Expanded Program on Immunization
Government of Pakistan

Third-Party Verification Immunization Coverage Survey (TPVICS)

Vaccination Coverage Quality Indicators (VCQI) Analyses Survey Report

February 2022

Centre of Excellence in Women and Child Health
The Aga Khan University
and
Biostat Global Consulting

آغا خان یونیورسٹی
THE AGA KHAN UNIVERSITY

BIOSTAT
GLOBAL CONSULTING

Abbreviations

1YL	First year of life
2YL	Second year of life
AJK	Azad Jammu and Kashmir
AKU	Aga Khan University
BCG	Bacille Calmette-Guérin
BMGF	Bill and Melinda Gates Foundation
CAPI	Computer Assisted Personal Interviews
CES	Coverage Evaluation Survey
CI	Confidence Interval
CMYP	Comprehensive Multi Year Plan
DLIs	Disbursement Link Indicators
EBs	Enumeration Blocks
EPI	Expanded Programme on Immunization
ERC	Ethical Review Committee
FATA	Federally Administered Tribal Areas or Khyber Pakhtunkhwa Newly Merged Districts
FIC	Fully Immunization Coverage
GB	Gilgit-Baltistan
HBR	Home-based vaccination record (often called a *vaccination card*)
ICC	Inter-agency Coordinating Committee
GoP	Government of Pakistan
HHs	Households
IPV	Inactivated Polio Vaccine
KP	Khyber Pakhtunkhwa
KP-NMD	Khyber Pakhtunkhwa Newly Merged Districts/ Federally Administered Tribal Areas
MCV	Measles-Containing-Vaccine
MDGs	Millennium Development Goals
MoNHSRC	Ministry of National Health Services Regulation & Coordination
NBC	National Bioethics Committee
NISP	National Immunization Support Project
NOCs	No Objection Certificates
NNS	National Nutrition Survey
PBS	Pakistan Bureau of Statistics
PCV	Pneumococcal Conjugate Vaccine
PSUs	Primary Sampling Units
SDGs	Sustainable Development Goals
SOPs	Standard Operating Procedures
SSUs	Secondary Sampling Units

TAG	Technical Advisory Group
TPVICS	Third-party Verification Immunization Coverage Survey
ToR	Terms of Reference
ToT	Training of Trainers
VCQI	Vaccination Coverage Quality Indicators
VPD	Vaccine-preventable diseases
WB	World Bank
WHO	World Health Organization

Table of Contents

List of Tables

List of Figures

List of Supplemental Files

This report is currently supplemented by 14 additional files available in an online Dropbox folder[1]. Some of the files may be updated over time. The versions that are replaced will be copied into a sub-folder named "Older files".

Supplement 01 - TPVICS VCQI tables - sample demographics - 2022-02-25.xlsx

Supplement 02 - TPVICS VCQI tables - overview output - 2022-02-25.xlsx

Supplement 03 - TPVICS VCQI tables - supplementary detailed output - 2022-02-12.xlsx

Supplement 04 - TPVICS VCQI tables - VCQI data quality report.xlsx

Supplement 05 - TPVICS VCQI bar charts - vaccination coverage and timeliness charts - 2022-02-15.pptx

Supplement 06 - TPVICS VCQI maps - national maps only - 2022-02-15.pptx

Supplement 07 - TPVICS VCQI maps - regional and national maps - 2022-02-15.pptx

Supplement 08 - TPVICS VCQI bar charts - province and region level results - 2022-02-15.pptx

Supplement 09 - TPVICS VCQI bar charts - supplemental district level results - 2022-02-15.pptx

Supplement 10 - TPVICS VCQI tables - p-values from 20 tests per region and demographic variable.xlsx

Supplement 11 - TPVICS Household Questionnaire ENG ver 3.docx

Supplement 12 - TPVICS Household Questionnaire URD ver 3.docx

Supplement 13 - TPVICS 12-23 Month Children questionnaire ENG Ver 3.docx

Supplement 14 - TPVICS 12-23 Month Children questionnaire URD Ver 3.docx

Suggested Citation

Centre of Excellence in Women and Child Health, The Aga Khan University and Biostat Global Consulting, Third-Party Verification Immunization Coverage Survey (TPVICS 2020-21) Vaccination Coverage Quality Indicators (VCQI) Analyses Survey Report, February 2022. Available at http://www.biostatglobal.com/downloads/TPVICS_2020_VCQI_Report.pdf

[1] https://www.dropbox.com/sh/dv7y5sq7erkd563/AADe6vUuBUulsV92lngQZ9Iua?dl=0

Executive Summary

The 2020 Third-Party Verification Immunization Coverage Survey (TPVICS) – conducted by the Aga Khan University (AKU) with the support of the Federal Expanded Program on Immunization (EPI) – collected information about routine immunization for children aged 12-23 months across all districts in Pakistan. The primary purpose of the survey was to provide an independent verification of the validity of immunization coverage data reported by the provinces and districts in Years 3 and 5 of the National Immunization Support Program (NISP) on four Disbursement Link Indicators (DLIs). Secondary objectives were to measure additional indicators of vaccination coverage and assess factors potentially impacting coverage in Pakistan.

TPVICS employed a stratified cluster sampling approach designed to yield a sample representative at the health district level. Overall, 8,759 clusters, 109,123 households, and 110,790 children were covered in the survey, which enrolled children born between September 2018 and January 2019. Survey data were weighted to make results representative at the levels of health district, province, and nation, and were used to develop vaccination coverage estimates for children who were ages 12-23 months at the time of the survey. Background, methods, and findings addressing TPVICS objectives are detailed in the main survey report [1].

This report supplements the earlier report by summarizing an additional set of analyses that use children's birth dates and vaccination dates to assess vaccination coverage and timeliness and missed opportunities for simultaneous vaccination (MOSVs) in accordance with World Health Organization (WHO) recommendations [2], [3]. Vaccination coverage and its associated indicators were calculated using the WHO's freely available software known as Vaccination Coverage Quality Indicators (VCQI)[2] [2].

The 2020-21 Pakistan TPVICS survey is the largest vaccination coverage survey that VCQI or these authors have ever analyzed: largest in terms of respondents aged 12-23 months

[2] Note that some coverage outcomes differ slightly between this report and the earlier report – usually the differences are a fraction of a percent. For some districts and provinces, this report suggests that coverage for some doses is very slightly higher than the results from the main report. The differences are due to a subtle distinction concerning whether and how to fill holes in vaccination evidence. If a child had evidence of receiving a later dose in a series, but was missing evidence for an earlier dose, the main report does not give credit for the earlier dose, whereas the VCQI software gives the benefit of the doubt and fills that hole in the evidence, conducting calculations as if the earlier dose was indeed recorded on the child's home-based vaccination card.

(N=110,790) and largest in terms of number of administrative strata for which to summarize vaccination program performance (N=152 districts nested in 8 provinces and regions). To thoroughly document all vaccination coverage indicators for each stratum would take many hundreds of pages. Rather than document those here, this report is intended to serve as an overview of the available results and to facilitate further dialog with the stakeholders of vaccination in Pakistan. While we have highlighted some features in the outcomes that caught our attention, we expect that persons more familiar with Pakistan's immunization challenges and successes and interventions and investments will be able to see other, more insightful features as they explore this report and the online tables and maps and figures that accompany it.

In brief:

1. The dataset is representative of children aged 12-23 months at the time of the survey.
2. Vaccination evidence for half the children in the dataset come from photos of home-based vaccination records, which are also known as vaccination cards.
3. After incorporating survey weights, the children with cards represent two-thirds of Pakistan's children aged 12-23m at the time of the survey.
4. Of the more than 750,000 dates transcribed from those ~55,000 cards, 99% passed VCQI's data quality tests for expected relationships among dates.
5. Vaccination coverage indicators are summarized in tables, maps, and figures and results are stratified by geographic strata as well as demographic subgroups.
6. Vaccination coverage varies from very high in Punjab to very low in Balochistan. Individual indicators are tabulated and portrayed in figures for every district in the online files that accompany this report.
7. A notable portion of children with vaccination cards received one or more vaccination doses late. Many received them more than a month later than scheduled, and as the children got older, they received more and more doses more than two months late.
8. Most tables with outcomes summarized by demographic category in this report show evidence of poorer outcomes among children of poorly educated mothers and children of poorer families. The education and wealth variables each have five levels and in many cases the color bars show monotonic stair-step evidence of correlation between the outcomes and those simple measures of socioeconomic status. This dataset could form the basis for careful follow-up multivariable logistic regression to calculate adjusted odds

ratios of various outcomes, accounting for several family and respondent characteristics that were measured in the survey.

9. There is very little evidence of disparity in outcomes between boys and girls, with the exception being in FATA, where 11 of 20 statistical hypothesis tests yielded significant differences; in ten of those differences, outcomes were better for girls than for boys[3].

10. Half of the 160 urban versus rural statistical hypothesis test comparisons were statistically significant. Three-fourths of the significant differences documented better outcomes among urban respondents. The other one-fourth documents better outcomes among rural respondents[3].

11. The data from cards indicates that in more than 80% of documented vaccination visits, the vaccinators gave the child all the doses s/he was eligible for.

12. Missed opportunities for simultaneous vaccination (MOSVs) were observed for about half the children who showed vaccination cards. When those children received a first or second dose of Penta, OPV, PCV, or Rota after the age of 14 weeks, the vaccinators did not usually also administer IPV, although they could have.[4]

13. MOSVs were observed for MCV1 for about 5% of children who showed vaccination cards, and many of those children were also just receiving doses scheduled to be given at 6- or 10- or 14-weeks even though they were more than 9 months old when the MOSVs occurred. Where MOSVs were observed, the vaccinators did not also administer MCV1 with the other doses.

14. For both IPV and MCV1, most of the children with MOSVs received the missed dose at a later visit (i.e., the MOSV was corrected), but a portion of them did not. In the main provinces, 12.8% of children who experienced MOSVs for IPV had not yet received the dose by the time of the survey. And 40.5% of children with MOSVs for MCV1 had not yet received that dose at the time of the survey.

The online supplement files that accompany this report hold many hundreds of pages. They each have interesting features. If you only look at two of those files, we recommend:

a) Supplement 05 – Vaccination coverage and timeliness charts for every province, region, and district. Those figures hold a lot of potential insight per page.

[3] Details are listed in the accompanying file named Supplement 10.
[4] We note here that this outcome is not limited to Pakistan. We also see a predominance of IPV MOSVs in the 2021 UNICEF MICS-NICS in Nigeria, whose report will be forthcoming later this spring.

b) Supplement 06 – Maps of most outcomes for all districts. When flipping through dozens of maps of outcomes, there are details to be noticed and an overall pattern of excellent outcomes in Punjab, poor outcomes in Balochistan and FATA and a mix of good and poor outcomes elsewhere. (But note from the coverage and timeliness charts that even in Punjab where coverage is high, many doses are administered late, and note from the map of IPV MOSVs that many Punjabi children experience MOSVs for IPV.)

If any sections of this report raise questions in the reader's mind, we would be happy to have a discussion and either point you toward the appropriate part of a supplement that might shed light on your question, or to come up with a plan to query the survey microdata or results datasets in a helpful manner. If any of the supplements are confusing or overwhelming, we would be happy to schedule a videoconference to give a guided tour of what is available and to discuss what else might be possible. Finally, if it would be helpful to assemble some province-specific or region-specific subsets of tables and figures, we can give advice on where to find what is wanted or can assist with assembling those curated subsets of the VCQI output. Please do not hesitate to contact Dale Rhoda with questions. (E-mail: Dale.Rhoda@biostatglobal.com)

1.0 Introduction

The 2020 Third-Party Verification Immunization Coverage Survey (TPVICS) collected information about routine immunization for children aged 12-23 months across all districts in Pakistan. This is the largest survey of its kind in Pakistan, encompassing 110,000 households.

The primary objective of the TPVICS was to provide an independent verification of the validity of immunization coverage data reported by the provinces and districts in Years 3 and 5 of the National Immunization Support Program (NISP) on four Disbursement Link Indicators (DLIs) developed by the Federal Expanded Program on Immunization (EPI):

- percentage of children aged between 12-23 months in each province who are fully immunized[5] (DLI 1)
- percentage of districts in each province reporting at least 80% coverage of Penta3 immunization in children between 12-23 months of age (DLI 2)
- percentage of children under two years of age with home-based vaccination records (HBRS; also known as *vaccination cards*) available in each project province (DLI 8)
- percentage of children aged 12 to 23 months in each targeted city who are fully immunized (DLI 10).

Secondary objectives of the survey were to measure additional indicators of vaccination coverage and assess factors potentially impacting coverage in Pakistan. Specifically, TPVICS explored

- differences in immunization coverage across wealth quintiles
- vaccination coverage across vaccines recommended from birth to 9 months for a child to be considered "fully immunized" (i.e., BCG, four doses of OPV, three doses of DTP-HepB-Hib pentavalent vaccine, and three doses of PCV))
- source of vaccination information (e.g., vaccination card vs. caregiver recall), vaccination card availability
- vaccination coverage by urban/rural residency, sex of the child, level of maternal education, and household living standards
- reported reasons for not vaccinating a child and reasons for the lack of utilization of vaccination services nationwide
- vaccination coverage at provincial and national levels.

Background, methods, and findings addressing these primary and secondary objectives are reported in in

[5] The DLI definition of *fully vaccinated* means that the child had evidence of receiving BCG, four doses of OPV, three doses of DTP-HepB-Hib pentavalent vaccine, and three doses of PCV, and one dose of measles vaccine.

the TPVICS Survey Report [1].

In addition to standard descriptions of vaccination coverage and card availability, the 2018 WHO Vaccination Coverage Cluster Survey Reference Guide recommends calculating and reporting additional analyses that use children's birth dates and vaccination dates to assess vaccination timeliness and missed opportunities for simultaneous vaccination (MOSVs) [3], [4]. In 2021 TPVICS stakeholders at the Bill and Melinda Gates Foundation (BMGF) initiated an activity to assemble an analysis plan that includes these additional coverage indicators. This report summarizes that analysis plan and presents relevant results. In some cases, the outcomes are summarized entirely and in some cases the report points to additional supplementary tables and maps and figures that hold additional detail.

2.0 Methods

Survey Sample Design & Sample Size

The survey sample was designed to provide estimates of key indicators at the health district level. Data may also be aggregated across districts to provide representative estimates at provincial and national levels. The survey sample design and weight description from the Pakistan Bureau of Statistics (PBS) are appended here as Annex A of this document.

Administrative data from each district were assessed in the survey design phase and each district was classified into one of two categories: a) likely to have 80% or more children fully vaccinated, or b) likely to have fewer than 80% of children fully vaccinated. Districts likely to have high coverage were allocated 49 primary sampling units (PSUs or *clusters*) each. Those likely to have lower coverage were allocated 64 clusters. Recall that, given two estimated proportions based on the same sample size, the 95% confidence interval is wider for outcomes near 50% than for those near 0% or 100%. The strategy of assigning larger samples to districts with lower expected coverage was to make the precision of district-level outcomes more uniform than if all districts used a single fixed number of clusters. Table 5 in the main survey report indicates the number of primary sampling units (PSUs) or clusters sampled in each district [1].

