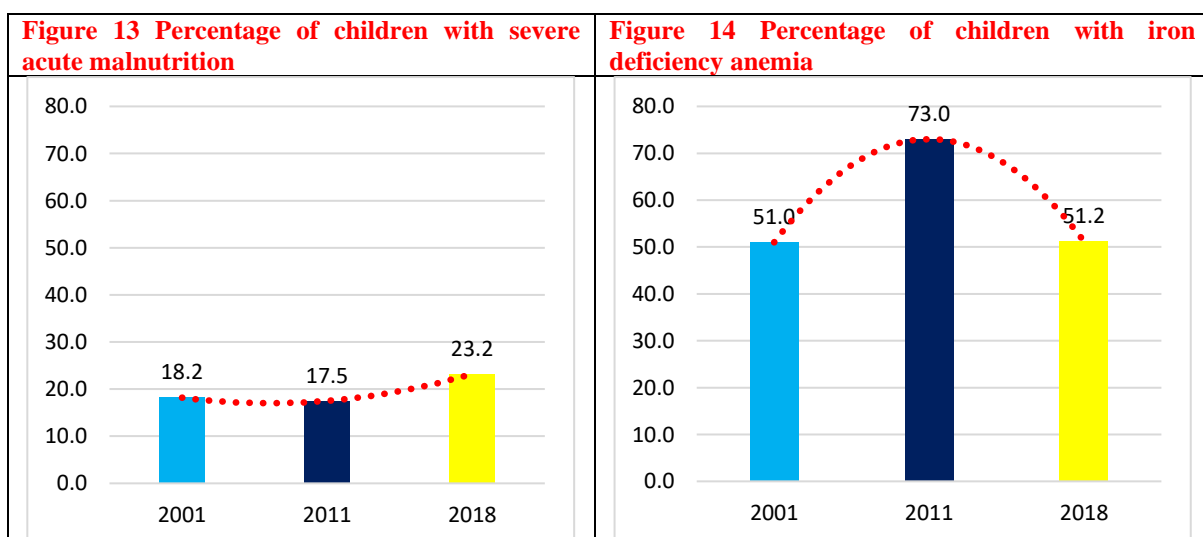


Source: Multiple Indicator Cluster Surveys 2014 and 2019

3.2 Malnutrition Indicators – National Nutrition Survey



Source: National Nutrition Surveys 2001, 2011, and 2018



Source: National Nutrition Survey 2001, 2011 and 2018

Figure 15 Percentage of children with vitamin A deficiency

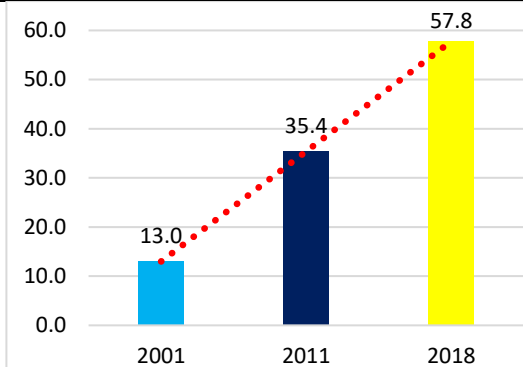
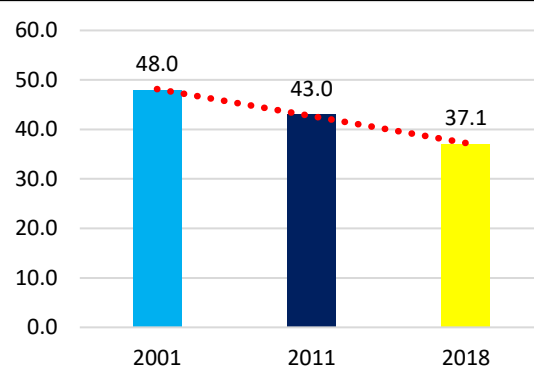


Figure 16 Percentage of children with vitamin D deficiency



Source: National Nutrition Surveys 2001, 2011, and 2018

4. SDG-2 Data of Indicators for Costing Model

The most important data source on Target 2.1 and Target 2.2 is the Multiple Indicator Cluster Survey (MICS) 2013-14 and 2019. MICS provides district-wise detailed data on Severe Acute Malnutrition (SAM) and Global Acute Malnutrition (GAM) under three categories stunting, wasting, and underweight. Since the nutrition-specific interventions and medical treatment for Moderate Acute malnutrition (MAM) and SAM are different, the segregated data for MAM and SAM are required, for which the value SAM is subtracted from GAM – see [Table 6](#), the resultant category is MAM.

[Table 6](#) provides district district-wise details on [Target 2.1](#) and [Target 2.2](#). The results of MICS 2014 and 2019 for stunting and wasting are presented in alphabetical order of districts starting from Badin and ending at Tharparkar. Provides the same results for 2019 only, and more importantly, the results are organized and presented in descending order of prevalence of stunting and wasting as per MICS 2019. It is alarming that Karachi ranked first regarding the highest percentage of wasting (MAM) and 6th for wasting (SAM) – see [Table 7](#). However, there are no nutrition programmes in Karachi as of now; for details, refer [Table 12](#). Leaving one-third of the population unaccounted for means the continuity of the vicious cycle of malnutrition for an indefinite period.

On average, the prevalence of stunting in Sindh is 50.2 percent, meaning one out of two children is stunted, possibly due to purpose sampling or representation bias in MICS. Based on these anomalies, there may be a need to revisit the standards of stunting for Sindh and Pakistan. This was also suggested by the participants of the consultative workshop on SDG-2 organized by UNDP. Nonetheless, the only data source to be relied upon for the costing model is MICS 2019.

The National Nutrition Survey provides data on anemic women. Due to data limitations at the district level the data of anemic pregnant and lactating women are provided at the division level –see [Table 8](#). SDG-2.2.3 is about pregnant and lactating women, whereas, from the Population and Housing Census 2017, the data of women of reproductive age can be computed. The average pregnancy rate for Sindh is 4 percent pregnancies²; using this percentage, the number of pregnant women in Sindh is computed in [Annexure 11](#).

² The figure provided during a key informant interview session is 4% annual pregnancies by Dr. Sahib Jan Badar.

Table 6 District Wise Situation of Malnutrition in Children under Five

SDG Target			SDG 2.2.1 - Stunting (height for age)						SDG 2.2.2 - Wasting (weight for height)					
MICS years			2014-15			2018-19			2014-15			2018-19		
			MAM	SAM	GAM	MAM	SAM	GAM	MAM	SAM	GAM	MAM	SAM	GAM
District			Between -2 SD & -3 SD	Below -3 SD	MAM+SAM	Between -2 SD & -3 SD	Below -3 SD	MAM+SAM	Between -2 SD & -3 SD	Below -3 SD	MAM+SAM	Between -2 SD & -3 SD	Below -3 SD	MAM+SAM
Badin			27.1	39.8	66.9	19.0	41.0	60.0	15.1	6.6	21.7	16.0	13.7	29.7
Dadu			23.2	34.7	57.9	21.0	50.5	71.5	11.5	3.0	14.5	9.7	4.1	13.8
Ghotki			25.1	27.7	52.8	23.1	27.0	50.1	11.2	3.1	14.3	7.2	2.2	9.4
Hyderabad			25.8	18.3	44.1	25.8	32.6	58.4	15.4	4.4	19.8	8.6	4.5	13.1
Jacobabad			27.3	36.4	63.7	25.0	37.1	62.1	10.2	3.7	13.9	7.6	7.0	14.6
Jamshoro			25.0	29.4	54.4	25.6	46.7	72.3	13.8	10.0	23.8	10.5	5.7	16.2
Kamber Shahdkot			24.2	36.0	60.2	14.0	31.0	45.0	9.9	3.8	13.7	10.4	11.8	22.2
Karachi (Division)			19.8	11.2	31.0	17.4	16.8	34.2	10.1	1.9	12.0	18.2	8.0	26.2
Kashmore			24.6	41.6	66.2	22.1	32.5	54.6	9.8	5.3	15.1	3.6	1.9	5.5
Khairpur			25.0	26.1	51.1	19.6	29.6	49.2	8.3	2.5	10.8	6.2	2.6	8.8
Larkana			25.9	25.7	51.6	15.3	29.9	45.2	8.4	1.4	9.8	10.7	9.1	19.8
Matiari			26.2	28.6	54.8	26.1	27.5	53.6	13.4	2.6	16.0	5.3	2.1	7.4
Mirpurkhas			27.2	28.2	55.4	20.2	36.6	56.8	19.4	7.1	26.5	12.8	5.0	17.8
Naushero Feroze			24.9	19.6	44.5	22.7	35.0	57.7	11.4	6.1	17.5	6.1	3.5	9.6
Sanghar			22.3	30.8	53.1	19.9	29.6	49.5	12.8	4.8	17.6	15.1	5.4	20.5
Shaheed Benazirabad			26.0	28.9	54.9	20.5	33.8	54.3	10.7	3.5	14.2	9.4	4.9	14.3
Shikarpur			26.5	29.7	56.2	24.8	28.9	53.7	6.0	3.4	9.4	6.2	3.1	9.3
Sujawal			24.9	30.7	55.6	17.4	55.3	72.7	15.2	4.9	20.1	10.2	4.5	14.7
Sukkur			24.3	26.5	50.8	23.3	26.5	49.8	10.4	2.7	13.1	8.6	3.6	12.2
Tando Allahyar			26.1	23.3	49.4	21.1	46.2	67.3	15.0	4.8	19.8	12.8	14.7	27.5
Tando Muhammad Khan			27.4	31.8	59.2	24.5	35.9	60.4	17.2	4.3	21.5	14.7	5.8	20.5
Tharparkar			23.8	39.2	63.0	26.4	24.2	50.6	24.1	8.8	32.9	16.2	9.5	25.7
Thatta			18.5	41.0	59.5	17.3	45.1	62.4	15.7	4.7	20.4	10.3	7.2	17.5
Umerkot			31.0	35.2	66.2	23.5	35.3	58.8	17.2	5.7	22.9	17.5	5.1	22.6
Total			23.8	24.4	48.2	20.5	29.7	50.2	11.8	3.6	15.4	9.7	5.1	14.8
Target 2030			27.5%						3.0%					

Source: The information below is from the Author's computation and compilation, using data from the Multiple Indicator Survey in 2014 and 2018-19. MAM, SAM, and GAM refer to moderate acute malnutrition, severe acute malnutrition, and global acute malnutrition, respectively

Table 7 Districts Ranked According to Severity of Moderate and Severe Malnutrition

Order of severity	SDG 2.2.1 - Stunting (height for age)				SDG 2.2.2 - Wasting (weight for height)			
	District	MAM %	District	SAM %	District	MAM %	District	SAM %
1	Tharparkar	26.4	Sujawal	55.3	Karachi (Division)	18.2	Tando Allahyar	14.7
2	Matari	26.1	Dadu	50.5	Umerkot	17.5	Badin	13.7
3	Hyderabad	25.8	Jamshoro	46.7	Tharparkar	16.2	Kamber Shahdkot	11.8
4	Jamshoro	25.6	Tando Allahyar	46.2	Badin	16.0	Tharparkar	9.5
5	Jacobabad	25.0	Thatta	45.1	Sanghar	15.1	Larkana	9.1
6	Shikarpur	24.8	Badin	41.0	Tando Muhammad Khan	14.7	Karachi (Division)	8.0
7	Tando Muhammad Khan	24.5	Jacobabad	37.1	Mirpurkhas	12.8	Thatta	7.2
8	Umerkot	23.5	Mirpurkhas	36.6	Tando Allahyar	12.8	Jacobabad	7.0
9	Sukkur	23.3	Tando Muhammad Khan	35.9	Larkana	10.7	Tando Muhammad Khan	5.8
10	Ghotki	23.1	Umerkot	35.3	Jamshoro	10.5	Jamshoro	5.7
11	Naushero Feroze	22.7	Naushero Feroze	35.0	Kamber Shahdkot	10.4	Sanghar	5.4
12	Kashmore	22.1	Shaheed Benazirabad	33.8	Thatta	10.3	Umerkot	5.1
13	Tando Allahyar	21.1	Hyderabad	32.6	Sujawal	10.2	Mirpurkhas	5.0
14	Dadu	21.0	Kashmore	32.5	Dadu	9.7	Shaheed Benazirabad	4.9
15	Shaheed Benazirabad	20.5	Kamber Shahdkot	31.0	Shaheed Benazirabad	9.4	Hyderabad	4.5
16	Mirpurkhas	20.2	Larkana	29.9	Hyderabad	8.6	Sujawal	4.5
17	Sanghar	19.9	Khairpur	29.6	Sukkur	8.6	Dadu	4.1
18	Khairpur	19.6	Sanghar	29.6	Jacobabad	7.6	Sukkur	3.6
19	Badin	19.0	Shikarpur	28.9	Ghotki	7.2	Naushero Feroze	3.5
20	Sujawal	17.4	Matari	27.5	Khairpur	6.2	Shikarpur	3.1
21	Karachi (Division)	17.4	Ghotki	27.0	Shikarpur	6.2	Khairpur	2.6
22	Thatta	17.3	Sukkur	26.5	Naushero Feroze	6.1	Ghotki	2.2
23	Larkana	15.3	Tharparkar	24.2	Matari	5.3	Matari	2.1
24	Kamber Shahdkot	14.0	Karachi (Division)	16.8	Kashmore	3.6	Kashmore	1.9

Source: Author's computation and compilation from Multiple Indicator Cluster Survey 2018-19