In each cluster, a field team enumerated all the households and established whether each had a child aged 12-23 months. A central sampling team used rigorously random selection to identify 13 households that had an eligible child to be interviewed, in hopes that each PSU would yield a completed interview with at least 10 eligible respondents.

Survey Data Collection

The TPVICS questionnaire is available in both English and Urdu; it is contained in Supplements 11-14 in the online folder of files that accompany this report. The main survey report describes the process of collecting and processing the survey data [1]. In addition to asking questions to caregivers of children aged 12-23 months, the survey interviewers also took digital photographs of the children's HBRs.

The questionnaire included questions about the number and kinds of consumer goods the respondents own, ranging from a television to a bicycle or car, and housing characteristics such as source of drinking water, toilet facilities, and flooring materials. Responses to those questions were used to calculate wealth quintiles whereby households are divided into five equal categories (poorest, second, middle, fourth, and richest), each with 20% of the population [5], [6].

Data Quality Pre-Processing Using Human Review

Vaccination evidence transcribed from HBRs was checked by survey staff using an online dashboard. A data quality script identified nonsensical dates (e.g., September 31) and identified date combinations that appear to violate the expected order relationships (e.g., vaccination date before the child's date of birth or

vaccination dates out of order). Dates flagged by the script were checked at least twice by data collection supervisors and quality assurance team members. The dashboard included the capability to correct dates in cases where the photograph provided a clear picture and when the interviewer had made an initial data entry error.

Data Quality Pre-Processing by VCQI

Vaccination coverage and its associated indicators were calculated using the World Health Organization's freely available software known as Vaccination Coverage Quality Indicators (VCQI) [2]. The analyses were conducted using Stata version 17 [7] and assessed coverage for children who were aged 12-23 months at the time of the survey.

The TPVICS dataset was converted to be compatible with VCQI [8], [9]. VCQI employs its own data cleaning process that makes some edits to the data. Vaccination evidence for an individual dose can take the form of:

a) a date from an HBR,
b) a tick mark from an HBR (indicating that there was a pen or pencil mark or signature to indicate that the child received the dose, but no date, or that the date was illegible), or
c) a yes/no/do not know caregiver recollection response concerning whether the child received the dose. If the caregiver said they did not know whether a dose was received, VCQI assumes that the child did not receive it.

In several well- defined circumstances, VCQI converts evidence in the form of a date to a tick mark before estimating coverage indicators. Dates are converted to simple yes/no tick marks under these conditions:

- If the date is only partially specified
- If the date is nonsensical (e.g., Feb. 30 or Sep. 31)
- If the date falls outside the possible period for eligible respondents (in this case, dates of birth should fall between 12 and 24 months before the survey interview and dates of vaccination should fall between the child's date of birth and the date of the survey interview)
- If doses in a series have dates that are equal (e.g., Penta1 date is the same as Penta2)
- If doses in a series have dates that are out of order (e.g., Penta2 date is before Penta1)

VCQI reports the number of dates that were converted to tick marks, and why.

Vaccination Coverage Indicators

VCQI was employed to calculate a set of indicators. Each indicator is described in detail in the VCQI software documentation. Details of calculation are described in the *VCQI Working List of Vaccination Survey Analyses and Software Specifications* [10] and guidance for interpreting the outcomes and using them correctly in English language sentences is in the *VCQI Results Interpretation Quick-Reference Guide* [11]. VCQI's

convention is that outcomes where all children are in the denominator are weighted and reported with confidence intervals whereas outcomes where only a subset of the children aged 12-23 months are in the denominator are unweighted and reported without confidence intervals. The outcome descriptions in this document and the footnotes accompanying tabular output annotate which outcomes are weighted.

Outcomes that do not rely on vaccination date data:

1. Demographics – Weighted estimation of demographics of the households holding children aged 12-23 months sampled for each region and district: percentage of respondents in urban/rural areas; percentage of children who are male/female; categorize households by years of maternal education, years of paternal education, wealth quintiles, and the first language of the head of the household.
2. Card availability – Weighted estimate of the proportion of children aged 12-23 months for whom a home-based record (HBR or *vaccination card*) was available to be seen.
3. Crude coverage – Weighted estimate of the proportion of children who had any evidence of receiving the dose, either via the home-based record (HBR) or via the recollections of the child's caregiver. Crude coverage is reported by dose.
4. Drop-out – Unweighted estimate of the proportion of children who began a dose series but did not complete it.
5. Fully vaccinated – Weighted estimate of the proportion of children who received all the doses in a specific list. This indicator was calculated using four different lists of doses:
    a. Classic EPI doses: BCG, Penta1-3, OPV1-3, MCV1
    b. All Pakistan first year of life (1YL) doses: BCG, OPV0, OPV1-3, Penta1-3, PCV1-3, IPV, MCV1, Rota1-2
    c. DLI definition: BCG, OPV1-3, Penta1-3, PCV1-3, MCV1
    d. All 1YL doses except Rota: BCG, OPV0, OPV1-3, Penta1-3, PCV1-3, IPV, MCV1
6. Not vaccinated or Zero-dose – Weighted estimate of the proportion of children who did not receive any of the doses in a specific list. This indicator was calculated using six different lists:
    a. Classic EPI doses: BCG, Penta1-3, OPV1-3, MCV1
    b. All Pakistan first year of life (1YL) doses: BCG, OPV0, OPV1-3, Penta1-3, PCV1-3, IPV, MCV1, Rota1-2
    c. DLI definition: BCG, OPV1-3, Penta1-3, PCV1-3, MCV1
    d. Gavi proxy: Penta1

e. Measles proxy: MCV1

f. All 1YL doses except Rota: BCG, OPV0, OPV1-3, Penta1-3, PCV1-3, IPV, MCV1

Outcomes that make use of vaccination dates on HBRs:

7. Valid coverage – Weighted proportion of children with documented evidence of having received the dose when they were age eligible and, in the case of doses in a series, when sufficient time had elapsed since the previous dose.

8. Timeliness – Weighted proportion of children who had documented evidence of receiving the dose too early, within 28 days of the appropriate age, 1-2 months late, or more than two months late.

9. Dose interval assessment – Unweighted proportion of dose pairs in a series that were given with an interval that was too short (< 28 days), an interval of 28-56 days, or an interval that was too long (> 56 days).

Missed opportunities for simultaneous vaccination (MOSVs) – An MOSV occurs when a child receives one or more doses on a particular day, but does not receive <u>all</u> the doses that s/he was eligible for.

10. Visits with MOSVs – Unweighted proportion of vaccination visits that include one or more MOSVs; these are reported by dose and proportion of visits with an MOSV for any dose.

11. Children with MOSVs – Unweighted proportion of children who experienced one or more MOSVs; these are reported by dose and MOSVs for any dose.

    a. Corrected MOSVs – Unweighted proportion of doses that were missed at the first eligible visit but were received at a later visit. Unweighted proportion of MOSVs that were still uncorrected at the time of the survey. These are reported by dose and overall.

    b. Time to MOSV correction – Among children who missed a dose at their first eligible visit and received it later, unweighted median time to correction, in days. (Of all the outcomes listed here this is the only one not automatically summarized in tabular or graphic form by VCQI. We have developed an R Shiny app to explore this outcome interactively using a web browser and one of VCQI's output files. An opportunity to browse those results can be made available on request.)

12. Consequence of eliminating MOSVs and early doses – Weighted proportion of children who would have had documented evidence of receiving a valid dose if every child with an HBR had received every dose they were eligible for at every one of their documented vaccination visits. (This outcome is summarized in the supplementary tables.)

3.0 Results

The large volume of TPVICS output tables, maps, and figures stratified by 152 districts and by demographic variables is too large to fit practically in this document, so this report summarizes important outcomes using district level maps and province/region level tables and points the reader to additional resources in an online folder of files for additional detail [12].

Note that results for Khyber Pakhtunkhwa do not include districts in the former semi-autonomous Federally Administered Tribal Areas (FATA). In this report, FATA results are reported separately.

Map Orientation

Many of the outcomes described below are documented using sets of colored maps per outcome:

1) A national map showing outcomes at the province and regional level
2) A national map showing outcomes at the district level
3) A region map for AJK showing results at the district level (includes district names)
4) A region map for Balochistan showing results at the district level (includes district names)
5) A region map for FATA showing results at the district level (includes district names)
6) A region map for GB showing results at the district level (includes district names)
7) A district map of Islamabad showing results at the district level (includes district names)
8) A region map for KP showing results at the district level (includes district names)
9) A region map for Punjab showing results at the district level (includes district names)
10) A region map for Sindh showing results at the district level (includes district names)

Because of limited space, in this section we show only national maps. If the reader is intrigued by the color of an individual district, s/he may consult the district keys in Annex B or the detailed maps in Supplement 07 to learn the name of the district and may consult the appropriate Excel table in the supplementary files to learn the precise indicator outcome values for that district.

Supplement 06 holds maps of many VCQI outcomes showing all 152 districts at a time on a single page. Supplement 07 contains the same maps as 06 as well as a more zoomed-in version of each outcome with one page per province or region and including district names. Each outcome is also tabulated precisely, many with confidence intervals, in the Excel files that are Supplements 02 and 03 and most are summarized graphically with VCQI bar charts, one row per region or province in Supplement 08 and figures with one bar per district in Supplement 09.

Sample Demographic Characteristics

The TPVICS sample is representative of Pakistani children who were aged 12-23 months in late 2020 and early 2021. Tables 3-1 to 3-5 summarize selected demographic characteristics of the households, parents, and children in the sample. Subsequent tables in this section summarize coverage outcomes by maternal education, child sex, wealth quintile, and urban/rural status.

Additional detail on sample demographic characteristics, at the national, regional, and district levels, is provided in Supplement 01.

Table 3-1. Total children aged 12-23 months, by sex and by urban/rural, Pakistan TPVICS 2020-21

	Male (%)	Female (%)	Rural (%)	Urban (%)	N
Punjab	52.2	47.8	63.2	36.8	24,037
Sindh	52.6	47.4	47.1	52.9	23,290
Khyber Pakhtunkhwa	52.7	47.3	81.0	19.0	17,432
FATA	56.6	43.4	97.0	3.0	5,779
Balochistan	57.7	42.3	73.0	27.0	25,764
ICT Islamabad	48.9	51.1	51.9	48.1	1,458
Total*	52.7	47.3	61.9	38.1	97,760
Azad Jammu and Kashmir	52.6	47.4	82.1	17.9	7,547
Gilgit-Baltistan	52.7	47.3	81.5	18.5	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*

Table 3-2. Years of education of mothers of children aged 12-23 months, Pakistan TPVICS 2020-21

	None (%)	Primary (1-5) (%)	Middle (6-8) (%)	Secondary (9-10) (%)	Higher (11+) (%)	N
Punjab	37.9	17.8	10.0	16.1	18.2	24,037
Sindh	58.5	8.9	5.2	12.6	14.9	23,290
Khyber Pakhtunkhwa	57.6	12.0	7.3	11.8	11.3	17,432
FATA	83.1	4.9	4.8	4.0	3.1	5,779
Balochistan	83.4	3.1	3.2	4.7	5.6	25,764
ICT Islamabad	25.1	8.0	8.2	16.0	42.7	1,458
Total*	48.3	13.8	8.0	13.9	15.9	97,760
Azad Jammu and Kashmir	20.1	18.3	17.3	20.6	23.7	7,547
Gilgit-Baltistan	44.4	6.5	9.1	16.7	23.2	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*

Table 3-3. Years of education of fathers of children aged 12-23 months, Pakistan TPVICS 2020-21

	None (%)	Primary (1-5) (%)	Middle (6-8) (%)	Secondary (9-10) (%)	Higher (11+) (%)	N
Punjab	30.6	14.1	13.9	22.3	19.1	24,037
Sindh	44.7	9.9	5.9	15.9	23.7	23,290
Khyber Pakhtunkhwa	37.7	7.5	9.7	23.0	22.1	17,432
FATA	69.4	5.4	9.6	8.6	7.0	5,779
Balochistan	78.3	3.3	3.6	6.5	8.3	25,764
ICT Islamabad	17.3	5.1	9.3	23.4	44.9	1,458
Total*	37.9	11.5	10.7	19.7	20.2	97,760
Azad Jammu and Kashmir	11.4	12.1	20.0	32.4	24.2	7,547
Gilgit-Baltistan	29.0	5.4	10.6	24.2	30.9	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*

Table 3-4. Household wealth quintile, Pakistan TPVICS 2020-21

	Poorest (%)	Poor (%)	Middle (%)	Rich (%)	Richest (%)	N
Punjab	3.5	9.3	16.6	25.7	44.8	24,037
Sindh	21.2	15.6	12.6	16.8	33.9	23,290
Khyber Pakhtunkhwa	5.1	14.1	26.0	30.8	24.0	17,432
FATA	28.5	36.7	22.8	9.8	2.2	5,779
Balochistan	34.5	25.2	21.8	11.0	7.4	25,764
ICT Islamabad	1.5	3.5	5.9	18.5	70.6	1,458
Total*	10.3	12.7	16.9	22.9	37.4	97,760
Azad Jammu and Kashmir	3.4	10.8	22.6	41.7	21.4	7,547
Gilgit-Baltistan	12.5	31.8	28.3	18.3	9.1	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*

Table 3-5. First language of head of household, Pakistan TPVICS 2020-21

	Urdu (%)	Punjabi (%)	Sindhi (%)	Pashto (%)	Baluchi (%)	Siraiki (%)	Hindko (%)	Other (%)	N
Punjab	10.9	61.4	0.3	1.9	0.8	23.7	0.5	0.7	24,037
Sindh	22.8	4.5	42.4	4.9	5.8	9.5	5.2	4.8	23,290
Khyber Pakhtunkhwa	0.8	0.1	0.0	74.3	0.1	4.4	14.1	6.2	17,432
FATA	0.0	0.0	0.0	99.4	0.0	0.3	0.0	0.2	5,779
Balochistan	0.7	0.8	7.6	29.5	40.3	3.0	0.2	17.9	25,764
ICT Islamabad	23.0	46.9	0.9	18.9	0.3	2.0	5.4	2.7	1,458
Total*	12.4	35.3	11.7	14.0	3.9	16.2	3.3	3.3	97,760
Azad Jammu and Kashmir	2.9	13.7	0.0	1.2	0.1	0.1	72.9	9.1	7,547
Gilgit-Baltistan	0.6	0.2	0.0	1.0	0.0	0.0	0.2	98.0	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*

Card Availability

Home-based records were seen for about half the children in the survey, but after accounting for survey weights, that half represents 66.2% of children in the provinces, 76.4% in AJK and 52.5% in GB. Table 3-6 and Figures 3-1 and 3-2 show card availability by province and region and by demographic subgroups within the provinces and regions.

Additional data on card availability is provided in Supplements 02, 06, 07, 08, and 09.

A note on shaded table cells in this report

Each cell in Table 3-6 is shaded to visually portray the weighted proportion of children whose caregivers showed cards to the interviewers. If 100% of children had cards for a particular group, the table cell would be 100% filled with the color green. The point of shading the cells is to help the reader notice patterns of similarity or differences across categories. In this report, there are numerous examples where outcomes differ by maternal education or by wealth or by urban vs. rural. These come through as monotonic stair-step patterns in these tables. Focus for a moment on card availability by wealth quintile in Table 3-6:

- In Punjab there is a very subtle increase in availability with wealth quintile, but the numbers are so similar, varying from 76.2% to 81.8%, that the cell shading does not form an obvious pattern.
- In contrast, in columns for Sindh, KP, FATA, Balochistan, and Total, there is a visually obvious stair-step pattern where the proportion of children with cards increased notably with increasing wealth.
- Special note for this draft report: For this draft version of the report, we have not indicated which differences are statistically significant. Supplemental file 10 summarizes results of 160 tests of statistical significance. Most outcomes with obvious stair-step patterns in the tables have significant differences between the outcome of the top and bottom categories (poorest versus richest or most educate versus least educated).

Note: It would be helpful to know whether readers want to see an annotation beside statistically significant differences in the tables in the report.

A note on statistical significance of differences

In many cases, coverage outcomes differ notably by socio-economic indicators in this report. Differences by urban vs rural can be quite large and there are many outcomes for which the shaded cells show a stair-step pattern of better outcomes for children with caregivers who had more years of formal education and for children from wealthier families. VCQI assessed the statistical significance of these differences using a Rao-Scott survey-adjusted chi-square procedure [13]–[15]. The results are reported in Supplement 10.

In each case, the null hypothesis is that there is no difference between population levels of the outcome between the first and second demographic groups being compared. Within each province and region, four comparisons were calculated:

1. Mothers with no formal education (0 years) versus those with 11 or more years of formal education
2. Boys versus girls
3. Those in the poorest wealth quintile versus the richest
4. Children who live in urban clusters versus rural

These tests indicate that many of the differences in the tables are statistically significant, meaning that their p-value is smaller than 0.05. While the p-values that are significant here are noteworthy, these results should be considered an initial exploration of differences, and not a thorough exposition [16]. In this report, p-values have not been adjusted for multiple comparisons and the analyses are simple bivariate chi-squared tests. For a more nuanced assessment of factors associated with coverage outcomes, the relationships should be examined using logistic regression and simultaneously adjusted for several demographic factors after assessing possible collinearity of the factors [17]. Further, both education and wealth are five-level variables and the simple tests reported here only examine differences between the lowest and highest levels. There are other tests that would yield a p-value for a trend instead of a difference between two levels. For this initial examination, the reader may combine their visual analysis of the trend in stair-step color bar lengths with the reported p-value of the difference between the top and bottom stairs to decide whether the relationship warrants additional consideration and analysis.

We have not reported on the significance of differences in outcomes *between* provinces and regions, only *within* those provinces and regions. There are very obvious differences in most outcomes between Balochistan and Punjab, for instance. If it is of interest to the readers, we could facilitate formal tests for any outcomes between any pairs or groups of strata.

A note on visual tests of statistical significance

All the vaccination coverage outcomes summarized in tables and maps in this report are tabulated in more detail in the supplemental files that accompany this report in an online folder [12]. Outcomes that are weighted include 95% confidence intervals in those tables. It may be of interest to conduct informal significance tests for outcomes, for example, between individual districts, by comparing the confidence intervals for two districts. This note is to remind the reader how to think about those tests [18]–[20].

Generally speaking:

- If the two confidence intervals do not overlap (e.g., coverage among urban children is estimated to be 80% (95% CI: 75.0-85.0) and among rural children it is 67.3% (95% CI: 60.0%-74.5%)) then we can confidently say that the p-value for a formal hypothesis test would be smaller than 0.05. The difference may be described as *statistically significant.*
- If the intervals overlap, and the interval for one group contains the point estimate for the other group (e.g., coverage among urban children is 80% (95% CI: 75.0-85.0) and among rural children it is 72% (95% CI: 62.0%-82.0%)) then we can confidently say that the p-value for a formal hypothesis test would be larger than 0.05. The difference in this case is *not statistically significant*.
- If the two intervals overlap, but neither group's interval contains the point estimate of the other group –e.g., coverage among urban children is 80% (95% CI: 75.0-85.0) and among rural children it is 72% (95% CI: 67.0%-77.0%) – then *more details are needed* and it will be prudent to obtain the survey microdata and conduct the hypothesis test. The p-value might be larger than or smaller than 0.05. To be clear: Just because the two confidence intervals have some overlap, that is not grounds to say that the difference is not statistically significant. In many cases where the intervals overlap slightly, the result of the formal test is that the p-value is smaller than 0.05, and the difference is, indeed, statistically significant.

If a reader is interested in conducting hypothesis tests for specific outcomes and strata, the authors of this report can assist you by either conducting the tests on your behalf, or helping you obtain the data and set up the syntax to do it yourself.

Table 3-6. Card availability, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	80.8	50.0	57.3	40.4	19.0	61.7	66.2	76.4	52.5
Maternal Education (years)									
None	77.8	40.1	51.5	41.7	16.9	55.1	56.0	75.7	44.4
Primary (1-5)	84.3	57.5	64.7	34.0	18.7	65.9	76.7	76.7	60.6
Middle (6-8)	83.9	63.7	64.8	33.1	28.5	67.6	76.8	78.5	57.4
Secondary (9-10)	83.0	67.1	64.8	29.5	29.0	69.6	76.2	74.6	61.8
Higher (11 and above)	80.0	65.4	66.2	41.8	36.9	60.8	73.9	76.7	57.4
Sex									
Boys	81.1	50.0	56.8	37.1	17.1	59.4	65.8	77.1	52.2
Girls	80.5	50.1	57.8	44.8	21.5	63.9	66.6	75.5	52.9
Wealth									
Lowest	76.2	30.5	30.8	31.1	11.3	80.0	36.2	67.3	39.9
Second	77.5	36.8	46.9	40.5	16.7	40.3	52.8	77.2	50.1
Middle	79.7	47.4	56.7	42.4	23.9	63.1	65.0	75.0	56.7
Fourth	81.6	57.0	63.7	58.8	26.3	53.1	72.4	76.1	58.3
Highest	81.8	65.9	61.5	57.0	37.6	64.5	75.7	79.2	54.0
Area									
Urban	78.8	61.4	61.0		26.2	65.2	69.4	74.9	51.3
Rural	82.0	37.3	56.4		16.3	58.6	64.2	76.7	52.8
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: This measure is a population estimate that incorporates survey weights.

Figure 3-1. Card availability, by region, Pakistan TPVICS 2020-21

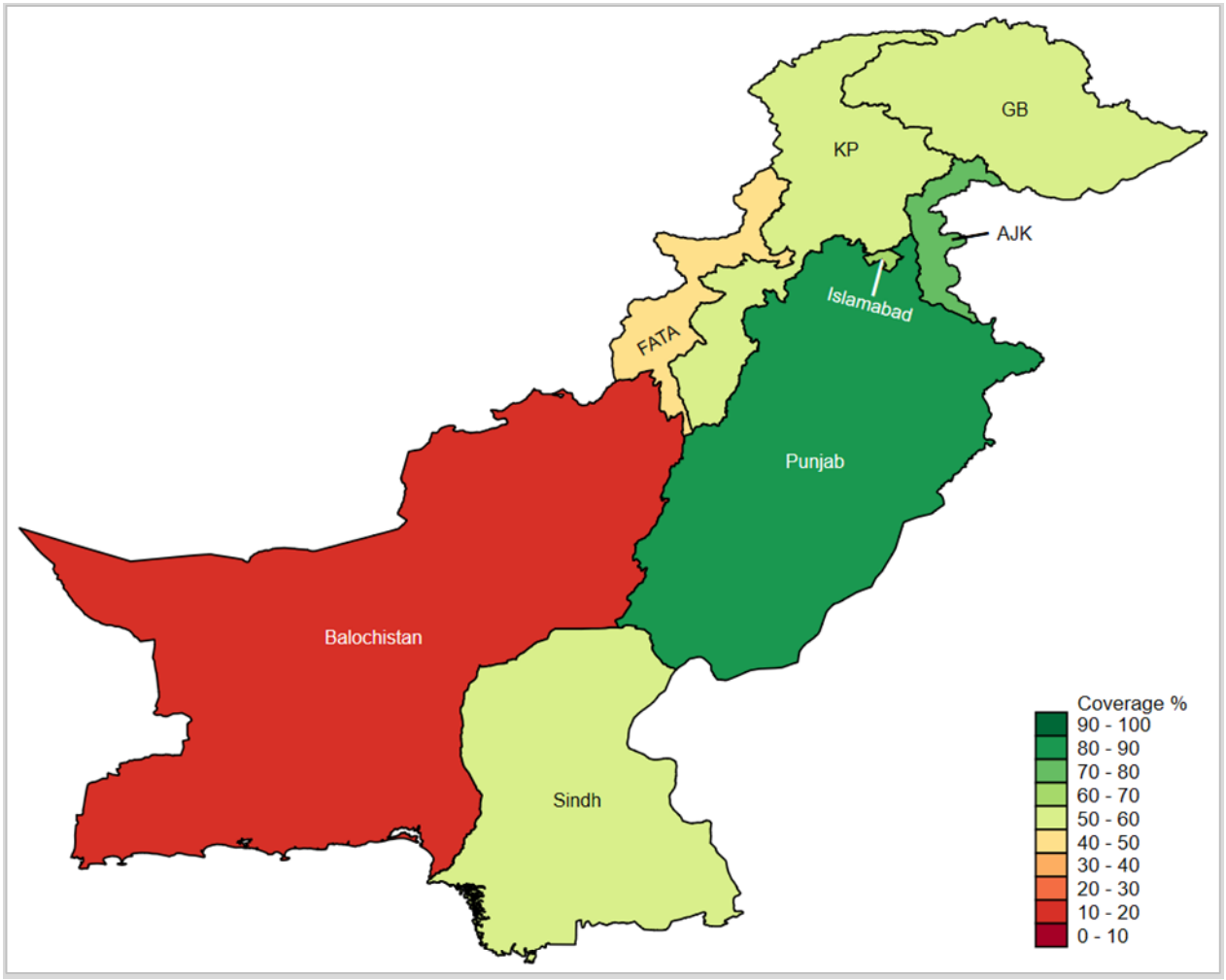
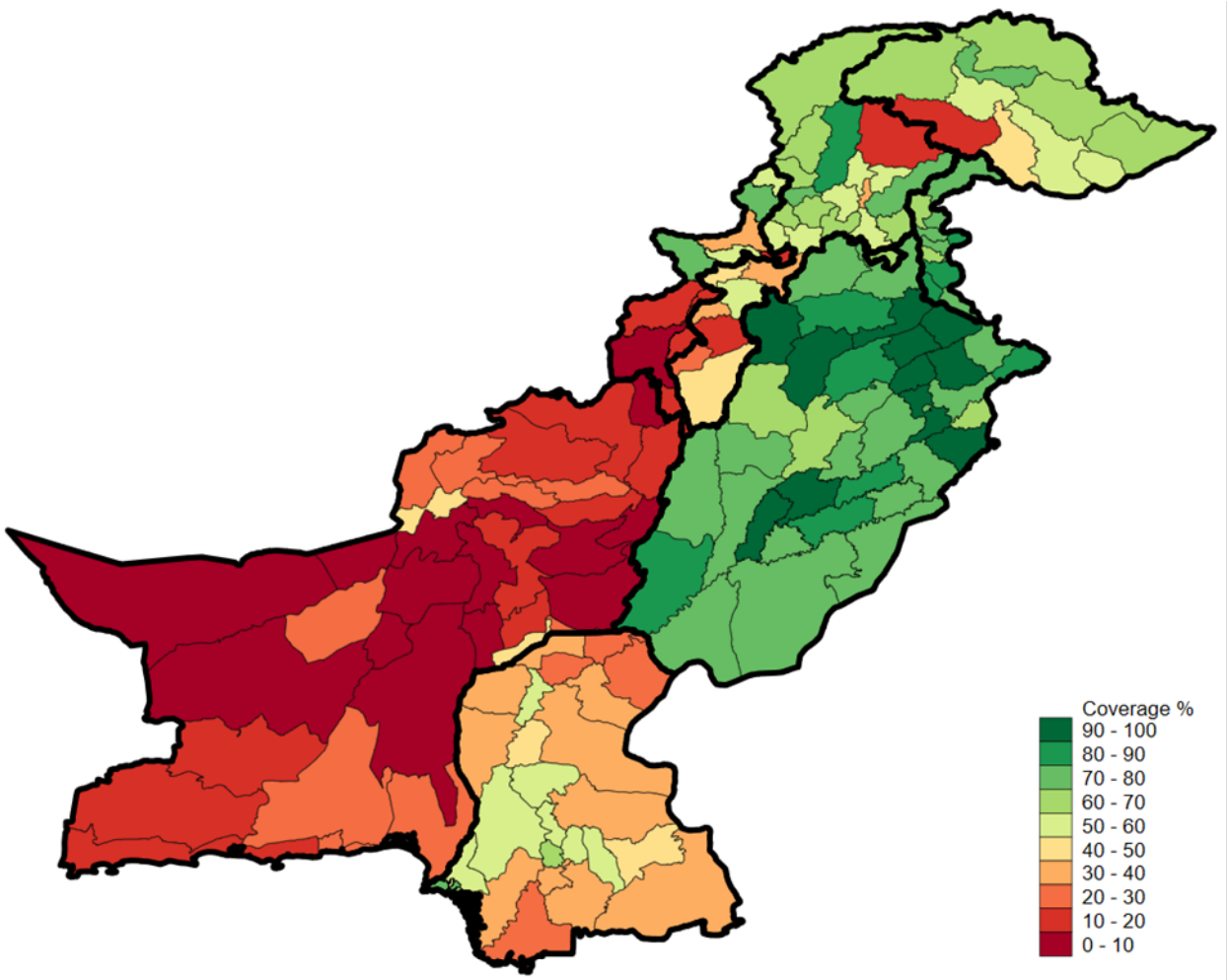


Figure 3-2. Card availability, by district, Pakistan TPVICS 2020-21



Note: The maps in Annex B show the names of every district. District level estimates are tabulated in <List excel file & tab> which is in the online folder of files to accompany this report [12].

Ever Received a Card

Some children had received a card but were not able to show it to the TPVICS interviewers. Table 3-7 and Figures 3-3 and 3-4 show the proportion of children whose caregivers reported that they had ever received a card. Comparing Tables 6 and 7, we see that the differences between the proportion who received and those who showed a card are quite substantial in some districts. The color bars in Table 7 show stair-step patterns of inequality by maternal education and wealth that are similar to the patterns in Table 3-6.