Table 8 Anemia in Women Aged 15 to 49 years, Regardless of Pregnancy Status

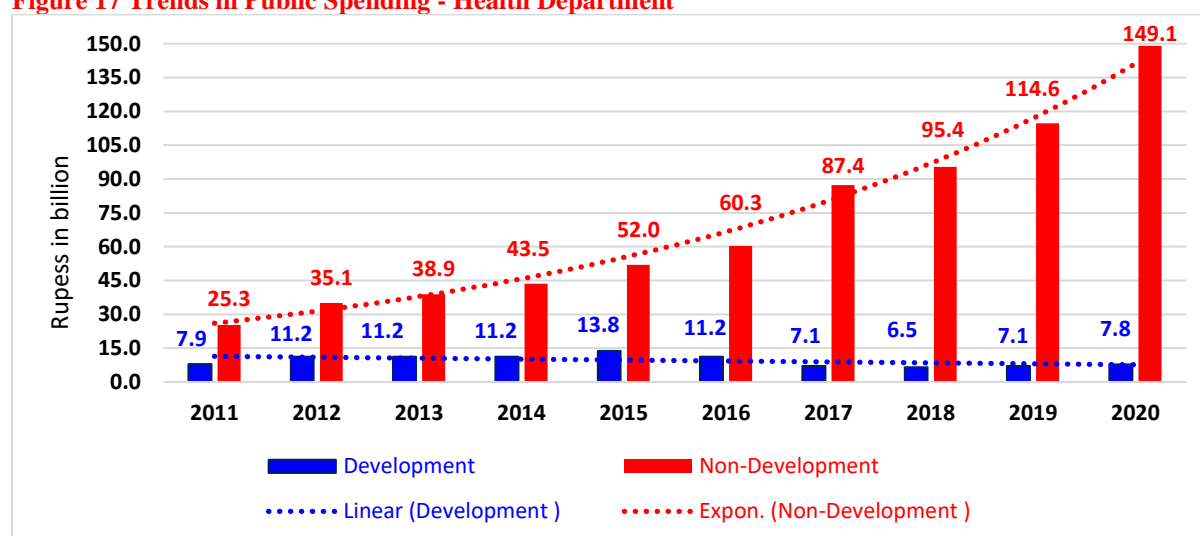
Division	Severe deficiency [<7gm/dL]	Moderate deficiency [7 -11.99 gm/dL]	Normal [>= 12 gm/dL]	WRAs need interventions
(WRAs in Percentage)	(a)	(b)	(c)	(d =a + b)
Larkana	1.0	53.7	45.3	54.7
Sukkur	1.9	53.2	44.9	55.1
Hyderabad	2.0	47.4	50.6	49.4
Mirpurkhas	1.7	48.0	50.3	49.7
Karachi	0.7	34.1	65.3	34.8
Shaheed Benazirabad	2.9	51.3	45.8	54.2
Total	1.4	43.9	54.7	45.3
Current 2018		45.3%	Target 2030	0.0%

Source: Author's computation and compilation from National Nutrition Survey 2018

5. Public Finance Review 2011-2020

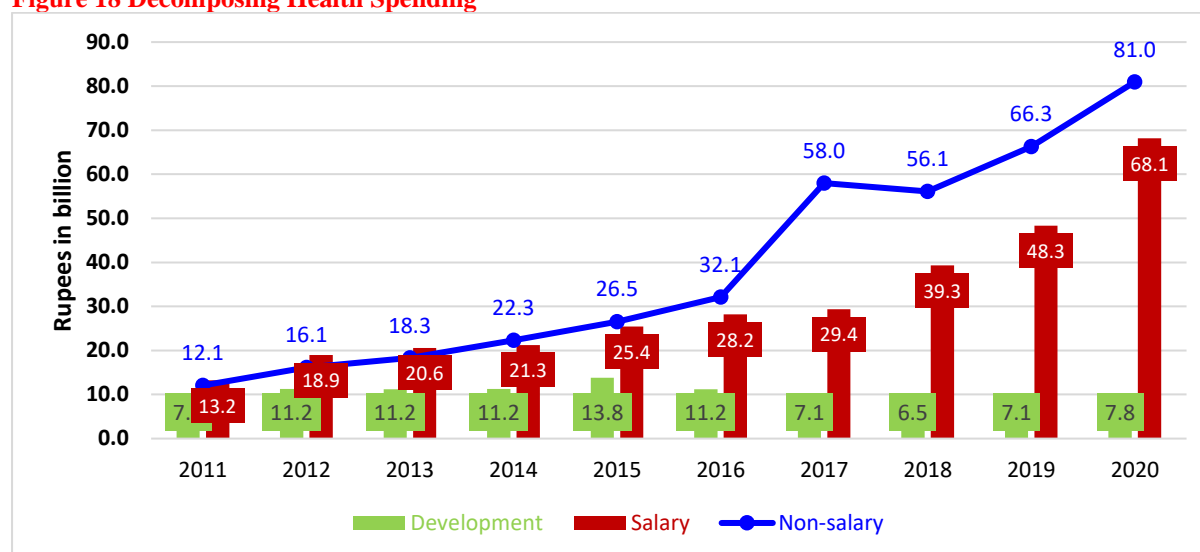
Before constructing a formal costing model for malnutrition in Sindh, it is imperative to analyze the present situation of public finances in health, nutrition, and other relevant sectors. The public finance analysis would reveal the system's ability for self-expansion and the need for assistance from foreign partners in the future. Health is a provincial subject after the Eighteenth Amendment to the Constitution of Pakistan, 1973. The health development budget in 2011 was Rs 7.9 billion, which stands at Rs 7.8 billion as of 2020. However, the non-development health budget witnessed an exponential increase from Rs 25.3 billion in 2011 to Rs 149.1 billion in 2020 – see [Figure 17](#).

Figure 17 Trends in Public Spending - Health Department



Source: Author's computations using IFMIS, Government of Sindh

For a careful examination, the non-development spending needs to be segregated further into salary versus non-salary components. The decomposition is consistent and shows that both components are increasing exponentially. Both are individually and jointly disproportionately higher than the development spending, out of which some portion is financed by donor partner of GoS - see [Table 9](#).

Figure 18 Decomposing Health Spending

Source: Author's computations using IFMIS, Government of Sindh

Table 9 Decomposing Health Spending

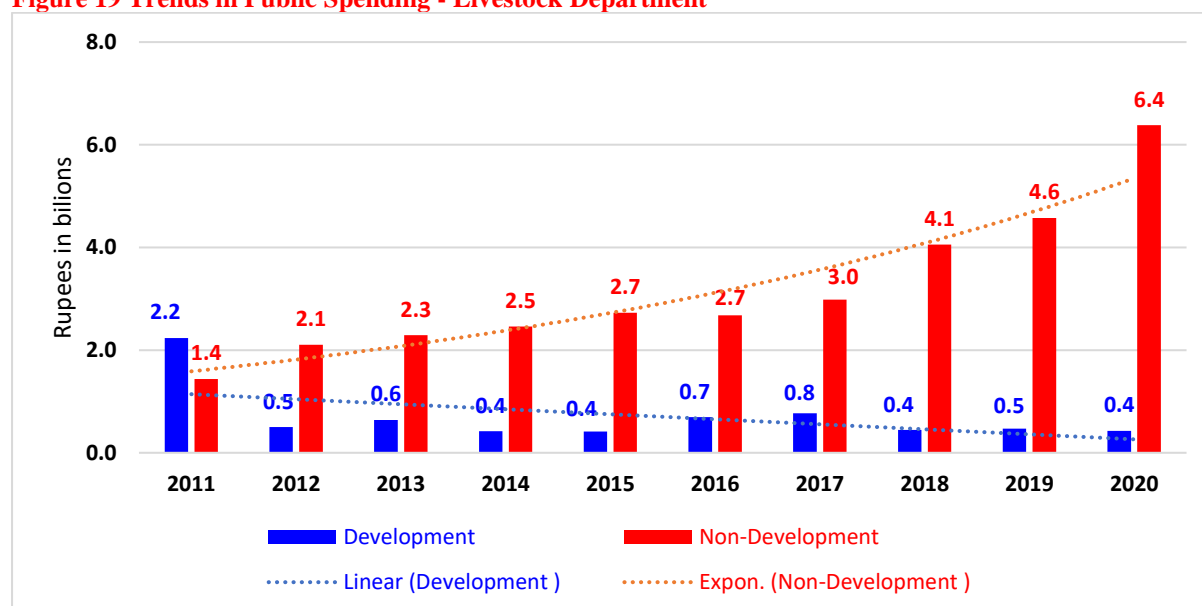
Year	Annual Development Plan (Rs in bn)		
	GoS Funded	Foreign Project Assistance	Total
2016	10.66 (95.2)	0.54 (4.79)	11.20 (100)
2017	6.23 (87.7)	0.88 (12.31)	7.11 (100)
2018	5.84 (90.2)	0.63 (9.79)	6.48 (100)
2019	6.68 (93.8)	0.44 (6.25)	7.12 (100)
2020	7.78 (99.96)	0.003 (0.04)	7.78 (100)

Source: Author's computations using IFMIS, Government of Sindh. Percentages are in brackets

The same elementary analysis is repeated for the Livestock, Food, Irrigation, and Welfare Department, and the trend of public finances is consistent and alarming for the future for two reasons first availability of funds for development because non-development spending is consistently crowding out the development priorities, second, the non-development spending in terms of public employment will add to pays and pension which may consequently lead to the problem of fiscal solvency.

Similarly, public finances of the cross-cutting sectors and departments relevant to malnutrition are important to study. The non-development spending in the livestock department increased from Rs 2.2 billion in 2011 to Rs 6.4 billion in 2020; however, development spending decreased from Rs 2.2 billion to 0.4 billion for the corresponding period – see [Figure 19](#).

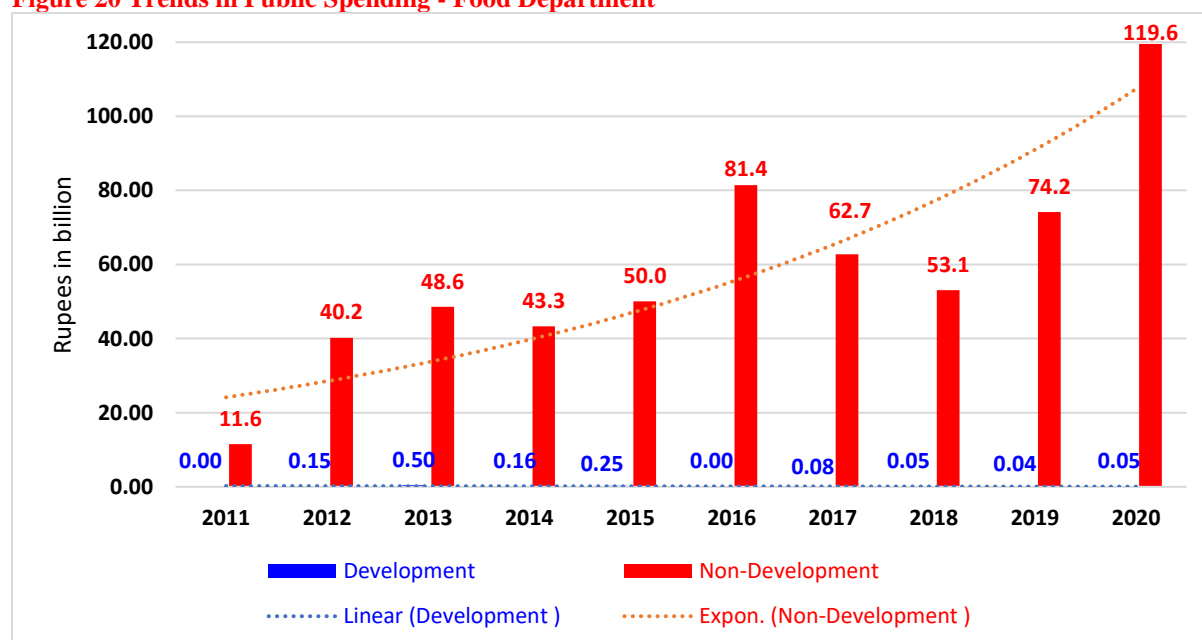
Figure 19 Trends in Public Spending - Livestock Department



Source: Author's computations using IFMIS, Government of Sindh

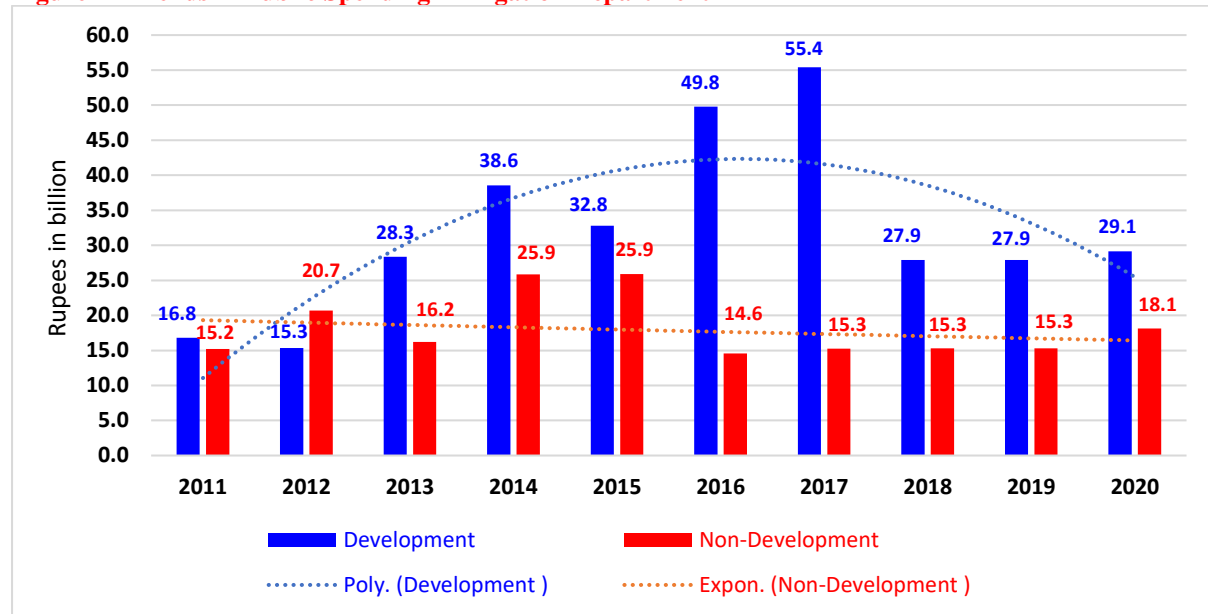
The non-development spending in the food department increased from Rs 11.6 billion in 2011 to Rs 119.6 billion in 2020. On the contrary, development spending stands at Rs 0.05 billion as of 2020 – see [Figure 20](#). Similar patterns are observed in Irrigation and Welfare Department [Figure 22](#). These trends are consistent and fiscally unsustainable; therefore, GoS should reconsider the budgetary allocations and spending patterns and rationalize them.