Table 3-7. Ever had a card, by region and demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	94.7	83.3	80.9	53.4	48.4	83.5	87.1	96.5	84.2
Maternal Education (years)									
None	94.4	76.7	75.2	55.0	46.7	76.9	81.0	96.7	76.9
Primary (1-5)	96.4	90.1	87.8	43.2	37.0	91.0	93.5	96.2	87.1
Middle (6-8)	95.1	93.5	89.0	44.7	45.8	77.9	92.6	96.6	87.8
Secondary (9-10)	95.1	93.7	88.9	40.9	58.5	89.2	93.3	96.4	90.0
Higher (11 and above)	92.9	92.8	88.8	54.0	73.7	84.9	91.9	96.6	91.9
Sex									
Boys	94.7	83.7	81.0	51.0	47.2	81.9	86.9	96.7	84.2
Girls	94.6	82.9	80.7	56.4	50.1	85.0	87.3	96.3	84.2
Wealth									
Lowest	93.7	70.4	51.4	39.6	37.5	91.8	67.1	91.0	72.8
Second	95.2	75.0	70.6	52.8	47.2	54.3	78.8	97.1	81.7
Middle	95.1	83.0	77.9	59.6	55.3	92.2	86.5	96.3	86.6
Fourth	94.6	88.1	86.5	74.6	56.0	75.2	90.9	96.4	90.2
Highest	94.5	93.0	89.1	81.6	71.6	86.2	93.3	97.4	89.3
Area									
Urban	93.6	89.7	87.5		54.9	86.9	90.4	96.1	85.3
Rural	95.3	76.1	79.3		46.0	80.3	85.1	96.6	84.0
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: This measure is a population estimate that incorporates survey weights.

Figure 3-3. Ever had a card, by region, Pakistan TPVICS 2020-21

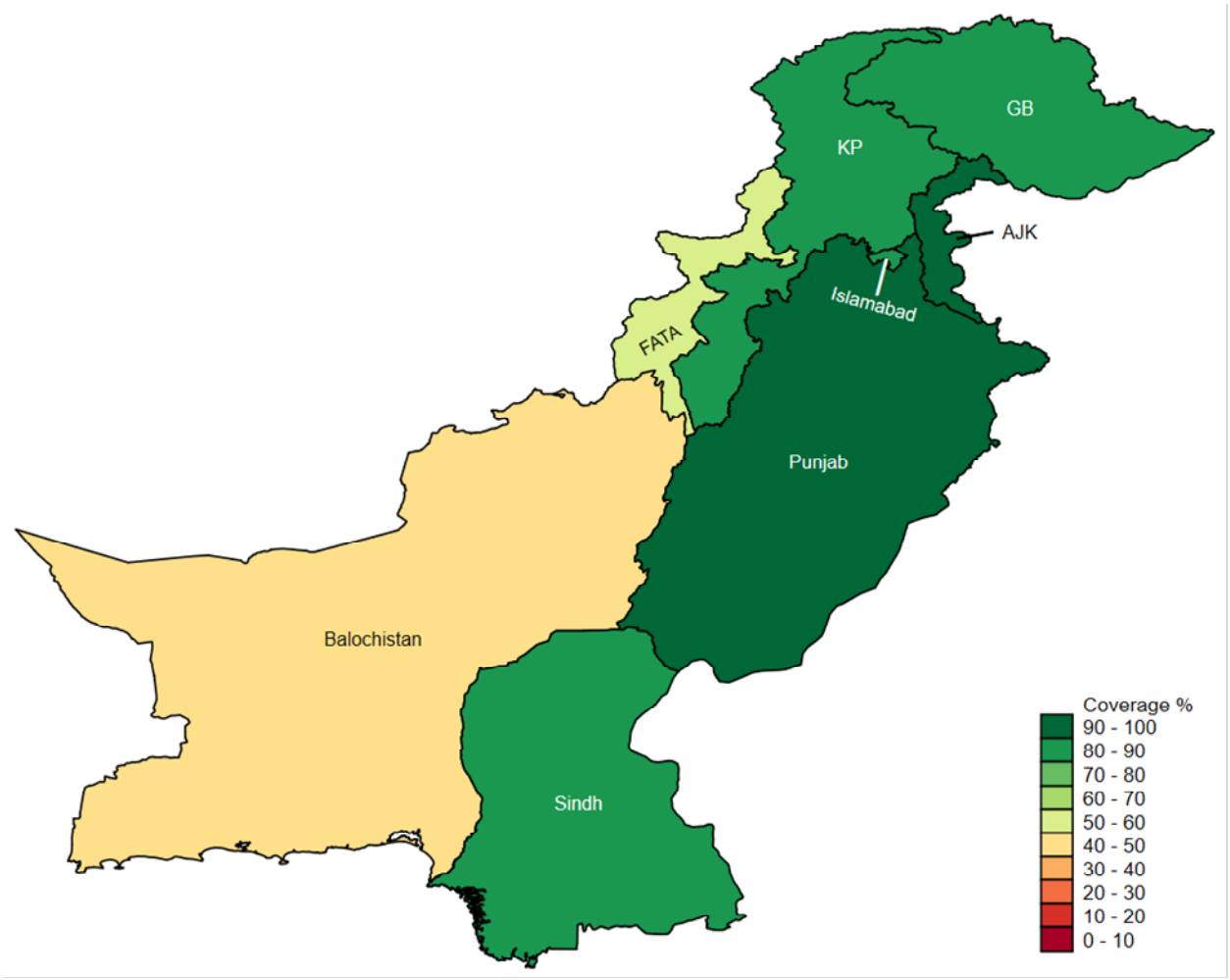
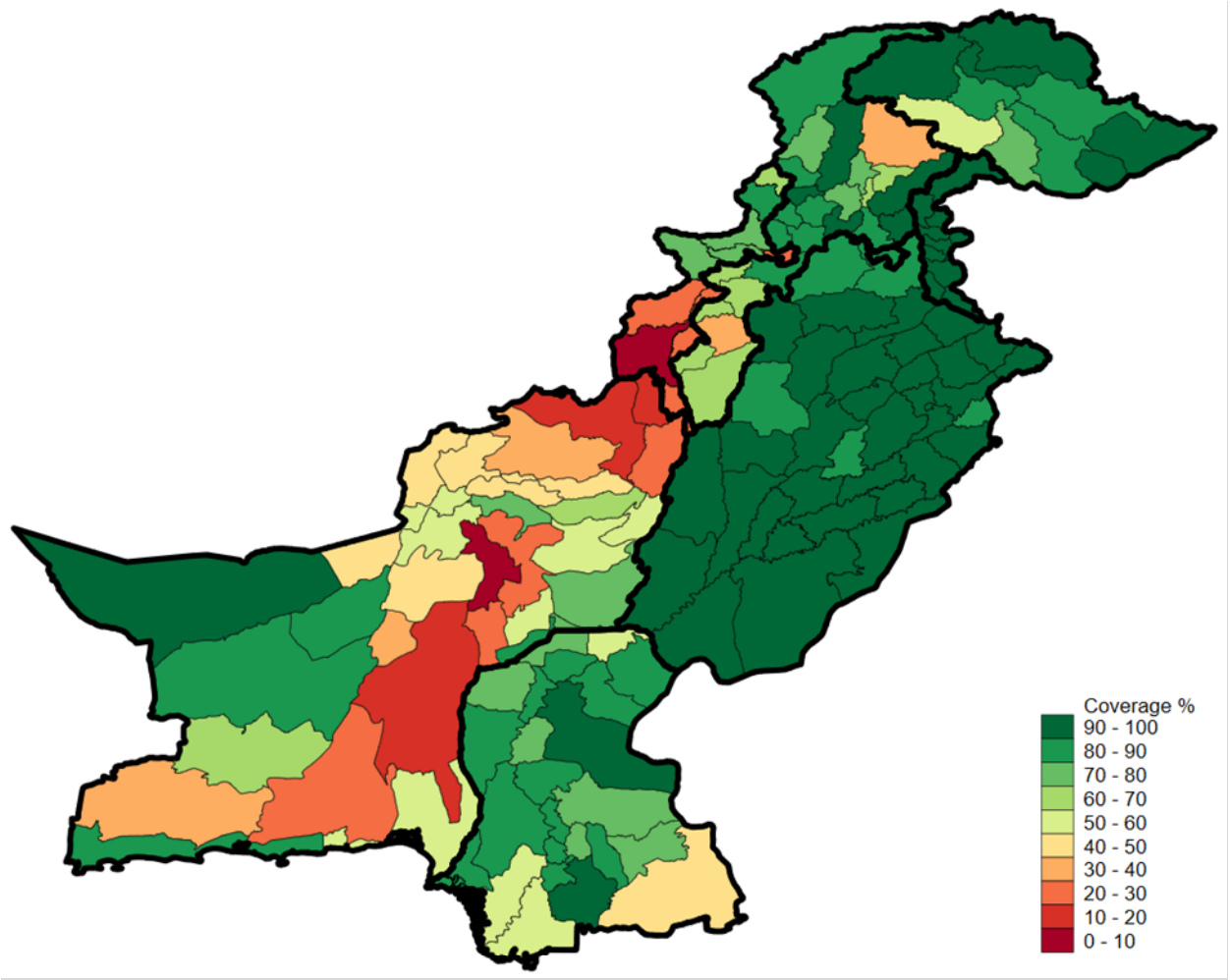


Figure 3-4. Ever had a card, by district, Pakistan TPVICS 2020-21



Vaccination Card Date Data Quality and Imputation of Missing Vaccination Evidence

It is encouraging that TPVICS interviewers viewed cards for children representing two-thirds of all children ages 12-23 months in Pakistan. This section reports on the face validity of the relationships between dates on individual cards. If the dates are appropriately ordered, we proceed with date-related analyses. If a large portion of dates were clearly of poor quality, we would pause and have doubts about the quality of data from home-based records in the TPVICS dataset.

VCQI analyzed data for 110,790 children aged 12-23 months. Of those, 55,574 (50.2%) showed a card. The cards had an average of 14.1 dose dates each. Of the 786,612 vaccination dates recorded from cards, 139 (0.02%) were nonsensical dates 3,330 (0.42%) were earlier than the child's earliest possible vaccination date, and 288 (0.04%) were after the survey interview date. With dates for doses in a series, 2,007 (0.26%) were out of order and 2,372 consecutive doses held the same dates. Overall, 99.0% of the vaccination dates were sensible, fell within the proper date range, and passed all data quality checks. Dates that failed a quality check were replaced with tick marks so the suspicious dates would not contaminate VCQI analyses of age-at-vaccination.

Furthermore, VCQI imputed missing vaccination evidence in the form of tick marks for 4,281 doses where the card showed evidence of a later dose in a series (e.g., PCV3), but was missing evidence for one or more earlier doses. Those earlier doses had tick marks imputed and the child received crude coverage credit not only for the later dose that was recorded on the card, but also for all the earlier doses in that same dose series. (By series we mean Penta1-3, OPV1-3, PCV1-3, Rota1-2, and MCV1-2.)

There is not an extensive set of data quality statistics to compare with, but 99% of dates with face validity is encouraging, so the dates are assumed here to be useful for determining the age at which children with cards were vaccinated, and useful for summarizing the performance of Pakistan's EPI program.

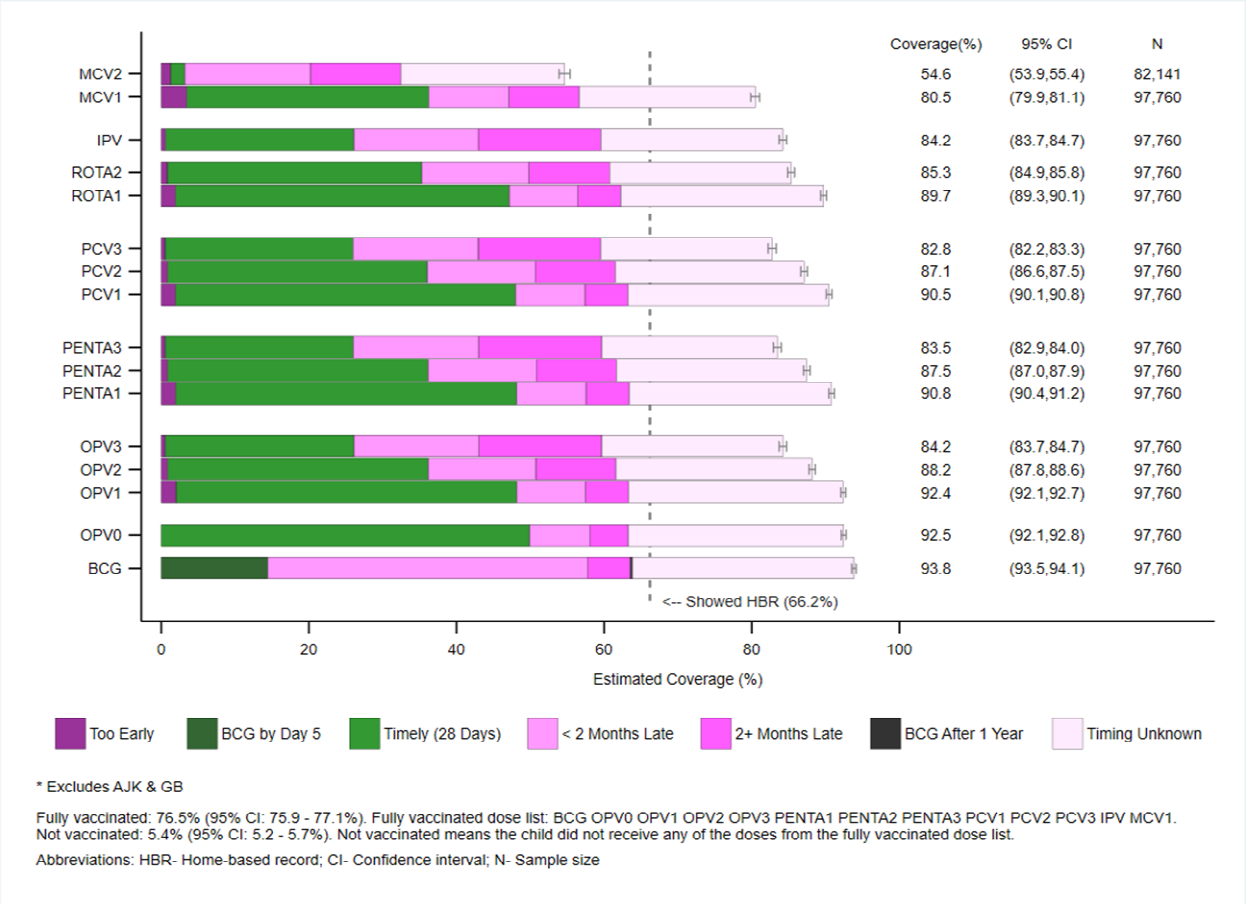
Additional information about data quality is provided in Supplement 04.

Vaccination Coverage and Timeliness

VCQI produces Vaccination Coverage and Timeliness Charts (VCTCs) that graphically portray card availability, vaccination coverage by dose, timeliness by dose, dropout by dose series, and the portion of vaccination evidence that comes from dates on cards versus evidence that comes from caregiver recall. Each VCTC shows data for a single group of respondents, usually arranged be geographic stratum. Figure 5 is a VCTC for Pakistan (excluding AJK & GB). Figures 6-13 are VCTCs for each province and region.

Additional information about vaccination coverage and timeliness at the national, province/regional, and district levels is provided in Supplement 05.

Figure 3-5. Vaccination coverage and timeliness, Pakistan (excluding AJK & GB) , Pakistan TPVICS 2020-21



* Excludes AJK & GB

Fully vaccinated: 76.5% (95% CI: 75.9 - 77.1%). Fully vaccinated dose list: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1.
Not vaccinated: 5.4% (95% CI: 5.2 - 5.7%). Not vaccinated means the child did not receive any of the doses from the fully vaccinated dose list.

Abbreviations: HBR- Home-based record; CI- Confidence interval; N- Sample size

Observations from Figure 5

First, most of the evidence of vaccination in this survey comes from dates on HBRs. Cards were seen for respondents representing two-thirds of the population of children aged 12-23 months. And of the dates on the cards, 99% passed the quality tests and were usable for assessing timeliness of vaccination. Thus, most of the evidence for most doses came from cards and may be used to document the timeliness of each dose. In other words, most of the evidence appears in the deeply saturated colors to the left of the vertical gray 'Showed HBR' line.

Crude coverage of the birth doses and the doses scheduled to be delivered at age 6 weeks (OPV1, Penta1, PCV1, Rota1) is quite high, with OPV1 being slightly higher than the other 6-week doses, probably because of OPV vaccination campaigns. There is dropout evident in every dose series. For OPV, 92.4% received the first dose but only 84.2% received OPV3. A survey-weighed estimate of OPV1 to 3 dropout is, then, (92.4-84.2)/(92.4) = 8.9%. We might say that 8.9% of children who began the OPV1-3 series had not finished it by the time of the survey.

While dropout is evaluated by looking at the tips of the bars and seeing that they are shorter for later doses, it is also interesting to look at the portion of doses that are timely (given within 28 days of the age when they are due) for earlier and later doses. In each dose series we note that the green portion of the

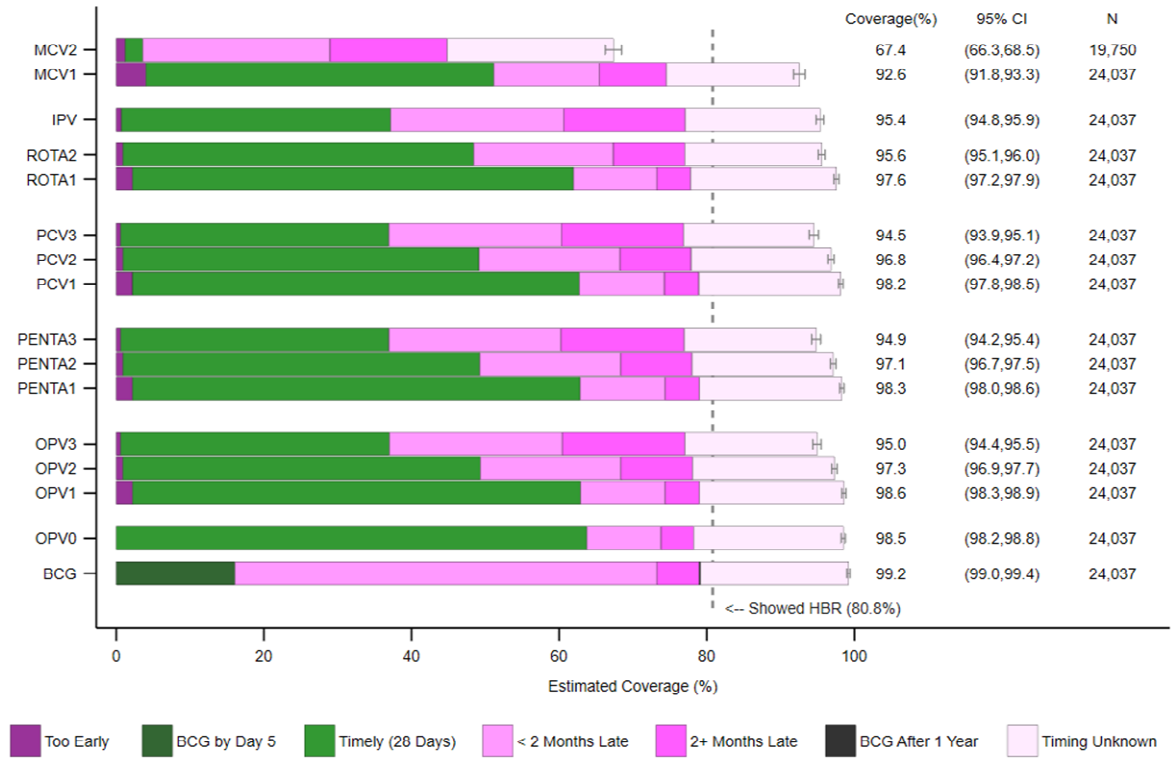
bar, which represents timely doses, is longest for the first dose and notably shorter for the last dose. Similarly, in each series, the deep pink portion of the bar, which represents doses given two or more months late (2+ months late) is shortest for the first dose and substantially longer for the last dose. A large portion of children in this sample received their vaccinations one or more months late and a very notable portion received the later doses in the schedule very late.

Orientation to VCQI VCTCs

1. The coverage estimates portrayed in VCTCs use survey weights and account for the complex sample design.
2. Each bar estimates the % of children in the geographic stratum with evidence of receiving the dose.
3. The estimates combine evidence from a HBR or card and caregiver recall.
4. Each figure indicates the % of respondents who showed an HBR.
5. The color-saturated portion of each bar, to the left of the vertical HBR line, summarizes what we know about timeliness, based on the children's dates of birth and vaccination dates.
6. The light pink portion at the far right of each bar summarizes the % who received the dose for whom timeliness is not known – primarily because that evidence comes from caregiver recall, or in some cases from an illegible or nonsensical date on the HBR.
7. Note that you can easily perceive the degree of dropout by noting how the bars for later doses are shorter than those for early doses.
8. All the doses except BCG use the same color scale in the legend.
9. BCG uses two additional colors: timely if received by age 5 days (dark green) and egregiously late if received after age 1 year (black).
10. Each bar includes a 2-sided 95% survey adjusted Wilson type confidence interval.
11. These figures do not document the precise length of the segments of the bar, only its entire length. Numeric figures describing each bar segment can be made available in a companion spreadsheet.
12. Footnotes document the % of children fully vaccinated with the doses the child should receive in the first year of life (excluding rotavirus vaccine) and the % of children not vaccinated with any of those doses.

Province and Regional Results

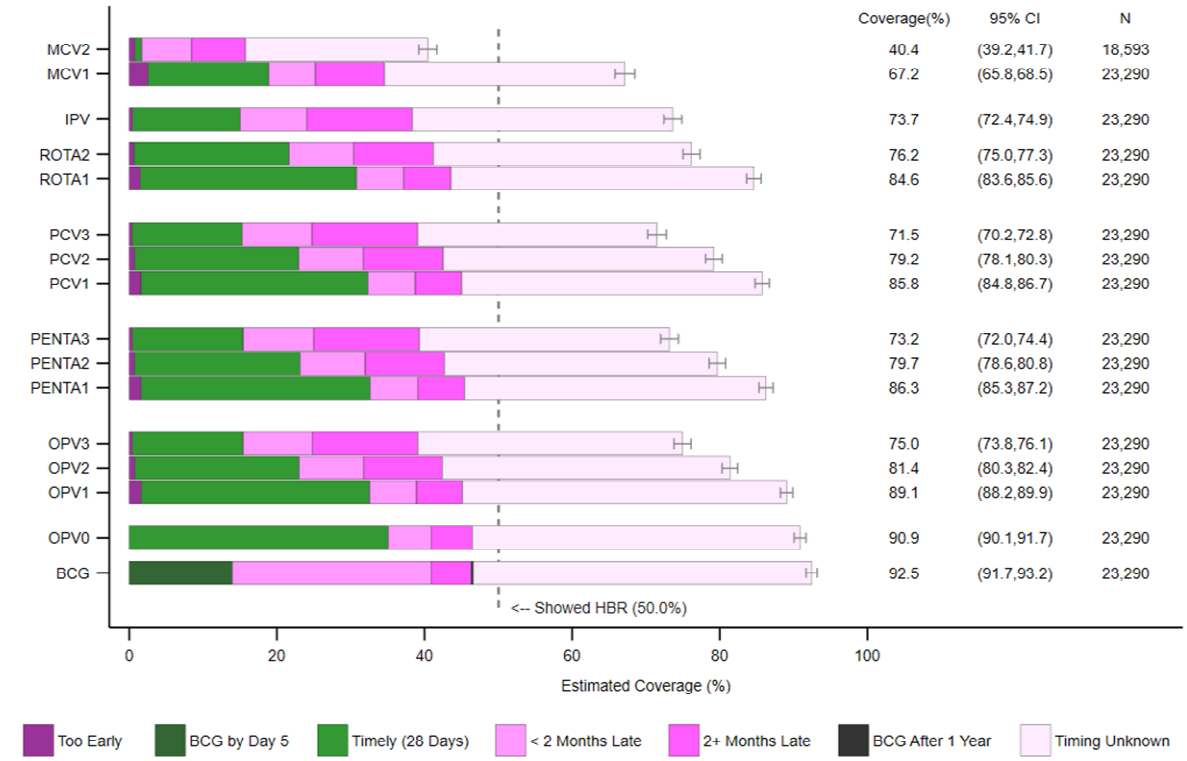
Figure 3-6. Vaccination coverage and timeliness: Punjab, Pakistan TPVICS 2020-21



Fully vaccinated: 90.0% (95% CI: 89.1 - 90.8%). Fully vaccinated dose list: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1.
Not vaccinated: 0.6% (95% CI: 0.4 - 0.8%). Not vaccinated means the child did not receive any of the doses from the fully vaccinated dose list.

Abbreviations: HBR- Home-based record; CI- Confidence interval; N- Sample size

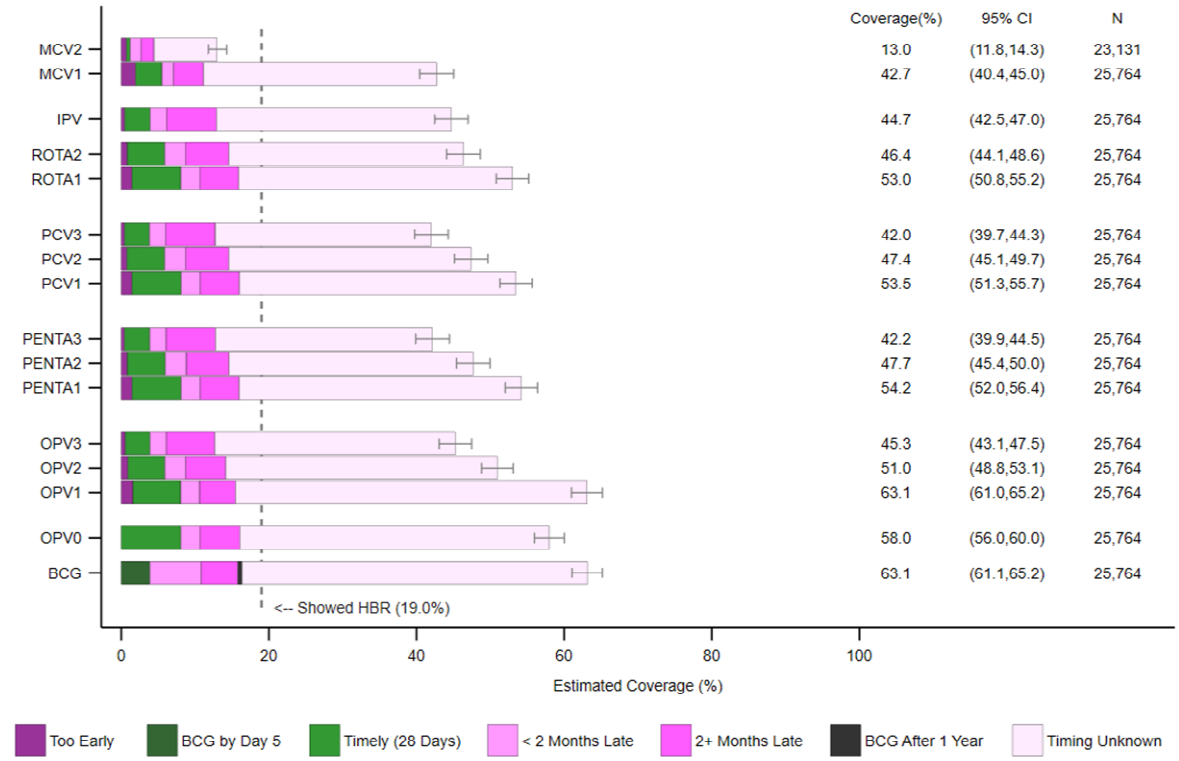
Figure 3-7. Vaccination coverage and timeliness: Sindh, Pakistan TPVICS 2020-21



Fully vaccinated: 61.2% (95% CI: 59.9 - 62.6%). Fully vaccinated dose list: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1.
Not vaccinated: 6.9% (95% CI: 6.2 - 7.6%). Not vaccinated means the child did not receive any of the doses from the fully vaccinated dose list.

Abbreviations: HBR- Home-based record; CI- Confidence interval; N- Sample size

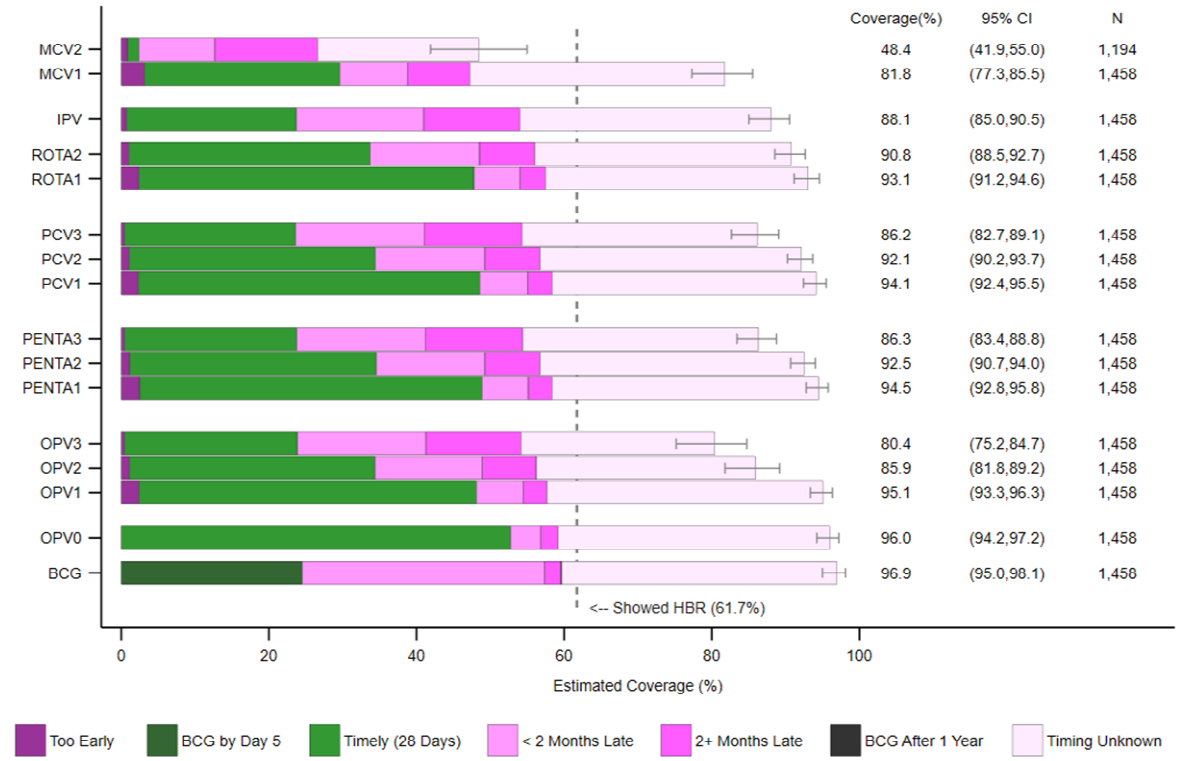
Figure 3-8. Vaccination coverage and timeliness: Balochistan, Pakistan TPVICS 2020-21



Fully vaccinated: 37.7% (95% CI: 35.4 - 40.1%). Fully vaccinated dose list: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1.
Not vaccinated: 31.5% (95% CI: 29.5 - 33.6%). Not vaccinated means the child did not receive any of the doses from the fully vaccinated dose list.