Figure 20 Trends in Public Spending - Food Department



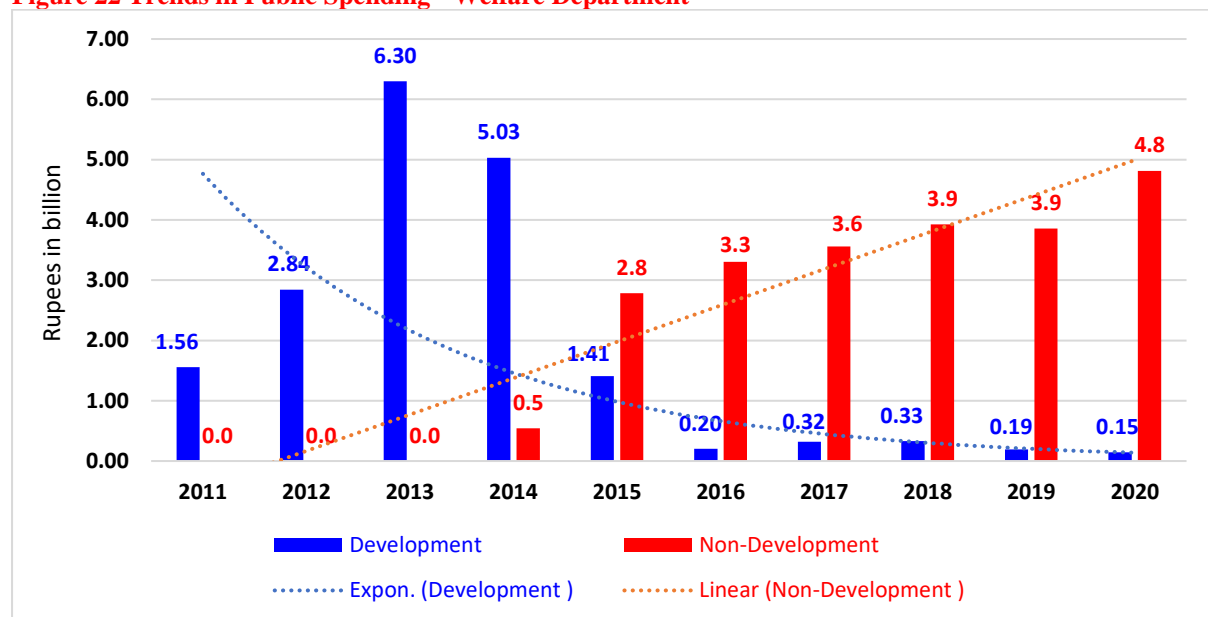
Source: Author's computations using IFMIS, Government of Sindh

Figure 21 Trends in Public Spending - Irrigation Department



Source: Author's computations using IFMIS, Government of Sindh

Figure 22 Trends in Public Spending - Welfare Department



Source: Author's computations using IFMIS, Government of Sindh

6. Public Finances and Nutrition Expenditures in Sindh FY2017-2020

Nutrition expenditure in Sindh has been steadily rising over time. The cumulative nutrition expenditure in FY 2017 was RS 19.8 billion, which increased to Rs 32.68 billion in FY 2020.

In relative terms, the nutrition expenditure as a percentage of total government expenditure in FY 2017 was 2.29 percent. This increased to 3.65 percent in FY 2020. Similarly, *per capita* nutrition expenditure increased from RS 413.84 in FY 2017 to RS 635.68 in FY 2020.

Table 10 Nutrition expenditure in Sindh

	2016–17	2017–18	2018–19	2019–20
	Rs Bn	Rs Bn	Rs Bn	Rs Bn
Nutrition-specific	2.59	7.10	8.00	7.77
Nutrition-sensitive	17.21	20.42	21.23	24.91
Total nutrition expenditure	19.80	27.52	29.22	32.68
Total government expenditure	863.36	936.33	860.65	896.65
Nutrition as a percentage of government expenditure	2.29%	2.94%	3.40%	3.65%
Population (million)	47.855	49.013	50.199	51.415
<i>Per capita</i> nutrition expenditure (RS)	413.84	561.42	582.16	635.68
<i>Per capita</i> nutrition expenditure (USD)	3.95	5.10	4.27	4.03

Source: Author's computation

In dollar terms, the per capita nutrition expenditure on nutrition ranged from USD 3.95 to USD 5.10 during the three years. This is well below the threshold of USD 10 per capita recommended by the World Bank³.

In FY 2017, nutrition spending as a percentage of total spending was 2.29 percent; however, for FY 2020, it stands at 3.65 percent, which is more than the average ranging from 1.67 percent to 1.70 percent in 30 countries, as reported in '[Analysis of nutrition-sensitive Budget Allocations: Experience from 30 countries MQSUN Report](#)'. However, the percentage of nutrition spending in Sindh is significantly less than in Guatemala (7.78 percent), Comoros (4.84 percent), and Peru (4.02 percent).

Nutrition expenditure by economic classification

The total budget outlay is classified under the non-development (current) and development budgets. Therefore, analyzing the nutrition spending under the two classifications is pertinent. The following table classifies the nutrition expenditure by the GoS by non-development and development expenditure categories, i.e., by economic classification.

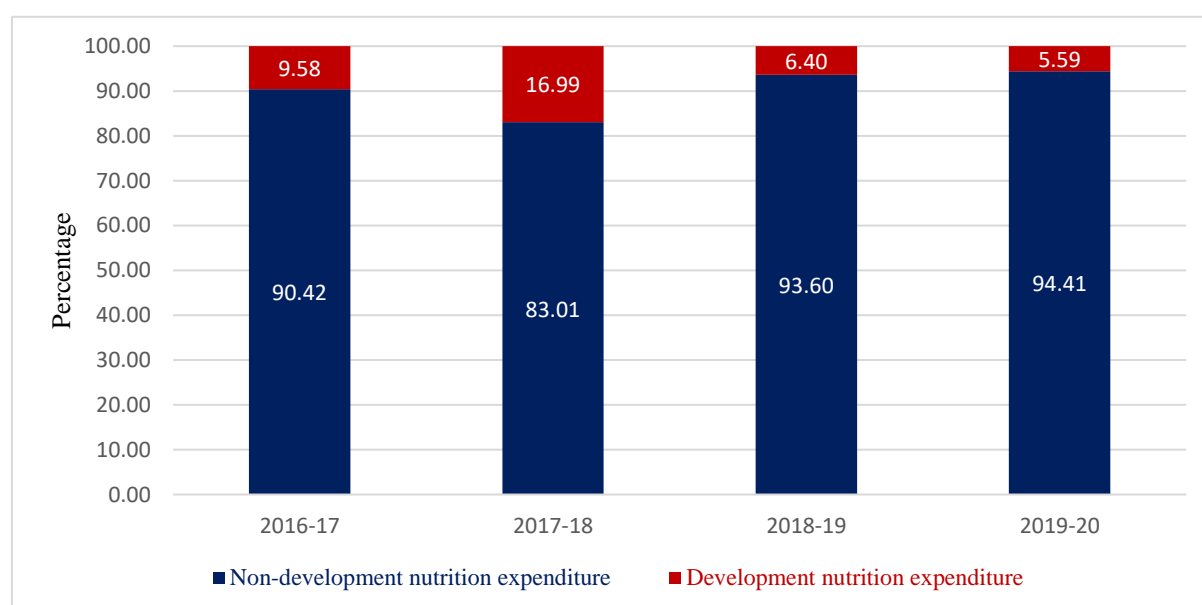
³ Shekar, Meera, Jakub Kakietek, Julia Dayton Eberwein, and Dylan Walters. 2017. An Investment Framework for Nutrition: Reaching the Global Targets for Stunting, Anemia, Breastfeeding, and Wasting. Directions in Development. Washington, DC

Table 11 Nutrition expenditure by economic classification

	2016–17	2017–18	2018–19	2019–20
	RS Bn	RS Bn	RS Bn	RS Bn
<i>Nutrition-specific</i>	1.13	3.48	6.89	6.89
<i>Nutrition-sensitive</i>	16.78	19.36	20.47	23.96
Non-development expenditure on nutrition	17.91	22.84	27.35	30.86
<i>Nutrition-specific</i>	1.47	3.62	1.11	0.88
<i>Nutrition-sensitive</i>	0.43	1.06	0.76	0.95
Development expenditure on nutrition	1.90	4.68	1.87	1.83
Total expenditure on nutrition	19.80	27.52	29.22	32.68

Source: Author's computation and analysis

Figure 23 Development versus non-development nutrition expenditure



Source: Author's computation and analysis

Non-development nutrition expenditure has a higher share in nutrition expenditure compared to development expenditure, and the trend has increased over time. In 2019–20, only 5.59 percent of nutrition expenditure was for development. Nutrition expenditure was primarily attributed to the non-development nutrition expenditure incurred in the thematic sectors of health, education, and agriculture, which remained consistent at around 90 percent (90 percent in FY 2017 and 94 percent in FY 2019) of the total nutrition expenditure.

7. Comparing GoS Nutrition Investment with Global Average

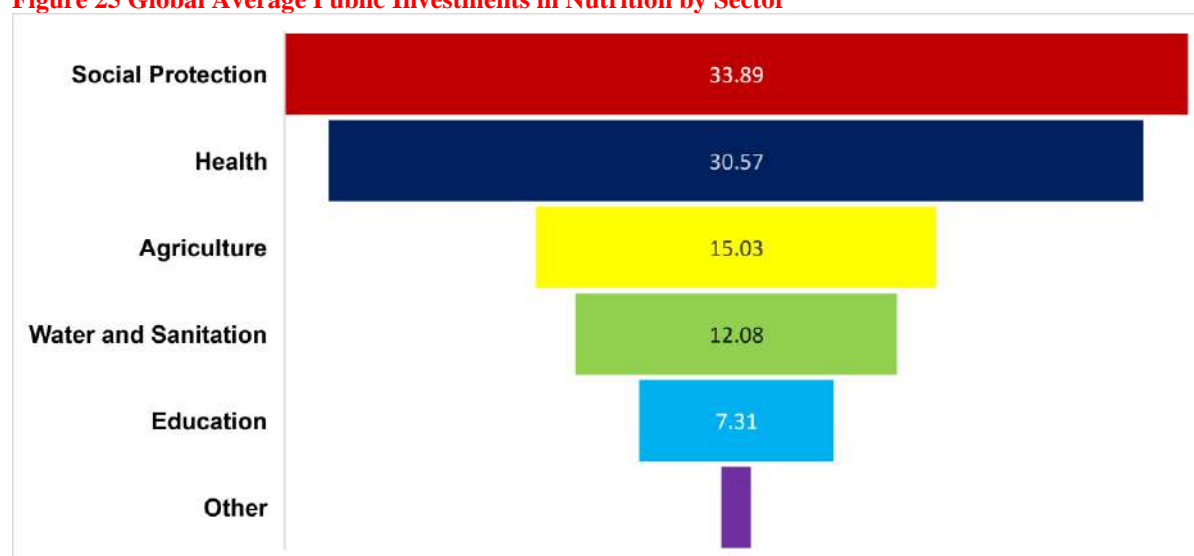
Countries across the globe are assigning a high priority to nutrition-sensitive investment, specifically in the context of social protection; also, a large proportion is allocated for WASH sectors – for details, refer [Figure 25](#), whereas the Government of Sindh is still following a conservative strategy of managing malnutrition crisis using nutrition specific curative interventions, of which 61.5 percent is allocated for health sector and 25.3 percent for education – see [Figure 24](#). It is high time for GoS to increase its investment in nutrition-sensitive, especially the WASH sector because the poor nutrition outcomes in many areas of Sindh result from drinking water contamination. Although water contamination and its effect on nutrition outcomes is not the scope of this report, as a matter of future record, research, and policy planning, the district-wise data on water contamination indicators in Sindh are provided in MICS (2018-19)

Figure 24 Sindh Public Investments in Nutrition by Sector (FY 2019-20)



Source: Author's computation and analysis

Figure 25 Global Average Public Investments in Nutrition by Sector



Source: Author's computation and analysis

Table 12 Coverage of Major Nutrition and Health Interventions

Districts	Peoples' Primary Healthcare Initiative PPHI	Peoples' Poverty Reduction Program	Australian donation to build livelihood activities in Sindh	Sindh Union Council and Community Economic Strengthening Support	Community Based Multi Sectoral Integrated Program	Sindh Enhanced Response to Reduce Stunting Programme	Saaf Suthro Sindh Program	Nutrition Support Program	Nutrition Sensitive Agriculture Programme	World Food Program	Programme for Improved Nutrition
Umerkot	✓	✓	✓	x	x	✓	✓	✓	✓	✓	x
Tharparkar	✓	✓	✓	x	x	✓	✓	✓	✓	✓	x
Sanghar	✓	✓	✓	x	x	✓	✓	✓	✓	x	✓
Jacobabad	✓	✓	x	x	x	✓	✓	✓	✓	x	✓
Badin	✓	✓	✓	x	x	✓	✓	✓	x	x	x
Kamber Shahdkot	✓	✓	x	✓	x	✓	✓	✓	x	x	✓
Larkana	✓	✓	x	✓	x	✓	✓	✓	x	x	✓
Tando Muhammad Khan	✓	✓	x	x	x	✓	✓	✓	x	x	✓
Kashmore	✓	✓	x	x	x	✓	✓	✓	x	x	x
Shikarpur	✓	✓	x	✓	x	✓	✓	x	x	x	✓
Dadu	✓	✓	x	x	x	✓	✓	x	x	x	✓
Sujawal	✓	✓	x	x	x	✓	✓	x	x	x	✓
Thatta	✓	✓	x	x	✓	✓	✓	x	x	x	✓
Mirpurkhas	✓	✓	✓	x	x	✓	x	x	x	x	x
Matiari	✓	✓	x	x	x	✓	x	x	x	x	x
Ghotki	✓	✓	x	x	x	✓	x	x	x	x	x
Tando Allahyar	✓	✓	x	x	x	✓	x	x	x	x	x
Khairpur	✓	✓	x	x	x	✓	x	x	x	x	x
Sukkur	✓	✓	x	x	x	✓	x	x	x	x	x
Jamshoro	✓	x	x	x	x	✓	x	x	x	x	x
Hyderabad	✓	x	x	x	x	✓	x	x	x	x	x
Naushero Feroze	✓	x	x	x	x	✓	x	x	x	x	x
Shaheed Benazirabad	✓	x	x	x	x	✓	x	x	x	x	x
Karachi	x	x	x	x	x	x	x	x	x	x	x

Source: Project Appraisal Document of SERRSP, PC-1 NSP, the GoS and Annual Key Performance Indicators Report (2018–19), PINS in support of the AAP, PPHI, ADP

8. Costing Methodology and Limitations

In the absence of historical trends, time series data of nutrition programs, number of beneficiaries, average recovery time per beneficiary, investment per beneficiary, socio-economic factors, data on development and recurrent costs of individual nutrition programs and the respective outcomes, any costing methodology for zero hunger and malnutrition will be the best estimate based on conventional wisdom and experience learned. Still, a preliminary scientific costed framework is better than no investigation whatsoever.

8.1 Methodology

For a costing model, the most crucial factor is to know the significant challenges, the number of malnourished children and PLWs, the targeting mechanism, interventions, and the time frame.

First, the projected population of WRAs and children under five till 2030 is required. The population is projected based on inter-census growth rates between 1998-2017. The detailed reports of Census 2017 provide age-wise breakdowns of the population for each district⁴. From these detailed tables, a total number of children under five and women from 15 to 49 years have been tabulated and projected for the population of every cohort till 2030; this gives us the gross population.

8.1.1 Sustainable Development Goals 2.1.1 and 2.1.2

Identification and Targeting

Using estimates of food insecure households in Sindh provided by Pakistan Overview of Food Security and Nutrition Report Ministry of National Food Security and Research, the inventory of food insecure households as of 2017 is estimated.

There are 8.58 million households in Sindh, of which 36 percent stands food insecure as per the above report, which is 3.13 million households -- **Annexure 1**.

Target 2.1: By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.

Indicator 2.1.1: Prevalence of undernourishment

Indicator 2.1.2: Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES).

Source: United Nations Statistics Division

Potential Intervention

For food insecure households, the provision of monthly food baskets costing Rs 3000 is considered the preferred intervention. During the first year, one-third of households are considered for intervention, and the remaining two-thirds will be targeted on a proportional basis in years to come. The price of intervention is assumed to be indexed against food average food inflation at a rate of five percent per annum -- **Annexure 2**.

⁴ Table 5, Census 2017, District Report

8.1.2 Sustainable Development Goals 2.2.1 and 2.2.2

Identification and Targeting

After projecting the population of children under five till 2030, the figures for children suffering from MAM and SAM under stunting (Annexure 3 and Annexure 5) and wasting (Annexure 7 and Annexure 9) are calculated separately using the percentage figures provided by latest MICS 2019.

Stunting and wasting are curable during the first two years of the child; this warrants targeting 50 percent of children in the first year and fifty percent in the second year; this is the only way to break the come out of the vicious cycle of malnutrition. Since GoS coverage is insufficient, the cycle repeats with the same gravity. The World Bank programme Sindh Enhance Response to Reduce Stunting set up the program's objective to reduce stunting in Sindh by 1 percent annually. This approach simply cannot end the vicious cycle of malnutrition, says Soofi⁵. Once exhaustive convergence is ensured during the first two years, the new cases will be as low as 5 to 10 percent per annum. Scientific wisdom warrants keeping the nutrition investment level high in the initial years and decreasing gradually as the situation normalizes.

Intervention

The prescribed treatment for children suffering from MAM under the stunting or wasting category is Micronutrient Powder (MNP), the cost of which is Rs 260; however, while accounting for the transaction, recurrent cost, and ancillary costs, it turns out to be to RS 500 per child. Whereas the cost of Ready to Use Therapeutic Food (RUTF) is RS 8400, it goes up to RS 9000 while other expenses are accounted for.

8.1.3 Sustainable Development Goal 2.2.3

Identification and Targeting

National Nutrition Survey provides data on anemic women. Due to data limitations at the district level, the data of anemic pregnant and lactating women are provided at the division level –see Table 8. SDG-2.2.3 is about pregnant and lactating women, whereas, from the Population and Housing Census 2017, data on women of reproductive age can be computed.

Target 2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age and address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons.

Indicator 2.2.1: Prevalence of stunting (height for age <-2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age

Indicator 2.2.2: Prevalence of malnutrition (weight for height $>+2$ or <-2 standard deviations from the median of the WHO Child Growth Standards) among children under 5 years of age, by type (wasting and overweight).

Source: United Nations Statistics Division

⁵ Dr. Sajid Soofi during key informant interview

The average pregnancy rate for Sindh is 4 percent of pregnancies⁶; using this percentage estimate, the number of pregnant women in Sindh is computed in Annexure 11.

Target 2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons.

Indicator 2.2.3 Prevalence of anemia in women aged 15-49 years, by pregnancy status (percentage)

Percentage of women aged 15-49 years with a hemoglobin level less than 120 g/L for non-pregnant women and lactating women, and less than 110 g/L for pregnant women, adjusted for altitude and smoking.

Source: United Nations Statistics Division

Intervention

For PLWs, the best strategy would be to provide a Conditional Cash Transfer (CCT) of Rs 1000 per month with the cost of Iron supplementation as Rs 100 for the entire pregnancy and three months after delivery. The conditions for the CCT program are regular monthly screening and checkups. To avoid mismanagement, the CCT voucher should be system generated, and screening results should be fed into a digital system from where a voucher will be generated. Each beneficiary will get the cash against the counter of designated banks. The government of Sindh will reimburse the bank, an amount equivalent to monthly vouchers plus service charges.

8.2 Data Limitations

SDG-2 is cross-cutting and necessarily involves multi-sectoral interventions; therefore, it involves a varied range of indicators – see

Table 13. For most such indicators, data availability is the biggest challenge. For instance, SDG 2.3.1 requires data on the volume of production per labour unit, which is precisely the yield, to measure output per unit of input; the production data at the federal and provincial level is not provided in such format and is not in conformation to specifications of SDG 2.3.1.

Similarly, data on the average income of small-scale food producers by sex and indigenous status, as specified by SDG 2.3.2, is a major limitation. The only survey datasets available to estimate the average income are survey based PSLM and HIES, and most importantly these surveys are not conducted at regular intervals.

SDG 2.4.1 asks for data on the proportion of agricultural area under productive and sustainable agriculture and requires increasing such area under cultivation, though; though the data is available in published form, this data is not sufficient to make it part of the costing model, and there is an on-going debate especially in countries like Pakistan to increase the productivity of crops instead of area under cultivation⁷.

⁶ The figure of four percent annual pregnancies is provided by Dr. Sahib Jan Badar during key informant interview session

⁷ According to Mr. Umer Karim, a key informant on agriculture and water resources for the UNFAO, simply increasing the area of land under cultivation would be costly and require significant public investment. Instead, there is a critical need to invest in improving productivity, as the current inputs are not generating optimal output.

The data on plant and animal conservation SDG 2.5.1, local animal breed at risk SDG 2.5.2, and SDG 2.a.1, 2.a.2, and 2.c1 are major limitations for this study; therefore, every such indicator is excluded for the purpose of costing model of malnutrition under SDG-2.

Table 13 SDG-2 Indicators for which Data is not Available

SDG	Indicator details
2.3.1	Volume of production per labour unit by classes of farming/ pastoral/ forestry enterprise
2.3.2	Average income of small-scale food producers, by sex and indigenous status
2.4.1	Proportion of agricultural area under productive and sustainable agriculture
2.5.1	Number of plant and animal genetic resources for food and agriculture secured in either medium or long-term conservation
2.5.2	Proportion of local breeds classified as being at risk, not-at-risk or at unknown level of risk of extinction
2.a.1	The agriculture orientation index for government expenditures
2.a.2	Total official flows (official development assistance plus other official flows) to the agriculture sector
2.c.1	Indicator of food price anomalies

Source: UNDP

9. Public Investment Requirements Sustainable Development Goal-2

Based on the detailed scientific methodology in [Section 8](#), the costing model's target population is projected based on district-wise urban and rural growth rates. The population of children under five and WRAs is projected based on the growth rate of respective cohorts. However, the number of pregnant women is 4 percent of WRAs. The Accelerated Action Plan-Health approximates the 4 percent estimate. The detailed working population projections and cost estimations are provided in detailed Annexures to this report. After identifying target beneficiaries, public intervention planning, and its cost is the most important step. [Table 14](#) summarizes the nature of beneficiaries of potential nutrition programs and interventions based on the discussion in [Section 8](#).

Table 14 Summary of nature of Beneficiaries and Interventions

Target beneficiaries	Intervention	Investment per beneficiary	Annual increment
Food insecure households	Food supplementation	Rs 3000 per household	5 percent
Stunting MAM	MNP	Rs 500 per child	10 percent
Stunting SAM	RTUF	Rs 9000 per child	10 percent
Wasting MAM	MNP	Rs 500 per child	10 percent
Wasting SAM	RTUF	Rs 9000 per child	10 percent
Iron supplementation	IFT	Rs 100 per pregnant women	Not applicable
Conditional Cash Transfer	Cash transfer	Rs 1000 per pregnant women	Not applicable

Source: Based on author's interviews with officials of experts at Aga Khan University, Accelerated Action Plan-Health, GoS, and UNICEF

After identification and targeting with geographical coverage, the gross costs under each head are calculated and summarized in [Table 15](#), which provides target-wise details of cost estimates

up to 2030. The district and SDG-wise detailed costing is provided from [Annexure 1](#) to [Annexure 11](#) of this report.

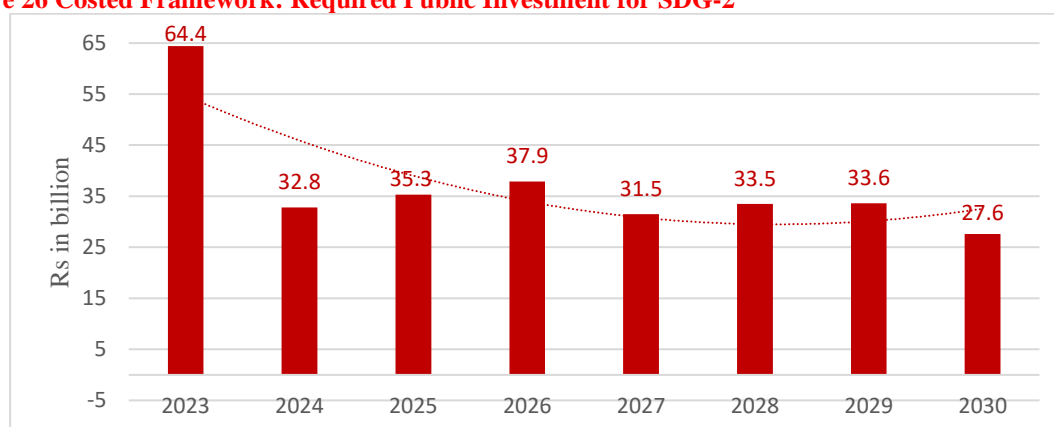
Table 15 SDG-2 Indicator Wise Summary of Public Investment Schedule

SDG Indicator	2023	2024	2025	2026	2027	2028	2029	2030	Total
2.1.1 & 2.1.2	33.9	12.4	13.1	13.7	14.4	15.1	15.9	11.1	129.7
2.2.1 – MAM	0.7	0.4	0.5	0.5	0.3	0.3	0.3	0.3	3.4
2.2.1 – SAM	19.9	11.2	12.6	14.2	8.0	9.0	8.2	6.9	90.0
2.2.1 – Total	20.6	11.6	13.1	14.7	8.3	9.3	8.5	7.2	93.4
2.2.2 -MAM	0.5	0.3	0.3	0.3	0.2	0.2	0.2	0.2	2.1
2.2.2 – SAM	2.5	1.4	1.6	1.8	1.0	1.1	1.0	0.9	11.3
2.2.2 – Total	3.0	1.7	1.9	2.1	1.2	1.3	1.2	1.1	13.4
2.2.3	6.9	7.1	7.2	7.4	7.6	7.8	8.0	8.2	60.3
Grand Total	64.4	32.8	35.3	37.9	31.5	33.5	33.6	27.6	296.8

Source: Author's computation and estimations from data of Sindh Multiple Indicator Cluster Survey 2018-19, Population Census 2017, and data of prices of products used as interventions against SAM in children under five collected from AAP-Health and UNICEF

Figure 26 shows the gross public investment required to deal with the grave food insecurity and malnutrition situation in Sindh. Dealing with food insecurity and malnutrition is like firefighting, where the quantum of initial effort and water are disproportionally higher than firefighting at the last moments. However, the approach of GoS is the opposite of conventional wisdom and international best practices because of lack of an appropriate level of the initial investment. The costing model shows that a total sum of Rs 296.8 billion up to 2030 is required to invest in multiple interventions to deal with food insecurity and malnutrition problems.

Figure 26 Costed Framework: Required Public Investment for SDG-2



Source: Author's computation and estimations from data of Sindh Multiple Indicator Cluster Survey 2018-19, Population Census 2017, and data of prices of products used as interventions against SAM in children under five collected from AAP-Health and UNICEF

10. Conclusion and Policy Recommendations

This report provides a scientific estimate of required public investments from 2023 to 2030 to meet the Sustainable Development Goal “SDG-2 Zero Hunger” targets. Based on available data on five different targets, their indicators, and sub-indicators, the inter-temporal menu of public investments is geographically mapped at the district level with a number of target beneficiaries.

The population of Sindh is 47.85 million as of 2017, and it is essential to note that Sindh is the only province with 52 percent of the population living in urban centers. The inter-census growth rate between 1998 and 2017 reveals that the average urban and rural growth rates are 2.75 percent and 2.07 percent, respectively. The overall average inter-census growth rate is 2.41 percent, almost equal to the national average of 2.40 percent. Although the population growth rate in Sindh has decreased over time from the highest of 4.90 percent in 1972 to 2.41 percent in 2017, the growth rates are one of the biggest challenges. Besides high growth rates, the vast population pyramid base contributes to a rapid increase in population, mainly because the median age in Sindh is 18.5 years, compared to the national median age of 21 years. Similarly, population density in Sindh ranges between extremes of 43,064 persons per square kilometer in Karachi-Central and 84 persons per square kilometer in Tharparkar, which is obviously a concern in both cases.

The percentage of both moderately and severely stunted children in Sindh has increased from 48.0 percent in 2014 to 50.2 percent in 2019. There has been a sharp increase in severe acute malnutrition from 17.5 percent (2011) to 23.2 percent (2018). In response to the grave malnutrition situation, the Government of Sindh (GoS) set out a comprehensive plan to significantly improve mothers' and children's health.

On average, the prevalence of stunting in Sindh is 50.2 percent, which means one out of two children is stunted. This seems unrealistic and may be due to MICS's purpose sampling or representation bias. An Accelerated Action Plan (AAP) for the Reduction of Stunting and Malnutrition has been launched to tackle the problem of malnutrition. This is a multi-sectoral programme involving eight sectors: Health, Education, Livestock, Fisheries, Agriculture, Local Government (Water, Sanitation, and Hygiene [WASH]), Population Welfare, and Social Welfare (Social Protection Strategy Unit (SPSU) at Chief Minister Sindh Secretariat. Under initiatives by AAP Health, five lac children under five, which is 7.8 percent of the cohort, have been screened and treated successfully and are back to everyday life.

Based on the MICS 2019 report, Karachi has the highest percentage of wasting for moderate acute malnutrition (MAM) and ranks sixth for severe acute malnutrition (SAM). Unfortunately, there is currently no nutrition program available in Karachi. This means that one-third of the population is not being accounted for, which perpetuates the vicious cycle of malnutrition indefinitely.

In the absence of historical trends, time series data of nutrition programs, number of beneficiaries, average recovery time per beneficiary, investment per beneficiary, socio-economic factors, data on development and recurrent costs of individual nutrition programs and the respective outcomes, any costing methodology for zero hunger and malnutrition will

be the best estimate based on conventional wisdom and experience learned. Still, the preliminary scientific costed framework is better than no investigation whatsoever. First, the projected population of WRAs and children under five till 2030 is required. The population is projected based on inter-census growth rates between 1998-2017. The detailed reports of Census 2017 provide age-wise breakdowns of the population for each district. From these detailed tables, a total number of children under five and women from 15 to 49 years have been tabulated and projected for the population of every cohort till 2030; this gives us the gross population. ***Overview of Food Security and Nutrition Report The Ministry of National Food Security and Research and MICS 2019*** are the data sources used extensively to calculate the number of beneficiaries, geographical impact, coverage, etc.