Abbreviations: HBR- Home-based record; CI- Confidence interval; N- Sample size

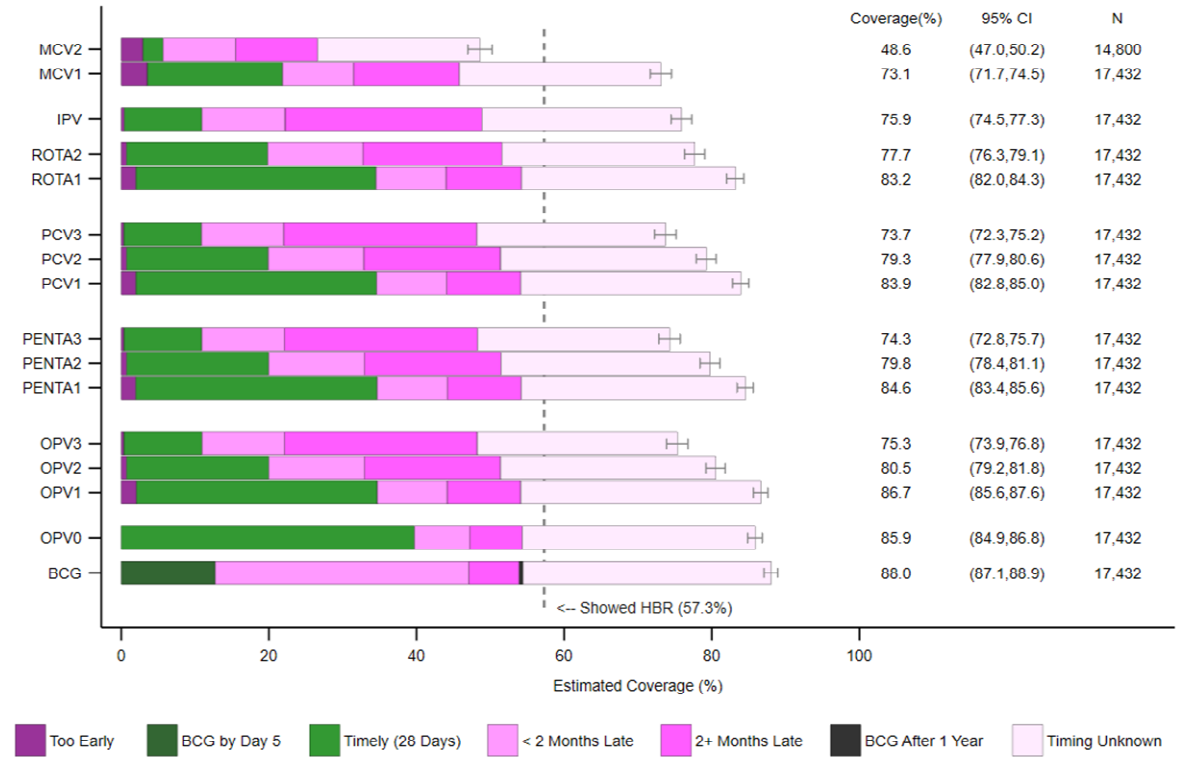
Figure 3-9. Vaccination coverage and timeliness: Islamabad, Pakistan TPVICS 2020-21



Fully vaccinated: 71.0% (95% CI: 65.7 - 75.8%). Fully vaccinated dose list: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1.
Not vaccinated: 2.9% (95% CI: 1.7 - 4.9%). Not vaccinated means the child did not receive any of the doses from the fully vaccinated dose list.

Abbreviations: HBR- Home-based record; CI- Confidence interval; N- Sample size

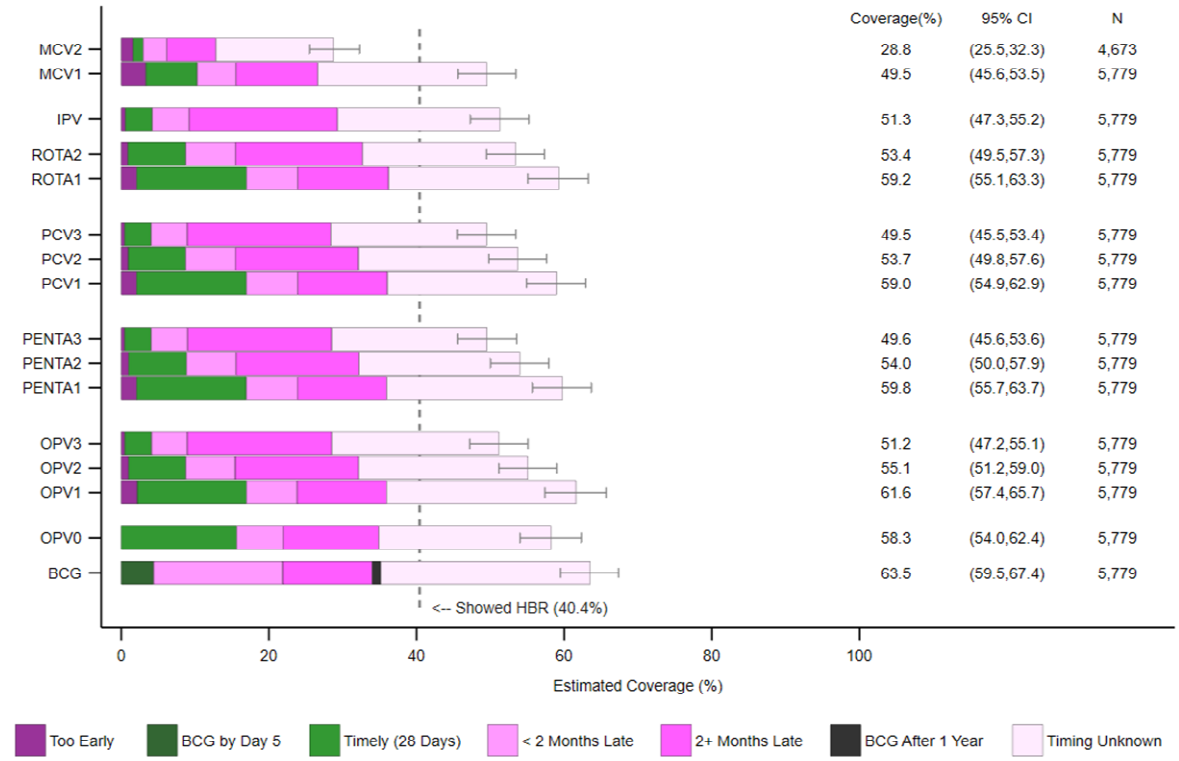
Figure 3-10.Vaccination coverage and timeliness: Khyber Pakhtunkhwa, Pakistan TPVICS 2020-21



Fully vaccinated: 68.5% (95% CI: 67.0 - 70.1%). Fully vaccinated dose list: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1.
Not vaccinated: 10.8% (95% CI: 9.9 - 11.8%). Not vaccinated means the child did not receive any of the doses from the fully vaccinated dose list.

Abbreviations: HBR- Home-based record; CI- Confidence interval; N- Sample size

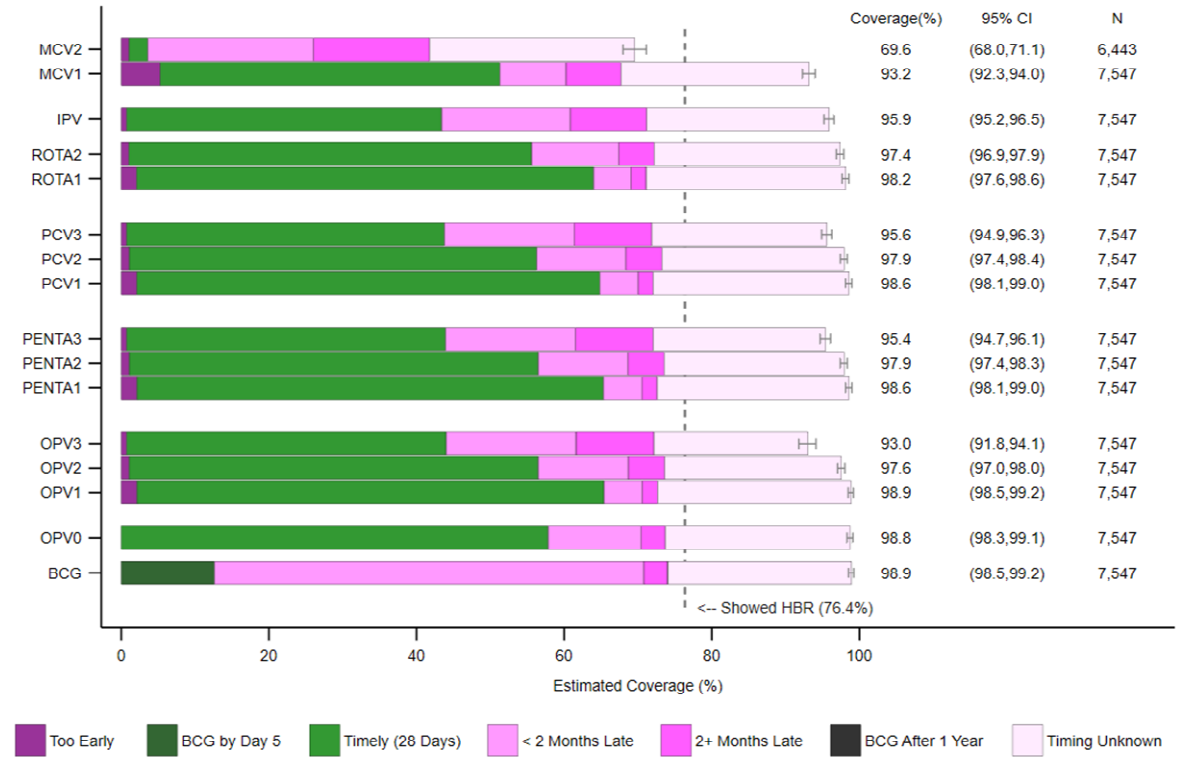
Figure 3-11. Vaccination coverage and timeliness: FATA, Pakistan TPVICS 2020-21



Fully vaccinated: 42.9% (95% CI: 39.1 - 46.9%). Fully vaccinated dose list: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1.
Not vaccinated: 34.2% (95% CI: 30.2 - 38.5%). Not vaccinated means the child did not receive any of the doses from the fully vaccinated dose list.

Abbreviations: HBR- Home-based record; CI- Confidence interval; N- Sample size

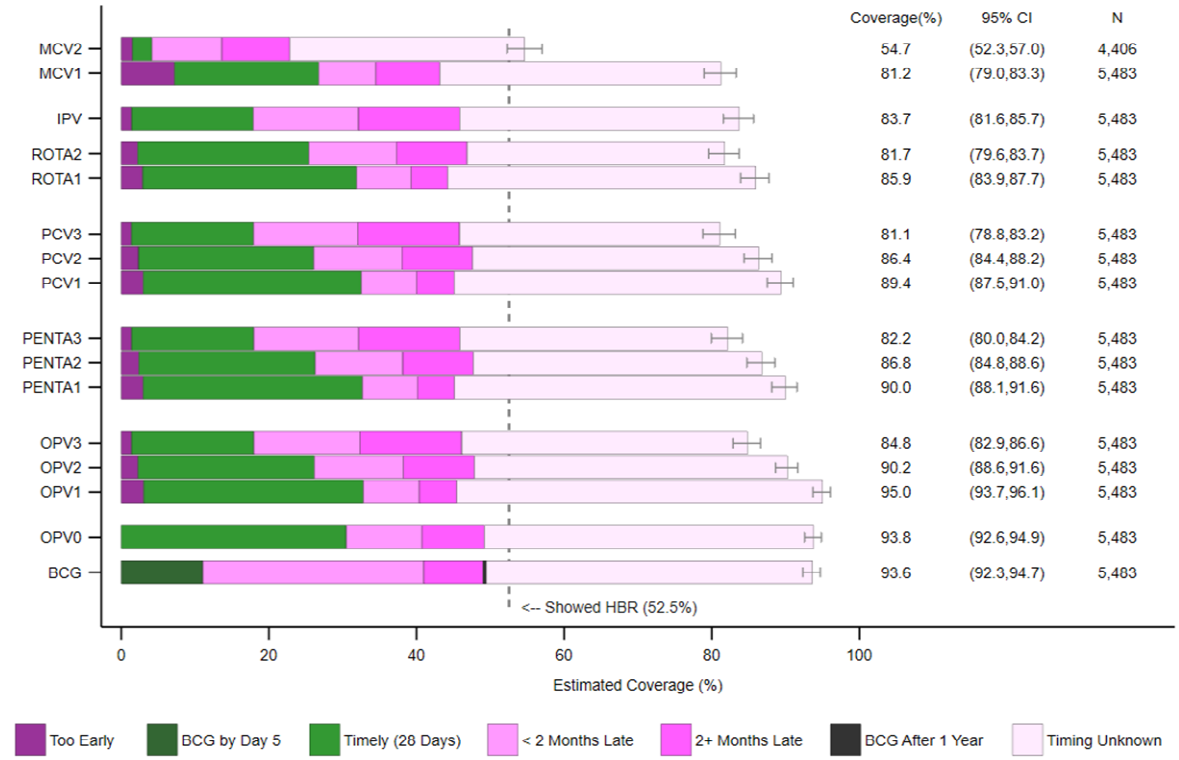
Figure 3-12. Vaccination coverage and timeliness: Azad Jammu and Kashmir, Pakistan TPVICS 2020-21



Fully vaccinated: 88.9% (95% CI: 87.5 - 90.1%). Fully vaccinated dose list: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1.
Not vaccinated: 0.9% (95% CI: 0.6 - 1.3%). Not vaccinated means the child did not receive any of the doses from the fully vaccinated dose list.