This costing model is for five SDG targets of SDG-2, whereas the data on the rest are either unavailable or insufficient. The gross public investment required to deal with the grave situation of food insecurity and malnutrition in Sindh is Rs 296.8 billion from 2023-2030. Dealing with food insecurity and malnutrition is like firefighting, where the quantum of initial effort and water are disproportionately higher than firefighting at the last moments. Hence, a feasible approach in the Sindh context should focus on an appropriate level of initial investment. As discussed in the report, the gravity of the situation calls for urgent action and an effective nutrition policy GoS should immediately conduct a Dietary Assessment Survey and plan to operationalize the district-wise Health Management Information System and Dashboard of PLWs and children under five.

As the global shift is changing in favor of nutrition-sensitive investments, GoS should prioritize investing in safe drinking water and WASH and curative interventions with a simultaneous increase in scope and targeting of the affected population.

Annexure 1 Number of Food Insecure Households

District	Households	Food Insecure	2022	2023	2024	2025	2026	2027	2028	2029	2030
Badin	359,376	58.1	208,797	62,639	21,924	21,924	21,924	21,924	21,924	21,924	14,616
Dadu	286,810	37.0	106,120	31,836	11,143	11,143	11,143	11,143	11,143	11,143	7,428
Ghotki	296,830	26.7	79,254	23,776	8,322	8,322	8,322	8,322	8,322	8,322	5,548
Hyderabad	435,209	44.0	191,492	57,448	20,107	20,107	20,107	20,107	20,107	20,107	13,404
Jacobabad	177,867	33.8	60,119	18,036	6,312	6,312	6,312	6,312	6,312	6,312	4,208
Jamshoro	180,922	33.7	60,971	18,291	6,402	6,402	6,402	6,402	6,402	6,402	4,268
Kamber Shahdkot	223,154	52.3	116,710	35,013	12,255	12,255	12,255	12,255	12,255	12,255	8,170
Karachi	2,770,626	20.8	576,290	172,887	60,510	60,510	60,510	60,510	60,510	60,510	40,340
Kashmore	185,143	32.4	59,986	17,996	6,299	6,299	6,299	6,299	6,299	6,299	4,199
Khairpur	413,044	41.3	170,587	51,176	17,912	17,912	17,912	17,912	17,912	17,912	11,941
Larkana	261,331	35.7	93,295	27,989	9,796	9,796	9,796	9,796	9,796	9,796	6,531
Matari	143,023	44.1	63,073	18,922	6,623	6,623	6,623	6,623	6,623	6,623	4,415
Mirpurkhas	286,547	35.1	100,578	30,173	10,561	10,561	10,561	10,561	10,561	10,561	7,040
Naushero Feroze	275,693	36.4	100,352	30,106	10,537	10,537	10,537	10,537	10,537	10,537	7,025
Sanghar	374,609	30.3	113,507	34,052	11,918	11,918	11,918	11,918	11,918	11,918	7,945
Shaheed Benazirabad	297,133	39.2	116,476	34,943	12,230	12,230	12,230	12,230	12,230	12,230	8,153
Shikarpur	207,555	37.9	78,663	23,599	8,260	8,260	8,260	8,260	8,260	8,260	5,506
Sujawal	153,018	72.1	110,326	33,098	11,584	11,584	11,584	11,584	11,584	11,584	7,723
Sukkur	263,042	25.4	66,813	20,044	7,015	7,015	7,015	7,015	7,015	7,015	4,677
Tando Allahyar	165,503	63.3	104,763	31,429	11,000	11,000	11,000	11,000	11,000	11,000	7,333
Tando Muhammad Khan	131,565	71.8	94,464	28,339	9,919	9,919	9,919	9,919	9,919	9,919	6,612
Tharparkar	301,625	65.6	197,866	59,360	20,776	20,776	20,776	20,776	20,776	20,776	13,851
Thatta	184,868	70.2	129,777	38,933	13,627	13,627	13,627	13,627	13,627	13,627	9,084
Umerkot	212,356	63.5	134,846	40,454	14,159	14,159	14,159	14,159	14,159	14,159	9,439
Total	8,586,849	36.0	3,135,125	940,538	329,188	329,188	329,188	329,188	329,188	329,188	219,459
Balance			-	2,194,587.8	1,865,399.6	1,536,211.5	1,207,023.3	877,835.1	548,646.9	219,458.8	0.0

Annexure 2 Public Investment for Food Insecure Households

District	Target 2030	Baseline 2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Badin	0.0	58.1	2.26	0.83	0.87	0.91	0.96	1.01	1.06	0.74	8.64
Dadu	0.0	37.0	1.15	0.42	0.44	0.46	0.49	0.51	0.54	0.38	4.39
Ghotki	0.0	26.7	0.86	0.31	0.33	0.35	0.36	0.38	0.40	0.28	3.28
Hyderabad	0.0	44.0	2.07	0.76	0.80	0.84	0.88	0.92	0.97	0.68	7.92
Jacobabad	0.0	33.8	0.65	0.24	0.25	0.26	0.28	0.29	0.30	0.21	2.49
Jamshoro	0.0	33.7	0.66	0.24	0.25	0.27	0.28	0.29	0.31	0.22	2.52
Kamber Shahdkot	0.0	52.3	1.26	0.46	0.49	0.51	0.54	0.56	0.59	0.41	4.83
Karachi	0.0	20.8	6.22	2.29	2.40	2.52	2.65	2.78	2.92	2.05	23.84
Kashmore	0.0	32.4	0.65	0.24	0.25	0.26	0.28	0.29	0.30	0.21	2.48
Khairpur	0.0	41.3	1.84	0.68	0.71	0.75	0.78	0.82	0.87	0.61	7.06
Larkana	0.0	35.7	1.01	0.37	0.39	0.41	0.43	0.45	0.47	0.33	3.86
Matiali	0.0	44.1	0.68	0.25	0.26	0.28	0.29	0.30	0.32	0.22	2.61
Mirpurkhas	0.0	35.1	1.09	0.40	0.42	0.44	0.46	0.49	0.51	0.36	4.16
Naushero Feroze	0.0	36.4	1.08	0.40	0.42	0.44	0.46	0.48	0.51	0.36	4.15
Sanghar	0.0	30.3	1.23	0.45	0.47	0.50	0.52	0.55	0.58	0.40	4.70
Shaheed Benazirabad	0.0	39.2	1.26	0.46	0.49	0.51	0.54	0.56	0.59	0.41	4.82
Shikarpur	0.0	37.9	0.85	0.31	0.33	0.34	0.36	0.38	0.40	0.28	3.25
Sujawal	0.0	72.1	1.19	0.44	0.46	0.48	0.51	0.53	0.56	0.39	4.56
Sukkur	0.0	25.4	0.72	0.27	0.28	0.29	0.31	0.32	0.34	0.24	2.76
Tando Allahyar	0.0	63.3	1.13	0.42	0.44	0.46	0.48	0.51	0.53	0.37	4.33
Tando Muhammad Khan	0.0	71.8	1.02	0.37	0.39	0.41	0.43	0.46	0.48	0.34	3.91
Tharparkar	0.0	65.6	2.14	0.79	0.83	0.87	0.91	0.95	1.00	0.70	8.18
Thatta	0.0	70.2	1.40	0.52	0.54	0.57	0.60	0.63	0.66	0.46	5.37
Umerkot	0.0	63.5	1.46	0.54	0.56	0.59	0.62	0.65	0.68	0.48	5.58
Total	0.0	36.0	33.9	12.4	13.1	13.7	14.4	15.1	15.9	11.1	129.7
Rupees per HH/month			3,000	3,150	3,310	3,475	3,650	3,830	4,025	4,225	

Source: Author's calculations and estimates were derived from data collected from Sindh Multiple Indicator Cluster Survey 2018-19, Population Census 2017, and prices of interventions used against SAM in children under five obtained from AAP-Health and UNICEF

Annexure 3 Stunting in Children Under Five MAM

District	MAM %	2023	2024	2025	2026	2027	2028	2029	2030
Badin	19.0	64,222	32,959	33,831	34,728	17,825	18,299	15,029	11,573
Dadu	21.0	54,430	27,707	28,209	28,721	14,621	14,887	12,127	9,261
Ghotki	23.1	73,910	38,019	39,116	40,246	20,706	21,307	17,542	13,540
Hyderabad	25.8	77,820	39,706	40,520	41,350	21,099	21,533	17,580	13,457
Jacobabad	25.0	48,030	24,432	24,856	25,289	12,865	13,090	10,656	8,132
Jamshoro	25.6	44,215	22,947	23,833	24,770	12,880	13,403	11,166	8,726
Kamber Shahdkot	14.0	35,053	17,925	18,337	18,764	9,603	9,832	8,055	6,188
Karachi (Division)	17.4	372,201	191,033	196,101	201,309	103,330	106,080	87,124	67,086
Kashmore	22.1	51,593	26,456	27,132	27,825	14,268	14,633	12,006	9,235
Khairpur	19.6	87,378	44,763	45,869	47,007	24,090	24,693	20,252	15,574
Larkana	15.3	38,722	19,801	20,253	20,716	10,595	10,839	8,871	6,807
Matari	26.1	33,026	16,904	17,306	17,717	9,069	9,285	7,605	5,839
Mirpurkhas	20.2	52,055	26,588	27,161	27,747	14,172	14,478	11,832	9,065
Naushero Feroze	22.7	62,074	31,704	32,387	33,087	16,902	17,270	14,117	10,820
Sanghar	19.9	69,997	35,814	36,649	37,505	19,190	19,638	16,078	12,340
Shaheed Benazirabad	20.5	56,352	28,748	29,333	29,930	15,270	15,582	12,721	9,736
Shikarpur	24.8	56,815	28,914	29,430	29,956	15,245	15,517	12,635	9,646
Sujawal	17.4	24,059	12,297	12,571	12,851	6,569	6,715	5,492	4,210
Sukkur	23.3	61,321	31,431	32,222	33,032	16,931	17,357	14,235	10,945
Tando Allahyar	21.1	31,836	16,397	16,893	17,407	8,970	9,247	7,627	5,899
Tando Muhammad Khan	24.5	4,254	2,177	2,229	2,283	1,169	1,197	980	753
Tharparkar	26.4	19,993	10,316	10,646	10,987	5,670	5,853	4,834	3,743
Thatta	17.3	30,180	15,516	15,957	16,413	8,442	8,687	7,152	5,521
Umerkot	23.5	50,223	25,765	26,437	27,129	13,920	14,286	11,731	9,031
Total	20.5	1,499,759	768,321	787,278	806,768	413,404	423,709	347,446	267,125
		20.1	10.1	10.1	10.1	5.0	5.0	4.0	3.0

Source: Author's calculations and estimates were derived from data collected from Sindh Multiple Indicator Cluster Survey 2018-19, Population Census 2017, and prices of interventions used against SAM in children under five obtained from AAP-Health and UNICEF

Annexure 4 Public Investment for Stunting in Children under Five Affected by MAM

District	MAM %	2023	2024	2025	2026	2027	2028	2029	2030	Total
Badin	19.0	32.1	18.1	20.5	23.1	13.0	14.7	13.3	11.3	146.2
Dadu	21.0	27.2	15.2	17.1	19.1	10.7	12.0	10.7	9.0	121.1
Ghotki	23.1	37.0	20.9	23.7	26.8	15.2	17.2	15.5	13.2	169.4
Hyderabad	25.8	38.9	21.8	24.5	27.5	15.4	17.3	15.6	13.1	174.3
Jacobabad	25.0	24.0	13.4	15.0	16.8	9.4	10.5	9.4	7.9	106.6
Jamshoro	25.6	22.1	12.6	14.4	16.5	9.4	10.8	9.9	8.5	104.2
Kamber Shahdkot	14.0	17.5	9.9	11.1	12.5	7.0	7.9	7.1	6.0	79.1
Karachi (Division)	17.4	186.1	105.1	118.6	134.0	75.6	85.4	77.2	65.4	847.4
Kashmore	22.1	25.8	14.6	16.4	18.5	10.4	11.8	10.6	9.0	117.1
Khairpur	19.6	43.7	24.6	27.8	31.3	17.6	19.9	17.9	15.2	198.0
Larkana	15.3	19.4	10.9	12.3	13.8	7.8	8.7	7.9	6.6	87.3
Matari	26.1	16.5	9.3	10.5	11.8	6.6	7.5	6.7	5.7	74.6
Mirpurkhas	20.2	26.0	14.6	16.4	18.5	10.4	11.7	10.5	8.8	116.9
Naushero Feroze	22.7	31.0	17.4	19.6	22.0	12.4	13.9	12.5	10.5	139.4
Sanghar	19.9	35.0	19.7	22.2	25.0	14.0	15.8	14.2	12.0	158.0
Shaheed Benazirabad	20.5	28.2	15.8	17.7	19.9	11.2	12.5	11.3	9.5	126.1
Shikarpur	24.8	28.4	15.9	17.8	19.9	11.2	12.5	11.2	9.4	126.3
Sujawal	17.4	12.0	6.8	7.6	8.6	4.8	5.4	4.9	4.1	54.1
Sukkur	23.3	30.7	17.3	19.5	22.0	12.4	14.0	12.6	10.7	139.1
Tando Allahyar	21.1	15.9	9.0	10.2	11.6	6.6	7.4	6.8	5.7	73.3
Tando Muhammad Khan	24.5	2.1	1.2	1.3	1.5	0.9	1.0	0.9	0.7	9.6
Tharparkar	26.4	10.0	5.7	6.4	7.3	4.2	4.7	4.3	3.6	46.2
Thatta	17.3	15.1	8.5	9.7	10.9	6.2	7.0	6.3	5.4	69.1
Umerkot	23.5	25.1	14.2	16.0	18.1	10.2	11.5	10.4	8.8	114.2
Total	20.5	749.9	422.6	476.3	536.9	302.6	341.2	307.8	260.3	3,397.5
		500	550	605	666	732	805	886	974	

Source: Author's calculations and estimates were derived from data collected from Sindh Multiple Indicator Cluster Survey 2018-19, Population Census 2017, and prices of interventions used against SAM in children under five obtained from AAP-Health and UNICEF