Abbreviations: HBR- Home-based record; CI- Confidence interval; N- Sample size

Figure 3-13. Vaccination coverage and timeliness: Gilgit-Baltistan, Pakistan TPVICS 2020-21



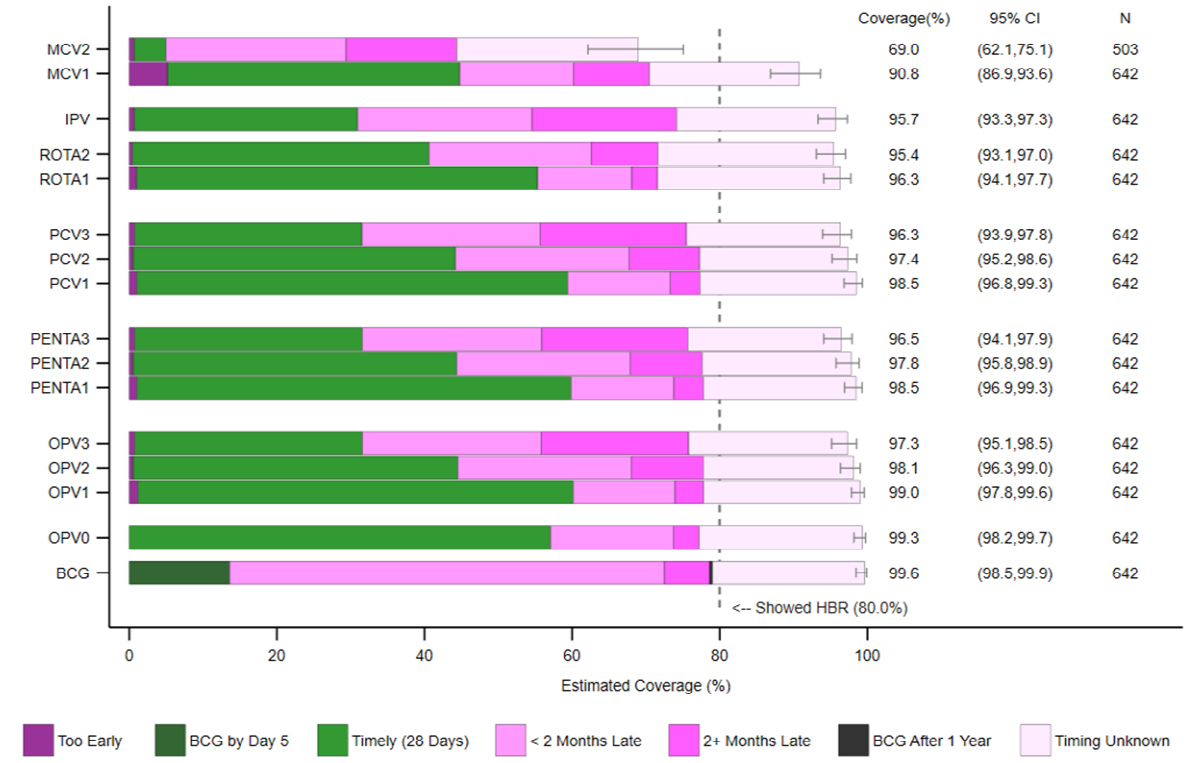
Fully vaccinated: 73.4% (95% CI: 71.0 - 75.6%). Fully vaccinated dose list: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1.
Not vaccinated: 3.9% (95% CI: 3.0 - 5.0%). Not vaccinated means the child did not receive any of the doses from the fully vaccinated dose list.

Abbreviations: HBR- Home-based record; CI- Confidence interval; N- Sample size

District Level Examples

There are 152 district level VCTCs in Supplement 05 in the online folder that accompanies this report **[12]**. Figures 14 and 15 show two examples: Bahawalpur District in Punjab and Gwadar District in Balochistan. It is evident that TPVICS card availability varied substantially from province to province and from district to district. In Bahawalpur District, card availability was high and vaccination coverage was very high. Note, however, the higher proportion of children who received later doses 2+ months late as compared to the earlier doses, and the correspondingly smaller set of children who received later doses within a month of when they should have. Many fewer cards were seen in Gwadar District than in Bahawalpur District. Dropout from dose 1 to dose 3 in each 3-dose series is more striking in Gwadar. The feature of more children receiving the later doses 2 or more months late is evident, also, even in the comparatively small amount of data from cards in Gwadar.

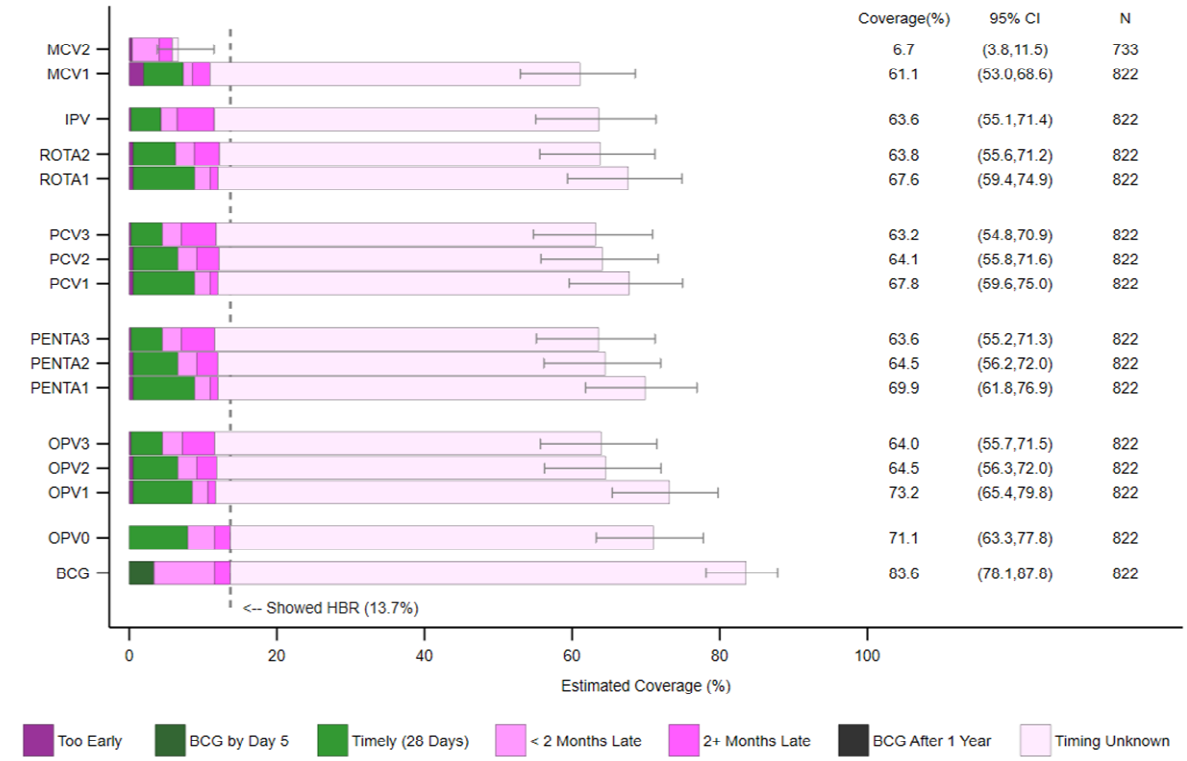
Figure 3-14. Vaccination coverage and timeliness: Bahawalpur District, Punjab, Pakistan TPVICS 2020-21



Fully vaccinated: 89.2% (95% CI: 85.2 - 92.2%). Fully vaccinated dose list: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1.
Not vaccinated: 0.2% (95% CI: 0.0 - 1.1%). Not vaccinated means the child did not receive any of the doses from the fully vaccinated dose list.

Abbreviations: HBR- Home-based record; CI- Confidence interval; N- Sample size

Figure 3-15. Vaccination coverage and timeliness: Gwadar District, Balochistan, Pakistan TPVICS 2020-21



Fully vaccinated: 59.0% (95% CI: 50.9 - 66.6%). Fully vaccinated dose list: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1.
Not vaccinated: 16.1% (95% CI: 11.9 - 21.5%). Not vaccinated means the child did not receive any of the doses from the fully vaccinated dose list.

Abbreviations: HBR- Home-based record; CI- Confidence interval; N- Sample size

Crude Coverage

The 2018 World Health Organization Vaccination Coverage Cluster Survey Reference Manual defines *crude vaccination coverage* to mean that a caregiver provides some evidence that the child received the dose – either a documented source like a date from a home-based vaccination record or anecdotal evidence based on the caregiver's recollection of the child's vaccination history. Crude coverage is the proportion of children who have any evidence of having received the dose, and it is contrasted with *valid vaccination coverage* which means not only that the evidence is from a documented source, but also that the child was age-eligible for the dose and, in the case of dose series, that at least a minimum acceptable intradose interval had passed since the date when the child received the earlier dose.

In addition to VCTCs, crude coverage is documented for every dose in tables and maps and bar charts in the online folder of files that accompany this report [12]. Tables 3-8 and 3-9 and 3-10 document crude coverage of Penta1, Penta3, and MCV1, respectively, by region and demographic categories. They are accompanied by Figures 3-16 to 3-21 which document regional and district level coverage using maps.

Additional information about crude coverage at the national, province/regional, and district levels are provided in Supplements 02, 03, 06, 07, 08, and 09.

Table 3-8. Crude coverage of Penta1, by region and demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	98.3	86.3	84.6	59.8	54.2	94.5	90.8	98.6	90.0
Maternal Education (years)									
None	97.4	80.3	79.1	61.5	52.4	85.2	84.7	96.2	81.4
Primary (1-5)	98.5	90.3	89.8	50.7	40.8	94.1	95.3	99.4	91.8
Middle (6-8)	98.4	91.8	91.4	49.8	53.4	95.3	95.2	98.6	92.8
Secondary (9-10)	99.1	95.1	92.6	44.1	64.9	97.5	96.7	99.2	98.1
Higher (11 and above)	99.4	98.1	94.0	62.9	79.4	98.7	98.2	99.5	98.9
Sex									
Boys	98.5	87.0	84.7	57.0	53.2	92.9	90.8	98.9	90.1
Girls	98.2	85.5	84.4	63.4	55.6	95.9	90.9	98.3	89.8
Wealth									
Lowest	96.5	76.4	61.9	50.4	40.0	81.1	72.4	92.1	81.0
Second	97.6	79.2	74.0	58.3	56.3	89.3	82.8	97.3	87.1
Middle	97.9	86.3	80.8	65.7	65.2	89.0	89.8	98.7	91.8
Fourth	98.3	88.5	89.7	72.8	64.9	94.3	94.1	99.0	95.8
Highest	98.8	94.7	93.2	86.0	65.1	95.5	97.0	99.5	95.1
Area									
Urban	98.0	91.3	90.2		64.2	95.7	93.9	98.0	91.3
Rural	98.5	80.7	83.2		50.5	93.4	88.9	98.8	89.7
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: This measure is a population estimate that incorporates survey weights.