Annexure 5 Stunting in Children under Five Affected by SAM

District	SAM %	2023	2024	2025	2026	2027	2028	2029	2030
Badin	41.0	138,583	71,122	73,004	74,939	38,464	39,487	32,431	24,973
Dadu	50.5	130,891	66,629	67,836	69,066	35,160	35,800	29,162	22,271
Ghotki	27.0	86,389	44,438	45,719	47,041	24,202	24,905	20,503	15,826
Hyderabad	32.6	98,331	50,171	51,199	52,249	26,661	27,208	22,214	17,003
Jacobabad	37.1	71,277	36,257	36,887	37,529	19,092	19,426	15,813	12,068
Jamshoro	46.7	80,659	41,860	43,476	45,185	23,496	24,451	20,369	15,918
Kamber Shahdkot	31.0	77,617	39,691	40,604	41,549	21,264	21,770	17,835	13,703
Karachi (Division)	16.8	359,367	184,446	189,339	194,367	99,767	102,422	84,120	64,772
Kashmore	32.5	75,871	38,905	39,900	40,920	20,983	21,519	17,656	13,581
Khairpur	29.6	131,959	67,601	69,271	70,990	36,380	37,292	30,585	23,519
Larkana	29.9	75,673	38,697	39,579	40,484	20,706	21,182	17,336	13,302
Matiali	27.5	34,797	17,811	18,234	18,667	9,555	9,783	8,013	6,153
Mirpurkhas	36.6	94,317	48,175	49,213	50,274	25,679	26,232	21,438	16,425
Naushero Feroze	35.0	95,709	48,883	49,936	51,015	26,061	26,627	21,767	16,682
Sanghar	29.6	104,115	53,271	54,514	55,786	28,544	29,211	23,915	18,355
Shaheed Benazirabad	33.8	92,912	47,399	48,363	49,348	25,178	25,692	20,974	16,053
Shikarpur	28.9	66,207	33,694	34,296	34,908	17,765	18,083	14,724	11,240
Sujawal	55.3	76,463	39,083	39,953	40,842	20,876	21,341	17,453	13,381
Sukkur	26.5	69,743	35,748	36,647	37,569	19,257	19,741	16,190	12,448
Tando Allahyar	46.2	69,708	35,902	36,989	38,115	19,641	20,246	16,699	12,915
Tando Muhammad Khan	35.9	6,233	3,191	3,267	3,345	1,712	1,753	1,436	1,103
Tharparkar	24.2	18,327	9,456	9,759	10,072	5,198	5,366	4,431	3,431
Thatta	45.1	78,678	40,449	41,598	42,787	22,009	22,645	18,644	14,393
Umerkot	35.3	75,441	38,702	39,712	40,751	20,910	21,460	17,621	13,565
Total	29.7	2,209,267	1,131,582	1,159,294	1,187,798	608,559	623,642	511,330	393,081
		29.6	14.8	14.8	14.8	7.4	7.4	5.9	4.4

Source: Author's calculations and estimates were derived from data collected from Sindh Multiple Indicator Cluster Survey 2018-19, Population Census 2017, and prices of interventions used against SAM in children under five obtained from AAP-Health and UNICEF

Annexure 6 Public Investment for Stunting in Children under Five Affected by SAM

District	SAM %	2023	2024	2025	2026	2027	2028	2029	2030	Total
Badin	41.0	1,247.3	704.1	795.0	897.7	506.8	572.3	517.1	438.0	5,678.3
Dadu	50.5	1,178.0	659.6	738.7	827.3	463.3	518.9	465.0	390.6	5,241.5
Ghotki	27.0	777.5	439.9	497.9	563.5	318.9	361.0	326.9	277.6	3,563.2
Hyderabad	32.6	885.0	496.7	557.6	625.9	351.3	394.4	354.2	298.2	3,963.2
Jacobabad	37.1	641.5	358.9	401.7	449.6	251.6	281.6	252.1	211.7	2,848.6
Jamshoro	46.7	725.9	414.4	473.5	541.3	309.6	354.4	324.8	279.2	3,423.0
Kamber Shahdkot	31.0	698.6	392.9	442.2	497.7	280.2	315.5	284.4	240.3	3,151.8
Karachi (Division)	16.8	3,234.3	1,826.0	2,061.9	2,328.3	1,314.6	1,484.6	1,341.2	1,136.0	14,727.0
Kashmore	32.5	682.8	385.2	434.5	490.2	276.5	311.9	281.5	238.2	3,100.8
Khairpur	29.6	1,187.6	669.3	754.4	850.4	479.4	540.5	487.6	412.5	5,381.7
Larkana	29.9	681.1	383.1	431.0	485.0	272.8	307.0	276.4	233.3	3,069.7
Matiari	27.5	313.2	176.3	198.6	223.6	125.9	141.8	127.8	107.9	1,415.1
Mirpurkhas	36.6	848.8	476.9	535.9	602.2	338.4	380.2	341.8	288.1	3,812.4
Naushero Feroze	35.0	861.4	483.9	543.8	611.1	343.4	386.0	347.0	292.6	3,869.2
Sanghar	29.6	937.0	527.4	593.7	668.3	376.1	423.4	381.3	321.9	4,229.1
Shaheed Benazirabad	33.8	836.2	469.3	526.7	591.1	331.8	372.4	334.4	281.5	3,743.4
Shikarpur	28.9	595.9	333.6	373.5	418.2	234.1	262.1	234.8	197.1	2,649.2
Sujawal	55.3	688.2	386.9	435.1	489.3	275.1	309.3	278.3	234.7	3,096.8
Sukkur	26.5	627.7	353.9	399.1	450.0	253.7	286.1	258.1	218.3	2,847.0
Tando Allahyar	46.2	627.4	355.4	402.8	456.6	258.8	293.5	266.3	226.5	2,887.2
Tando Muhammad Khan	35.9	56.1	31.6	35.6	40.1	22.6	25.4	22.9	19.4	253.6
Tharparkar	24.2	164.9	93.6	106.3	120.6	68.5	77.8	70.7	60.2	762.6
Thatta	45.1	708.1	400.4	453.0	512.5	290.0	328.2	297.3	252.4	3,242.0
Umerkot	35.3	679.0	383.2	432.5	488.2	275.5	311.1	280.9	237.9	3,088.2
Total	29.7	19,883.4	11,202.7	12,624.7	14,228.6	8,018.9	9,039.4	8,152.7	6,894.0	90,044.5
Allowance per HH/month		9,000	9,900	10,890	11,979	13,177	14,495	15,944	17,538	

Source: Author's calculations and estimates were derived from data collected from Sindh Multiple Indicator Cluster Survey 2018-19, Population Census 2017, and prices of interventions used against SAM in children under five obtained from AAP-Health and UNICEF

Annexure 7 Wasting in Children under Five Affected by MAM

District	MAM %	2023	2024	2025	2026	2027	2028	2029	2030
Badin	16.0	54,081	27,755	28,489	29,244	15,010	15,410	12,656	9,745
Dadu	9.7	25,141	12,798	13,030	13,266	6,754	6,876	5,601	4,278
Ghotki	7.2	23,037	11,850	12,192	12,544	6,454	6,641	5,468	4,220
Hyderabad	8.6	25,940	13,235	13,507	13,783	7,033	7,178	5,860	4,486
Jacobabad	7.6	14,601	7,427	7,556	7,688	3,911	3,979	3,239	2,472
Jamshoro	10.5	18,135	9,412	9,775	10,159	5,283	5,497	4,580	3,579
Kamber Shahdadkot	10.4	26,039	13,316	13,622	13,939	7,134	7,303	5,984	4,597
Karachi (Division)	18.2	389,314	199,816	205,117	210,565	108,081	110,957	91,130	70,170
Kashmore	3.6	8,404	4,309	4,420	4,533	2,324	2,384	1,956	1,504
Khairpur	6.2	27,640	14,160	14,509	14,870	7,620	7,811	6,406	4,926
Larkana	10.7	27,080	13,848	14,164	14,488	7,410	7,580	6,204	4,760
Matiali	5.3	6,706	3,433	3,514	3,598	1,842	1,885	1,544	1,186
Mirpurkhas	12.8	32,985	16,848	17,211	17,582	8,980	9,174	7,497	5,744
Naushero Feroze	6.1	16,681	8,520	8,703	8,891	4,542	4,641	3,794	2,907
Sanghar	15.1	53,113	27,176	27,809	28,458	14,561	14,901	12,200	9,364
Shaheed Benazirabad	9.4	25,840	13,182	13,450	13,724	7,002	7,145	5,833	4,465
Shikarpur	6.2	14,204	7,229	7,358	7,489	3,811	3,879	3,159	2,411
Sujawal	10.2	14,103	7,209	7,369	7,533	3,851	3,936	3,219	2,468
Sukkur	8.6	22,634	11,601	11,893	12,192	6,249	6,407	5,254	4,040
Tando Allahyar	12.8	19,313	9,947	10,248	10,560	5,442	5,609	4,627	3,578
Tando Muhammad Khan	14.7	2,552	1,306	1,338	1,370	701	718	588	452
Tharparkar	16.2	12,269	6,330	6,533	6,742	3,480	3,592	2,966	2,297
Thatta	10.3	17,969	9,238	9,500	9,772	5,026	5,172	4,258	3,287
Umerkot	17.5	37,400	19,187	19,687	20,202	10,366	10,639	8,736	6,725
Total	9.7	915,182	469,131	480,995	493,192	252,867	259,316	212,759	163,662
		12.3	6.1	6.1	6.2	3.1	3.1	2.5	1.8

Source: Author's computation and estimations from data of Sindh Multiple Indicator Cluster Survey 2018-19, Population Census 2017

Annexure 8 Public Investment for Wasting in Children under Five Affected by MAM

District	MAM %	2023	2024	2025	2026	2027	2028	2029	2030	Total
Badin	16.0	27.0	15.3	17.2	19.5	11.0	12.4	11.2	9.5	123.1
Dadu	9.7	12.6	7.0	7.9	8.8	4.9	5.5	5.0	4.2	55.9
Ghotki	7.2	11.5	6.5	7.4	8.3	4.7	5.3	4.8	4.1	52.8
Hyderabad	8.6	13.0	7.3	8.2	9.2	5.1	5.8	5.2	4.4	58.1
Jacobabad	7.6	7.3	4.1	4.6	5.1	2.9	3.2	2.9	2.4	32.4
Jamshoro	10.5	9.1	5.2	5.9	6.8	3.9	4.4	4.1	3.5	42.8
Kamber Shahdadt	10.4	13.0	7.3	8.2	9.3	5.2	5.9	5.3	4.5	58.7
Karachi (Division)	18.2	194.7	109.9	124.1	140.1	79.1	89.3	80.7	68.4	886.3
Kashmore	3.6	4.2	2.4	2.7	3.0	1.7	1.9	1.7	1.5	19.1
Khairpur	6.2	13.8	7.8	8.8	9.9	5.6	6.3	5.7	4.8	62.6
Larkana	10.7	13.5	7.6	8.6	9.6	5.4	6.1	5.5	4.6	61.0
Matiali	5.3	3.4	1.9	2.1	2.4	1.3	1.5	1.4	1.2	15.2
Mirpurkhas	12.8	16.5	9.3	10.4	11.7	6.6	7.4	6.6	5.6	74.1
Naushero Feroze	6.1	8.3	4.7	5.3	5.9	3.3	3.7	3.4	2.8	37.5
Sanghar	15.1	26.6	14.9	16.8	18.9	10.7	12.0	10.8	9.1	119.9
Shaheed Benazirabad	9.4	12.9	7.3	8.1	9.1	5.1	5.8	5.2	4.4	57.8
Shikarpur	6.2	7.1	4.0	4.5	5.0	2.8	3.1	2.8	2.3	31.6
Sujawal	10.2	7.1	4.0	4.5	5.0	2.8	3.2	2.9	2.4	31.7
Sukkur	8.6	11.3	6.4	7.2	8.1	4.6	5.2	4.7	3.9	51.3
Tando Allahyar	12.8	9.7	5.5	6.2	7.0	4.0	4.5	4.1	3.5	44.4
Tando Muhammad Khan	14.7	1.3	0.7	0.8	0.9	0.5	0.6	0.5	0.4	5.8
Tharparkar	16.2	6.1	3.5	4.0	4.5	2.5	2.9	2.6	2.2	28.4
Thatta	10.3	9.0	5.1	5.7	6.5	3.7	4.2	3.8	3.2	41.1
Umerkot	17.5	18.7	10.6	11.9	13.4	7.6	8.6	7.7	6.6	85.1
Total	20.5	457.6	258.0	291.0	328.2	185.1	208.8	188.5	159.5	2,076.7
		500	550	605	666	732	805	886	974	

Source: Author's calculations and estimates were derived from data collected from Sindh Multiple Indicator Cluster Survey 2018-19, Population Census 2017, and prices of interventions used against SAM in children under five obtained from AAP-Health and UNICEF

Annexure 9 Wasting in Children under Five Affected by SAM

District	SAM %	2023	2024	2025	2026	2027	2028	2029	2030
Badin	6.6	22,309	11,449	11,752	12,063	6,192	6,356	5,221	4,020
Dadu	3.0	7,776	3,958	4,030	4,103	2,089	2,127	1,732	1,323
Ghotki	3.1	9,919	5,102	5,249	5,401	2,779	2,859	2,354	1,817
Hyderabad	4.4	13,272	6,772	6,910	7,052	3,598	3,672	2,998	2,295
Jacobabad	3.7	7,108	3,616	3,679	3,743	1,904	1,937	1,577	1,204
Jamshoro	10.0	17,272	8,964	9,310	9,676	5,031	5,236	4,362	3,408
Kamber Shahdadkot	3.8	9,514	4,865	4,977	5,093	2,607	2,669	2,186	1,680
Karachi (Division)	1.9	40,643	20,860	21,413	21,982	11,283	11,583	9,514	7,325
Kashmore	5.3	12,373	6,345	6,507	6,673	3,422	3,509	2,879	2,215
Khairpur	2.5	11,145	5,710	5,851	5,996	3,073	3,150	2,583	1,986
Larkana	1.4	3,543	1,812	1,853	1,896	970	992	812	623
Matiali	2.6	3,290	1,684	1,724	1,765	903	925	758	582
Mirpurkhas	7.1	18,296	9,345	9,547	9,753	4,981	5,089	4,159	3,186
Naushero Feroze	6.1	16,681	8,520	8,703	8,891	4,542	4,641	3,794	2,907
Sanghar	4.8	16,884	8,639	8,840	9,046	4,629	4,737	3,878	2,977
Shaheed Benazirabad	3.5	9,621	4,908	5,008	5,110	2,607	2,660	2,172	1,662
Shikarpur	3.4	7,789	3,964	4,035	4,107	2,090	2,127	1,732	1,322
Sujawal	4.9	6,775	3,463	3,540	3,619	1,850	1,891	1,546	1,186
Sukkur	2.7	7,106	3,642	3,734	3,828	1,962	2,011	1,650	1,268
Tando Allahyar	4.8	7,242	3,730	3,843	3,960	2,041	2,104	1,735	1,342
Tando Muhammad Khan	4.3	747	382	391	401	205	210	172	132
Tharparkar	8.8	6,664	3,439	3,549	3,662	1,890	1,951	1,611	1,248
Thatta	4.7	8,199	4,215	4,335	4,459	2,294	2,360	1,943	1,500
Umerkot	5.7	12,182	6,249	6,412	6,580	3,376	3,465	2,845	2,190
Total	3.6	276,349	141,632	145,192	148,858	76,317	78,262	64,213	49,399
		3.7	1.9	1.9	1.9	0.9	0.9	0.7	0.6

Source: Author's computation and estimations from data of Sindh Multiple Indicator Cluster Survey 2018-19, Population Census 2017

Annexure 10 Public Investment for Wasting in Children under Five Affected by SAM

District	SAM %	2023	2024	2025	2026	2027	2028	2029	2030	Total
Badin	6.6	200.8	113.3	128.0	144.5	81.6	92.1	83.2	70.5	914.1
Dadu	3.0	70.0	39.2	43.9	49.1	27.5	30.8	27.6	23.2	311.4
Ghotki	3.1	89.3	50.5	57.2	64.7	36.6	41.4	37.5	31.9	409.1
Hyderabad	4.4	119.4	67.0	75.3	84.5	47.4	53.2	47.8	40.2	534.9
Jacobabad	3.7	64.0	35.8	40.1	44.8	25.1	28.1	25.1	21.1	284.1
Jamshoro	10.0	155.4	88.7	101.4	115.9	66.3	75.9	69.5	59.8	733.0
Kamber Shahdkot	3.8	85.6	48.2	54.2	61.0	34.3	38.7	34.9	29.5	386.4
Karachi (Division)	1.9	365.8	206.5	233.2	263.3	148.7	167.9	151.7	128.5	1,665.5
Kashmore	5.3	111.4	62.8	70.9	79.9	45.1	50.9	45.9	38.8	505.7
Khairpur	2.5	100.3	56.5	63.7	71.8	40.5	45.7	41.2	34.8	454.5
Larkana	1.4	31.9	17.9	20.2	22.7	12.8	14.4	12.9	10.9	143.7
Matiali	2.6	29.6	16.7	18.8	21.1	11.9	13.4	12.1	10.2	133.8
Mirpurkhas	7.1	164.7	92.5	104.0	116.8	65.6	73.8	66.3	55.9	739.6
Naushero Feroze	6.1	150.1	84.3	94.8	106.5	59.8	67.3	60.5	51.0	674.4
Sanghar	4.8	152.0	85.5	96.3	108.4	61.0	68.7	61.8	52.2	685.8
Shaheed Benazirabad	3.5	86.6	48.6	54.5	61.2	34.4	38.6	34.6	29.2	387.6
Shikarpur	3.4	70.1	39.2	43.9	49.2	27.5	30.8	27.6	23.2	311.7
Sujawal	4.9	61.0	34.3	38.6	43.4	24.4	27.4	24.7	20.8	274.4
Sukkur	2.7	64.0	36.1	40.7	45.9	25.9	29.2	26.3	22.2	290.1
Tando Allahyar	4.8	65.2	36.9	41.8	47.4	26.9	30.5	27.7	23.5	300.0
Tando Muhammad Khan	4.3	6.7	3.8	4.3	4.8	2.7	3.0	2.7	2.3	30.4
Tharparkar	8.8	60.0	34.0	38.6	43.9	24.9	28.3	25.7	21.9	277.3
Thatta	4.7	73.8	41.7	47.2	53.4	30.2	34.2	31.0	26.3	337.9
Umerkot	5.7	109.6	61.9	69.8	78.8	44.5	50.2	45.4	38.4	498.7
Total	3.6	2,487.1	1,402.2	1,581.1	1,783.2	1,005.6	1,134.4	1,023.8	866.4	11,283.8
		9,000	9,900	10,890	11,979	13,177	14,495	15,944	17,538	

Source: Author's calculations and estimates were derived from data collected from Sindh Multiple Indicator Cluster Survey 2018-19, Population Census 2017, and prices of interventions used against SAM in children under five obtained from AAP-Health and UNICEF

Annexure 11 Anemia in Pregnant Women

Target population	Division	2023	2024	2025	2026	2027	2028	2029	2030
Projected Population of women of reproductive age 15-49 years	Karachi	4,746,656	4,870,696	4,998,077	5,128,895	5,263,246	5,401,230	5,542,949	5,688,510
	Hyderabad	2,868,644	2,942,266	3,018,245	3,096,677	3,177,662	3,261,307	3,347,720	3,437,018
	Larkana	1,535,619	1,569,483	1,604,236	1,639,904	1,676,518	1,714,106	1,752,697	1,792,325
	Sukkur	1,448,417	1,487,092	1,526,920	1,567,936	1,610,183	1,653,698	1,698,526	1,744,710
	Shaheed Benazirabad	1,388,985	1,420,239	1,452,252	1,485,045	1,518,636	1,553,049	1,588,303	1,624,422
	Mirpurkhas	1,057,050	1,085,809	1,115,452	1,146,012	1,177,521	1,210,015	1,243,530	1,278,104
	Total	13,045,371	13,375,585	13,715,182	14,064,469	14,423,766	14,793,404	15,173,726	15,565,089
Estimated population pregnant women	Karachi	189,866	194,828	199,923	205,156	210,530	216,049	221,718	227,540
	Hyderabad	114,746	117,691	120,730	123,867	127,106	130,452	133,909	137,481
	Larkana	61,425	62,779	64,169	65,596	67,061	68,564	70,108	71,693
	Sukkur	57,937	59,484	61,077	62,717	64,407	66,148	67,941	69,788
	Shaheed Benazirabad	55,559	56,810	58,090	59,402	60,745	62,122	63,532	64,977
	Mirpurkhas	42,282	43,432	44,618	45,840	47,101	48,401	49,741	51,124
	Total	521,815	535,023	548,607	562,579	576,951	591,736	606,949	622,604
Iron Folate Supplementation and conditional cash transfer (Rs in billion)	Karachi	2.51	2.57	2.64	2.71	2.78	2.85	2.93	3.00
	Hyderabad	1.51	1.55	1.59	1.64	1.68	1.72	1.77	1.81
	Larkana	0.81	0.83	0.85	0.87	0.89	0.91	0.93	0.95
	Sukkur	0.76	0.79	0.81	0.83	0.85	0.87	0.90	0.92
	Shaheed Benazirabad	0.73	0.75	0.77	0.78	0.80	0.82	0.84	0.86
	Mirpurkhas	0.56	0.57	0.59	0.61	0.62	0.64	0.66	0.67
	Total (Rs 60.3 up to 2030)	6.89	7.06	7.24	7.43	7.62	7.81	8.01	8.22

Source: Author's calculations and estimates were derived from data collected from Sindh Multiple Indicator Cluster Survey 2018-19, Population Census 2017, and prices of interventions used against SAM in children under five obtained from AAP-Health and UNICEF

Annexure 12 Population Projections

District	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Badin	1,852,848	1,902,095	1,952,739	2,004,823	2,058,392	2,113,491	2,170,166	2,228,467	2,288,444	2,350,149	2,413,635	2,478,957	2,546,174
Dadu	1,578,557	1,607,280	1,636,571	1,666,441	1,696,904	1,727,973	1,759,660	1,791,979	1,824,943	1,858,567	1,892,866	1,927,853	1,963,545
Ghotki	1,696,467	1,745,718	1,796,511	1,848,898	1,902,934	1,958,675	2,016,180	2,075,510	2,136,727	2,199,897	2,265,087	2,332,368	2,401,813
Hyderabad	2,245,535	2,292,128	2,339,727	2,388,356	2,438,037	2,488,794	2,540,650	2,593,629	2,647,757	2,703,059	2,759,560	2,817,288	2,876,270
Jacobabad	1,024,756	1,042,851	1,061,304	1,080,121	1,099,310	1,118,880	1,138,839	1,159,196	1,179,960	1,201,138	1,222,742	1,244,779	1,267,261
Jamshoro	1,028,403	1,064,781	1,103,159	1,143,664	1,186,427	1,231,592	1,279,309	1,329,738	1,383,051	1,439,430	1,499,068	1,562,172	1,628,960
Kamber Shahdadkot	1,367,364	1,397,680	1,429,025	1,461,442	1,494,976	1,529,676	1,565,591	1,602,773	1,641,277	1,681,158	1,722,478	1,765,297	1,809,681
Karachi	16,443,015	16,872,376	17,313,292	17,766,087	18,231,098	18,708,668	19,199,151	19,702,915	20,220,334	20,751,797	21,297,703	21,858,463	22,434,503
Kashmore	1,118,060	1,146,492	1,175,652	1,205,557	1,236,228	1,267,683	1,299,943	1,333,028	1,366,961	1,401,761	1,437,453	1,474,059	1,511,602
Khairpur	2,464,323	2,525,202	2,587,886	2,652,438	2,718,921	2,787,403	2,857,952	2,930,641	3,005,543	3,082,737	3,162,302	3,244,322	3,328,883
Larkana	1,556,528	1,592,152	1,628,685	1,666,149	1,704,572	1,743,980	1,784,401	1,825,861	1,868,391	1,912,021	1,956,780	2,002,700	2,049,815
Matiali	788,383	807,181	826,445	846,186	866,418	887,153	908,403	930,184	952,508	975,389	998,842	1,022,882	1,047,525
Mirpurkhas	1,536,638	1,569,528	1,603,123	1,637,440	1,672,493	1,708,299	1,744,874	1,782,234	1,820,396	1,859,377	1,899,196	1,939,870	1,981,417
Naushero Feroze	1,646,777	1,682,365	1,718,834	1,756,209	1,794,516	1,833,782	1,874,035	1,915,302	1,957,613	2,000,999	2,045,490	2,091,118	2,137,917
Sanghar	2,098,159	2,147,607	2,198,245	2,250,104	2,303,212	2,357,602	2,413,304	2,470,351	2,528,776	2,588,614	2,649,898	2,712,666	2,776,954
Shaheed Benazirabad	1,646,687	1,680,606	1,715,279	1,750,726	1,786,966	1,824,016	1,861,896	1,900,628	1,940,231	1,980,726	2,022,136	2,064,482	2,107,788
Shikarpur	1,255,872	1,278,380	1,301,293	1,324,617	1,348,360	1,372,529	1,397,132	1,422,177	1,447,672	1,473,625	1,500,044	1,526,937	1,554,313
Sujawal	796,344	814,011	832,072	850,535	869,410	888,706	908,432	928,597	949,213	970,288	991,833	1,013,858	1,036,375
Sukkur	1,525,573	1,563,707	1,602,796	1,642,865	1,683,938	1,726,041	1,769,199	1,813,439	1,858,788	1,905,275	1,952,927	2,001,774	2,051,845
Tando Allahyar	863,656	889,694	916,681	944,656	973,661	1,003,740	1,034,940	1,067,307	1,100,893	1,135,750	1,171,933	1,209,500	1,248,511
T M Khan	693,096	709,510	726,352	743,635	761,372	779,575	798,259	817,438	837,126	857,338	878,090	899,398	921,278
Tharparkar	1,700,112	1,755,056	1,811,944	1,870,854	1,931,868	1,995,074	2,060,560	2,128,423	2,198,762	2,271,680	2,347,288	2,425,700	2,507,036
Thatta	1,009,345	1,037,467	1,066,542	1,096,609	1,127,710	1,159,888	1,193,189	1,227,661	1,263,353	1,300,318	1,338,612	1,378,292	1,419,418
Umerkot	1,101,593	1,130,533	1,160,315	1,190,966	1,222,514	1,254,989	1,288,420	1,322,840	1,358,281	1,394,777	1,432,362	1,471,073	1,510,947
Total	49,038,091	50,254,399	51,504,469	52,789,377	54,110,238	55,468,207	56,864,486	58,300,319	59,776,999	61,295,869	62,858,323	64,465,808	66,119,829

Source: Author's computation from inter-census urban and rural growth rates using data of Population Census Organization, Pakistan Bureau of Statistics

Annexure 13 Percentage of Households with TDS and Hardness Concentration in Drinking Water

District	Percentage of household with TDS concentration in drinking water					Percentage of household with hardness concentration in drinking water			
	upto 500 ppm	> 500 ppm < 1000 ppm	> 1000 ppm < 3000 ppm	> 3000 ppm	>500	upto 300 ppm	> 300 ppm < 500 ppm	>500	>300
	a	b	c	d	e=b+c+d	A	b	c	d=b+c
Badin	38.2	41.6	20.2	0.0	61.8	53.8	35.1	11.1	46.2
Dadu	14.8	34.0	49.1	2.2	85.3	33.1	37.2	29.7	66.9
Ghotki	36.9	46.6	16.5	0.0	63.1	60.1	34.3	5.5	39.8
Hyderabad	69.0	15.7	15.3	0.0	31.0	74.0	11.7	14.3	26.0
Jacobabad	6.1	53.2	40.7	0.0	93.9	20.0	58.7	21.3	80.0
Jamshoro	51.9	22.1	18.6	7.3	48.0	67.7	18.7	13.6	32.3
Kamber Shahdkot	10.3	52.9	34.9	1.8	89.6	14.1	60.8	25.1	85.9
Karachi Central	71.9	21.5	6.7	0.0	28.2	86.4	12.6	1.0	13.6
Karachi East	87.7	6.5	5.2	0.6	12.3	91.5	7.9	0.5	8.4
Karachi Korangi	90.3	8.5	0.0	1.2	9.7	96.1	3.9	0.0	3.9
Karachi Malir	78.3	15.5	6.2	0.0	21.7	90.7	8.6	0.7	9.3
Karachi South	88.3	10.8	0.9	0.0	11.7	93.3	5.8	0.9	6.7
Karachi West	51.0	30.7	13.1	5.2	49.0	77.6	17.4	5.1	22.5
Kashmore	8.6	45.9	45.4	0.0	91.3	43.5	35.6	21.0	56.6
Khairpur	18.4	49.2	32.4	0.0	81.6	21.3	60.3	18.4	78.7
Larkana	15.4	58.0	26.7	0.0	84.7	35.1	52.6	12.3	64.9
Matari	10.1	49.4	40.5	0.0	89.9	20.6	57.3	22.1	79.4
Mirpurkhas	41.7	15.9	42.4	0.0	58.3	40.9	22.7	36.3	59.0
Naushero Feroze	11.8	49.5	36.9	1.7	88.1	35.7	53.9	10.4	64.3
Sanghar	18.5	39.4	40.5	1.6	81.5	33.9	45.6	20.5	66.1
Shaheed Benazirabad	11.4	27.1	54.9	6.6	88.6	30.0	28.8	41.2	70.0
Shikarpur	3.7	59.0	37.3	0.0	96.3	27.9	46.6	25.5	72.1
Sujawal	12.7	23.5	63.3	0.5	87.3	44.3	33.3	22.4	55.7
Sukkur	45.8	26.1	28.1	0.0	54.2	51.4	28.2	20.4	48.6
Tando Allahyar	13.2	36.5	48.3	2.0	86.8	23.9	46.6	29.6	76.2
Tando Muhammad Khan	9.8	43.2	45.0	2.0	90.2	24.4	55.9	19.8	75.7
Tharparkar	29.2	18.6	22.7	29.4	70.7	48.1	24.6	27.3	51.9
Thatta	21.3	56.1	20.5	2.0	78.6	64.2	22.6	13.2	35.8
Umerkot	38.8	16.1	40.4	4.7	61.2	41.5	22.5	36.0	58.5
Sindh	46.4	29	22.4	2.2	53.6	60.6	26.8	12.6	39.4

Source: National Nutrition Survey 2018

Annexure 14 Percentage of Households with E. coli and Coliform Concentration in Drinking Water

District	Percentage of households with E. coli contamination risk in drinking water						Percentage of households with Coliform contamination risk in drinking water					
	0 cfu/ml	1 to 10 cfu/ml	11 to 50 cfu/ml	15 to 50 cfu/ml	51 to 100 cfu/ml	>100 cfu/ml	0 cfu/ml	1 to 10 cfu/ml	11 to 50 cfu/ml	15 to 50 cfu/ml	51 to 100 cfu/ml	>100 cfu/ml
Badin	48.6	44.8	2.1	4.5	0.0	0.0	6.9	37.4	11.1	26.4	12.9	5.4
Dadu	66.9	27.2	2.6	2.1	1.3	0.0	18.0	25.8	5.8	27.1	5.0	18.3
Ghotki	94.8	3.4	0.0	0.6	1.2	0.0	41.6	30.5	2.5	9.6	6.0	9.8
Hyderabad	69.9	23.6	0.0	6.5	0.0	0.0	9.1	20.5	7.6	34.9	16.7	11.2
Jacobabad	92.4	7.6	0.0	0.0	0.0	0.0	7.3	34.3	2.4	45.2	10.7	0.0
Jamshoro	*	*	*	*	*	*	*	*	*	*	*	*
Kambar Shahdadkot	49.3	26.9	8.8	12.8	1.6	0.6	15.6	23.4	3.7	28.7	9.9	18.7
Karachi West	73.7	19.0	2.7	4.2	0.2	0.2	0.5	10.9	6.0	33.9	21.0	27.8
Karachi Malir	65.6	23.2	4.3	5.3	1.2	0.4	1.9	9.9	4.3	35.2	24.6	24.2
Karachi South	74.6	18.3	1.3	2.1	3.3	0.4	2.1	22.2	9.3	27.7	16.1	22.6
Karachi East	73.1	22.0	0.7	2.9	0.3	1.0	4.0	9.1	4.1	27.6	33.9	21.3
Karachi Central	75.2	18.8	1.7	3.6	0.7	0.0	4.2	16.3	6.8	32.5	21.8	18.4
Karachi Korangi	58.0	30.6	1.9	5.6	3.4	0.4	2.3	12.7	3.7	39.3	20.5	21.5
Kashmore	76.7	8.9	6.7	7.7	0.0	0.0	28.4	16.3	3.9	30	15.4	6.0
Khairpur	88.4	8.2	0.7	1.4	0.0	1.3	28.3	21.2	4.2	20.2	14.7	11.4
Larkana	72.1	21.5	1.1	4.0	0.6	0.7	37.5	22.8	6.1	13.4	8.0	12.2
Matiari	64.4	23.7	0.0	3.4	4.5	4.1	46	33.4	1.9	5.6	6.8	6.3
Mirpurkhas	70.4	22.8	4.1	1.8	0.9	0.0	18.6	9.8	5.9	30.9	19.5	15.2
Naushahro Feroze	94.8	4.3	0.0	0.9	0.0	0.0	47.3	23.6	0.4	15.3	9.1	4.3
Sanghar	73.8	21.6	1.4	2.6	0.0	0.6	13.2	22.6	3.4	12.9	18.7	29.1
Shaheed Benazirabad	87.9	7.3	2.4	2.3	0.0	0.0	31.7	28.1	3.7	18.3	10.7	7.5
Shikarpur	90.0	6.7	0.0	3.2	0.0	0.0	23.3	16.6	4.1	16.4	21.0	18.6
Sujawal	64.5	25.8	3.0	4.8	0.8	1.2	4.6	18.2	9.3	20.5	20.7	26.7
Sukkur	70.2	19.2	1.8	4.7	1.1	3.0	4.1	14.2	4.8	20.8	28.1	28.0
Tando Allahyar	83.5	11.2	0.0	4.3	1.0	0.0	47.5	12.5	2.3	17.1	13.6	7.0

District	Percentage of households with E. coli contamination risk in drinking water						Percentage of households with Coliform contamination risk in drinking water					
	0 cfu/ml	1 to 10 cfu/ml	11 to 50 cfu/ml	15 to 50 cfu/ml	51 to 100 cfu/ml	>100 cfu/ml	0 cfu/ml	1 to 10 cfu/ml	11 to 50 cfu/ml	15 to 50 cfu/ml	51 to 100 cfu/ml	>100 cfu/ml
Tando Muhammad Khan	89.5	10.5	0.0	0.0	0.0	0.0	32.9	40.1	2.7	6.4	6.6	11.4
Thatta	74.3	18.5	0.0	3.4	0.5	3.4	6.6	22.4	2.5	15.6	17.2	35.7
Umer Kot	74.3	23.8	1.0	0.9	0.0	0.0	4.9	6.8	1.9	8.8	9.1	68.6
Tharparkar	49.4	28.6	2.3	9.6	6.4	3.7	0.0	3.0	1.0	4.7	12.0	79.3
Sindh	72.7	19.9	1.9	3.9	1.0	0.7	13.7	18.2	4.8	24.0	17.7	21.6

Source: National Nutrition Survey 2018

Annexure 15 Percentage of Households with Arsenic, Nitrate, Fluoride & Iron Concentration in Drinking Water

District	Percentage of households with Arsenic concentration in drinking water				Percentage of households with Nitrate concentration in drinking water		Percentage of households with Fluoride concentration in drinking water			Percentage of households with Iron concentration in drinking water	
	0 ppb	> 0 and up to 10 ppb	>10 and up to 50 ppb	>50ppb	Up to 10 ppm	> 10 ppm	Up to 1 ppm	>1 to 1.5 ppm	> 1.5 ppm	Up to 0.3 ppm	> 0.3 ppm
Badin	3.3	77.5	16.0	3.2	97.2	2.8	78.3	12.1	9.6	92.0	8.0
Dadu	0.0	90.5	7.5	2.0	100.0	0.0	76.5	16.0	7.5	93.6	6.4
Ghotki	0.0	52.4	31.8	15.9	97.7	2.3	87.4	3.4	9.2	98.0	2.0
Hyderabad	7.6	81.1	8.7	2.7	98.8	1.2	95.7	4.3	0.0	94.4	5.6
Jacobabad	0.0	97.9	2.1	0.0	97.8	2.2	76.3	21.5	2.2	100.0	0.0
Jamshoro	7.3	78.1	14.6	0.0	100.0	0.0	94.9	2.6	2.5	86.1	13.9
Kambar Shahdadkot	1.9	66.1	30.1	1.9	100.0	0.0	81.1	18.9	0.0	98.2	1.8
Karachi Central	17.3	80.0	2.0	0.7	96.9	3.1	90.6	6.6	2.9	98.8	1.2
Karachi East	5.9	91.3	2.8	0.0	100.0	0.0	96.0	2.2	1.8	98.1	1.9
Karachi Korangi	7.7	92.3	0.0	0.0	99.7	0.3	96.0	4.0	0.0	98.5	1.5
Karachi Malir	1.0	98.3	0.7	0.0	95.4	4.6	95.9	0.9	3.1	97.3	2.7
Karachi South	13.9	86.1	0.0	0.0	100.0	0.0	100.0	0.0	0.0	100.0	0.0
Karachi West	20.2	79.8	0.0	0.0	93.5	6.5	92.6	3.8	3.6	98.5	1.5
Kashmore	0.0	80.7	15.1	4.2	100.0	0.0	84.7	11.0	4.3	96.6	3.4
Khairpur	0.0	81.5	13.6	4.9	94.5	5.5	76.0	16.9	7.1	98.5	1.5
Larkana	0.0	94.6	5.4	0.0	98.3	1.7	98.1	0.0	1.9	94.2	5.8
Matiali	9.9	79.6	5.8	4.7	96.8	3.2	88.3	8.8	2.9	84.0	16.0
Mirpurkhas	6.7	88.8	4.6	0.0	94.9	5.1	88.5	8.7	2.8	96.6	3.4
Naushahro Feroze	0.0	91.4	8.6	0.0	95.1	4.9	69.0	14.2	16.7	95.9	4.1
Sanghar	6.4	93.6	0.0	0.0	100.0	0.0	61.0	20.5	18.5	98.8	1.2
Shaheed Benazirabad	0.0	84.6	15.4	0.0	80.2	19.8	72.8	12.9	14.3	96.9	3.1

District	Percentage of households with Arsenic concentration in drinking water				Percentage of households with Nitrate concentration in drinking water		Percentage of households with Fluoride concentration in drinking water			Percentage of households with Iron concentration in drinking water	
	0 ppb	> 0 and up to 10 ppb	>10 and up to 50 ppb	>50ppb	Up to 10 ppm	> 10 ppm	Up to 1 ppm	>1 to 1.5 ppm	> 1.5 ppm	Up to 0.3 ppm	> 0.3 ppm
Shikarpur	0.0	89.6	10.4	0.0	100.0	0.0	81.8	14.4	3.7	92.7	7.3
Sujawal	0.9	91.5	5.7	1.9	98.7	1.3	87.5	6.1	6.4	85.4	14.6
Sukkur	0.0	73.0	17.5	9.5	97.2	2.8	79.1	15.2	5.7	97.7	2.3
Tando Allahyar	0.0	74.4	21.2	4.4	90.8	9.2	77.2	17.8	5.0	87.3	12.7
Tando Muhammad Khan	10.2	89.8	0.0	0.0	97.7	2.3	86.7	2.4	10.9	69.7	30.3
Tharparkar	0.5	88.2	11.3	0.0	57.0	43.0	57.1	14.3	28.6	95.8	4.2
Thatta	0.0	100.0	0.0	0.0	97.9	2.1	95.3	3.6	1.1	98.5	1.5
Umer Kot	6.3	93.7	0.0	0.0	88.4	11.6	79.5	16.2	4.2	94.6	5.4
Sindh	5.9	85.3	7.2	1.6	95.6	4.4	86.1	8.3	5.6	96.1	3.9

Source: National Nutrition Survey 2018

Annexure 16 Administrative Divisions and Districts in Sindh

Division	Districts
Larkana	Larkana, Jacobabad, Kashmore, Qambar Shahdadkot, Shikarpur
Sukkur	Sukkur, Ghotki, Khairpur
Hyderabad	Hyderabad, Jamshoro, Dadu, Matriari, Tando Muhammad Khan, Tando Allahyar, Badin, Sajawal, Thatta
Mirpur Khas	Mirpur Khas, Sanghar, Tharparkar, Umerkot
Shaheed Benazirabad	Naushahro Feroze, Shaheed Benazirabad
Karachi	Central, East, Korangi, Malir, South and West

Source: Population Census 2017

Annexure 17 Population Statistics 2017

Division	Area (Sq Kms)	Households	Population	WRAs	Pregnant women	Children under five
Karachi	3,527	2,770,626	16,024,894	4,067,664	162,707	1,829,310
Hyderabad	48,670	2,040,294	10,596,049	2,471,600	98,864	1,450,573
Larkana	15,213	1,055,050	6,190,926	1,349,681	53,987	1,021,405
Sukkur	27,158	972,916	5,542,270	1,238,588	49,544	883,228
Shaheed Benazirabad	18,176	947,435	5,275,426	1,216,354	48,654	791,232
Mirpur Khas	28,170	800,528	4,224,945	901,419	36,057	473,014
Total	140,914	8,586,849	47,854,510	11,245,306	449,812	6,448,762

Source: According to the 2017 Population Census by the Pakistan Bureau of Statistics in Islamabad, the divisions are listed in descending order of population

Annexure 18 List of Key Informant Interviews

S. No	Key Informant
1.	Mr. Veerji Kolhi is a Special Assistant to the Chief Minister of Sindh. He hails from the Tharparkar district of Sindh.
2.	Dr. Sajid Soofi, from the Department of Pediatrics and Child Health at Aga Khan University, is the Co-Principal Investigator of the National Nutrition Survey in 2018.
3.	Associate Professor Dr. Romaina Iqbal is affiliated with Aga Khan University, located in Karachi.
4.	Dr. Ashok Kumar, an expert in nutrition and community medicine, currently practices at Saint James School of Medicine in North America. He originally hails from Taluka Kandhari District Sanghar in Sindh.
5.	Asghar Memon is the Chief Economist at the Planning and Development Department of Sindh.
6.	Dr. Abid Shaikh is the Team Lead of the Social Protection Strategy Unit at the Chief Minister Secretariat, Government of Sindh.
7.	Dr. Sahibjaan Badar is the Program Coordinator for the Accelerated Action Plan-Health.
8.	Ms. Sayfoor Khan is the Assistant Program Manager for Technical Accelerated Action Plan - Health.
9.	Mr. Murtuza is the Assistant Program Manager for Monitoring and Evaluation of the Accelerated Action Plan for Health.
10.	Mr. Kazim Jafri, Deputy Director of Bureau of Statistics, is the Coordinator for the 2018-19 Multiple Indicator Cluster Survey (MICS). He is also an IPC Certified Food Security Expert.
11.	Mr. Umer Karim is an expert in agriculture, irrigation, and water resources at the United Nations Food and Agriculture Organization (UN FAO).
12.	Dr. Mannan Khokar is the Director of the Livestock and Animal Husbandry Department in the Government of Sindh.
13.	Dr. Mazhar Iqbal works for UNICEF Karachi.

Annexure 19 List of Participants of Consultative Workshop

S. No	Participant	Department/Designation
1.	Dr. Asim Bashir Khan	Lead of the Workshop
2.	Farhat Ul Ain	Microbiologist
3.	Syed Sajjad Gilani	UNDP
4.	Ahmed Hasan	UNDP
5.	Malik Abdul Hameed	Member PWF
6.	Dr. Akbar Ali	AAP-Livestock
7.	Bakht Birhmani	Program Manager Indus Resource Centre
8.	Dr. Naveed Bhutto	Nutrition Expert USAID
9.	Dr. Mazhar Iqbal	Nutrition Officer, UNICEF
10.	Farah Ali	District Team Leader FAO
11.	M. Anis Danish	Chief Services HANDS
12.	M. Asif Iqbal	SPDC
13.	Tahir Mehmood	Director Social Welfare
14.	Sadaf Fatima	Programme Policy Officer WFP
15.	Dr. Agha Inam	Health System Analyst USAID
16.	Sarwat Alam	Education Specialist UNICEF
17.	Muhammad Tehseen	Food Safety Officer Sindh Food Authority

Source: The consultation was held on 10th May 2022, 11:00 am to 02:00 pm, at Avari Hotel, Karachi

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