Figure 3-16. Crude coverage of Penta1, by region, Pakistan TPVICS 2020-21

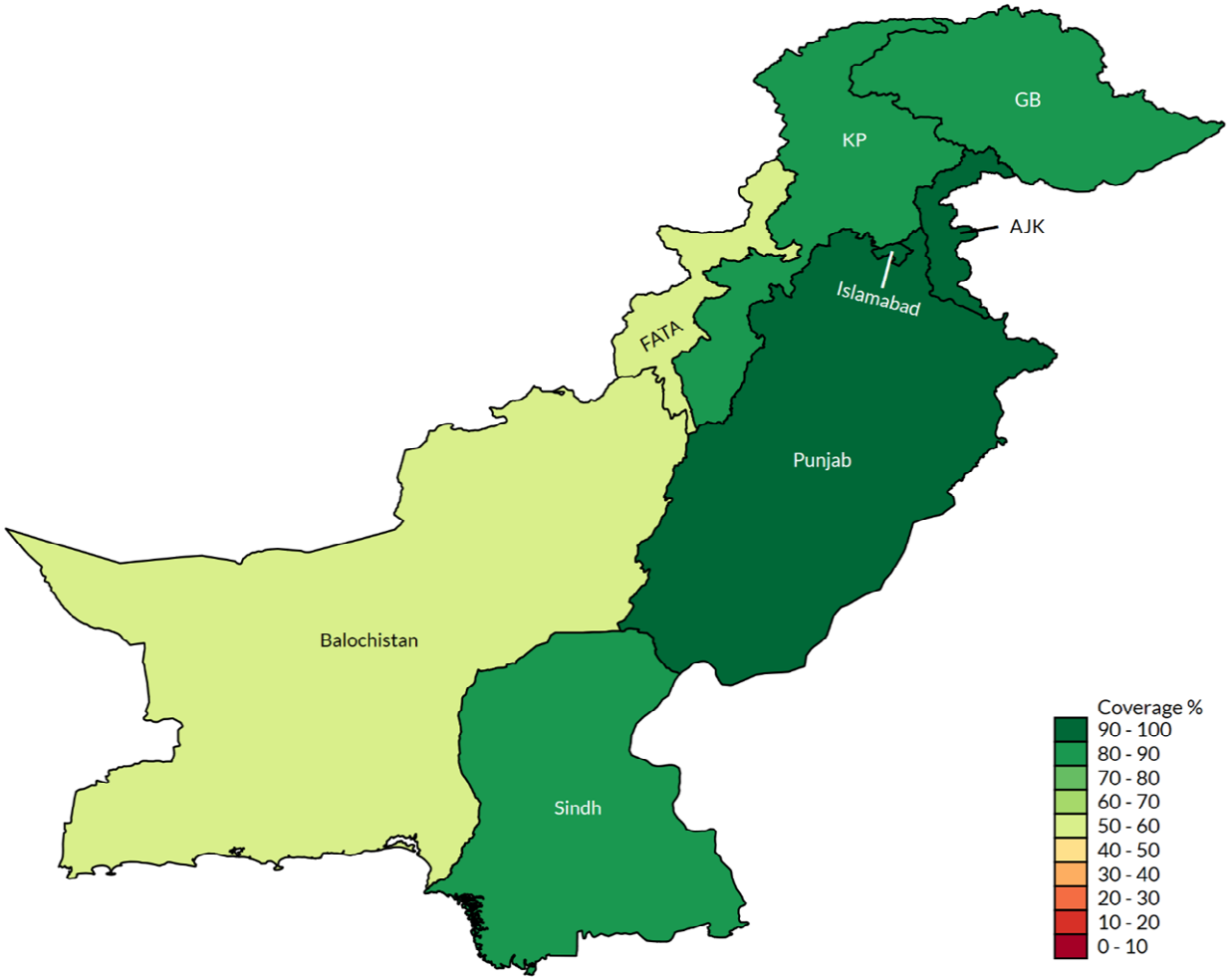


Figure 3-17. Crude coverage of Penta1, by district, Pakistan TPVICS 2020-21

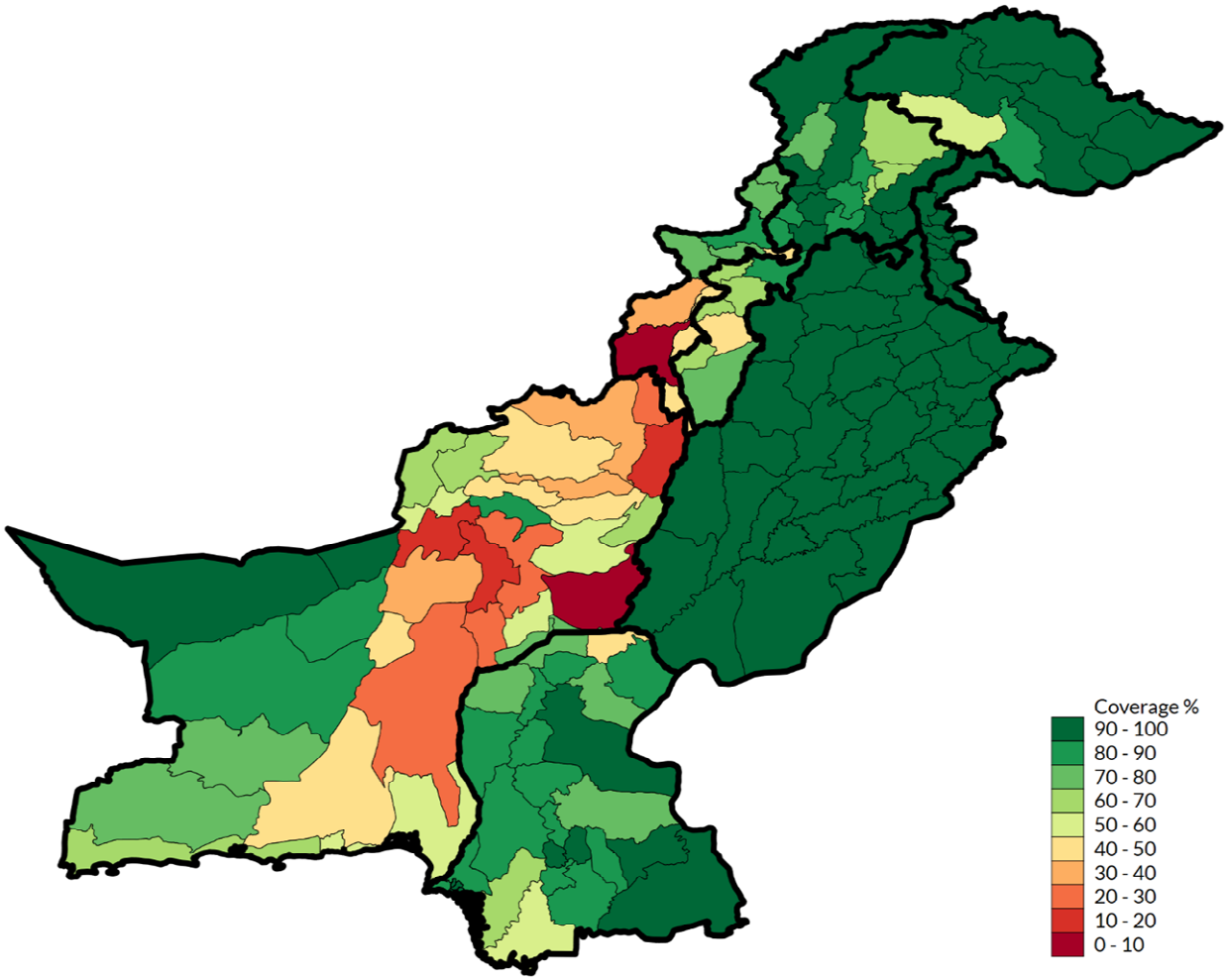


Table 3-9. Crude coverage of Penta3, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	94.9	73.2	74.3	49.6	42.2	86.3	83.5	95.4	82.2
Maternal Education (years)									
None	94.2	64.8	66.8	51.5	39.9	67.9	75.3	89.9	72.5
Primary (1-5)	94.7	76.1	82.5	33.7	32.0	83.6	89.2	96.1	82.3
Middle (6-8)	94.4	79.4	83.0	42.5	43.7	88.3	89.1	95.4	84.2
Secondary (9-10)	96.0	85.0	85.0	36.7	53.2	90.9	91.3	97.2	91.2
Higher (11 and above)	95.7	92.6	87.2	52.1	71.6	95.6	93.7	98.3	93.4
Sex									
Boys	95.1	73.8	74.4	47.3	41.6	85.0	83.4	96.1	82.4
Girls	94.5	72.6	74.2	52.5	42.9	87.5	83.5	94.7	81.9
Wealth									
Lowest	93.8	61.3	47.1	41.6	29.8	48.0	60.7	84.6	70.8
Second	93.7	63.9	60.3	47.3	42.2	65.9	72.6	91.0	78.9
Middle	94.9	72.1	68.9	55.7	51.6	68.6	82.2	95.1	85.4
Fourth	95.0	73.8	81.3	60.3	54.7	81.4	87.5	96.4	87.9
Highest	95.1	85.1	85.2	79.4	53.4	90.9	91.5	97.8	87.4
Area									
Urban	92.9	79.4	80.6		53.8	86.4	85.8	94.7	82.6
Rural	96.0	66.3	72.8		37.9	86.2	82.0	95.6	82.1
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: This measure is a population estimate that incorporates survey weights.

Figure 3-18. Crude coverage of Penta3, by region, Pakistan TPVICS 2020-21

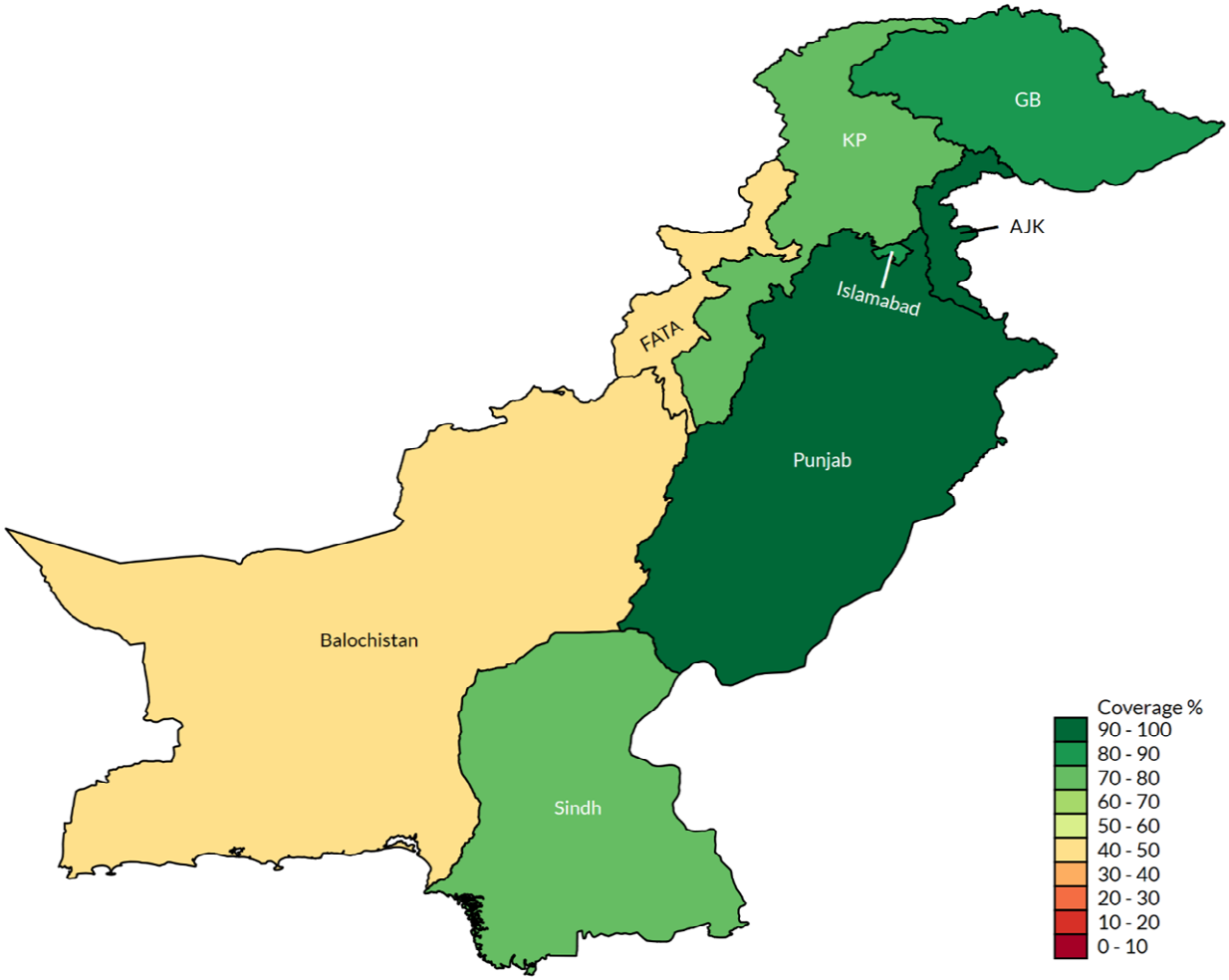


Figure 3-19. Crude coverage of Penta3, by district, Pakistan TPVICS 2020-21

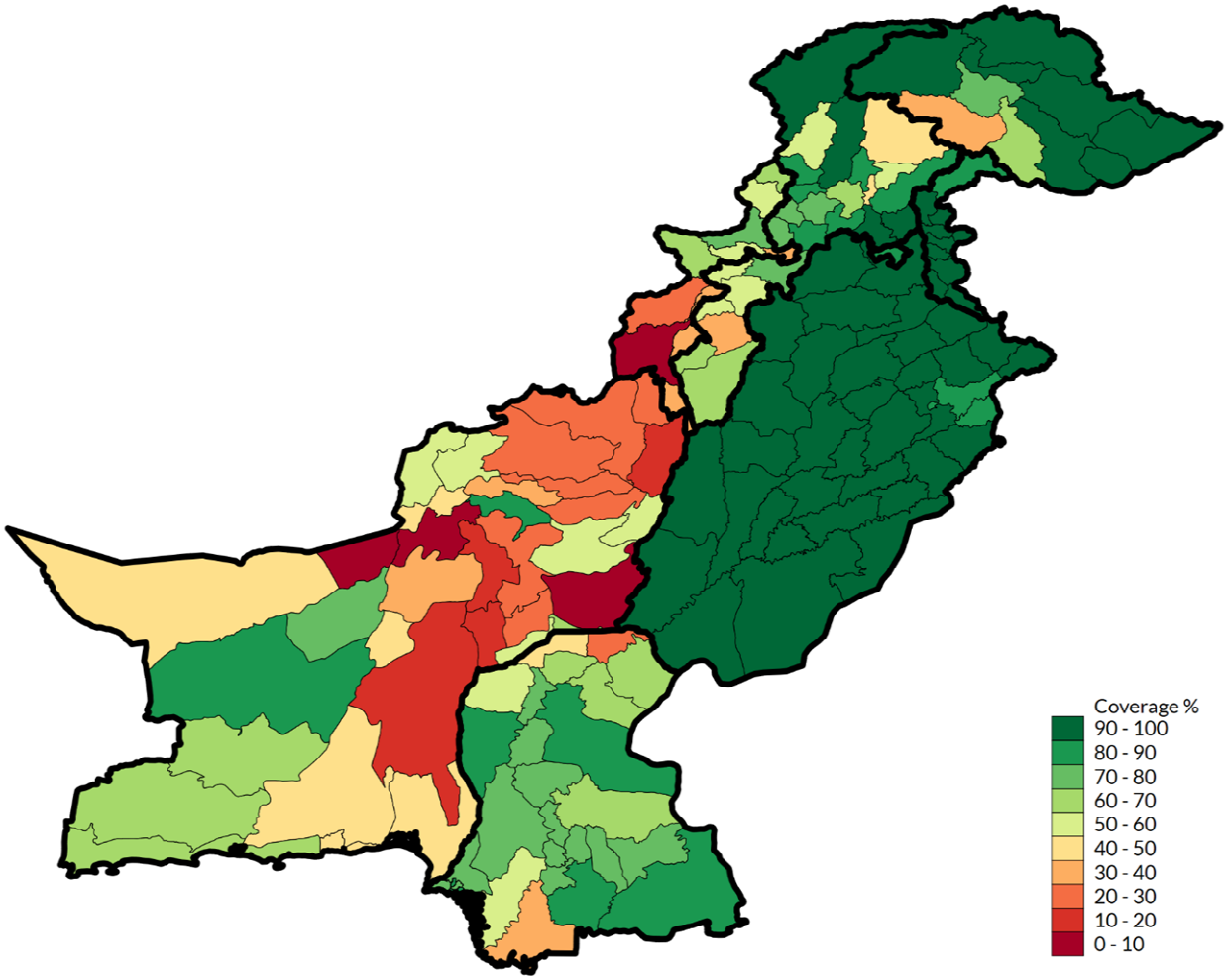


Table 3-10. Crude coverage of MCV1, by region and demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	92.6	67.2	73.1	49.5	42.7	81.8	80.5	93.2	81.2
Maternal Education (years)									
None	91.6	59.4	66.0	51.3	40.6	66.6	72.4	85.4	70.7
Primary (1-5)	92.9	68.3	80.1	39.4	33.4	73.4	86.4	94.8	81.0
Middle (6-8)	91.6	70.9	82.0	39.0	40.1	83.2	85.5	92.9	85.6
Secondary (9-10)	93.4	76.4	82.9	35.8	55.8	83.3	87.4	95.5	89.9
Higher (11 and above)	93.9	87.9	86.1	51.4	70.0	91.5	91.2	96.8	93.6
Sex									
Boys	92.6	67.5	73.4	48.4	42.3	79.2	80.2	93.4	81.3
Girls	92.6	66.8	72.8	51.0	43.4	84.3	80.7	93.0	81.2
Wealth									
Lowest	91.4	57.8	48.0	42.8	30.0	31.1	58.4	79.6	70.9
Second	91.8	58.9	60.9	48.7	43.4	62.6	70.4	87.0	76.4
Middle	92.2	65.5	67.5	54.3	52.7	63.6	79.2	92.0	84.2
Fourth	93.1	67.2	79.0	54.1	54.0	79.5	84.7	94.9	88.5
Highest	92.7	77.4	84.2	81.0	53.1	85.9	87.9	96.4	88.3
Area									
Urban	90.0	72.1	78.8		53.5	78.6	81.4	90.4	80.4
Rural	94.0	61.7	71.8		38.7	84.8	79.9	93.8	81.4
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: This measure is a population estimate that incorporates survey weights.

Figure 3-20. Crude coverage of MCV1, by region, Pakistan TPVICS 2020-21

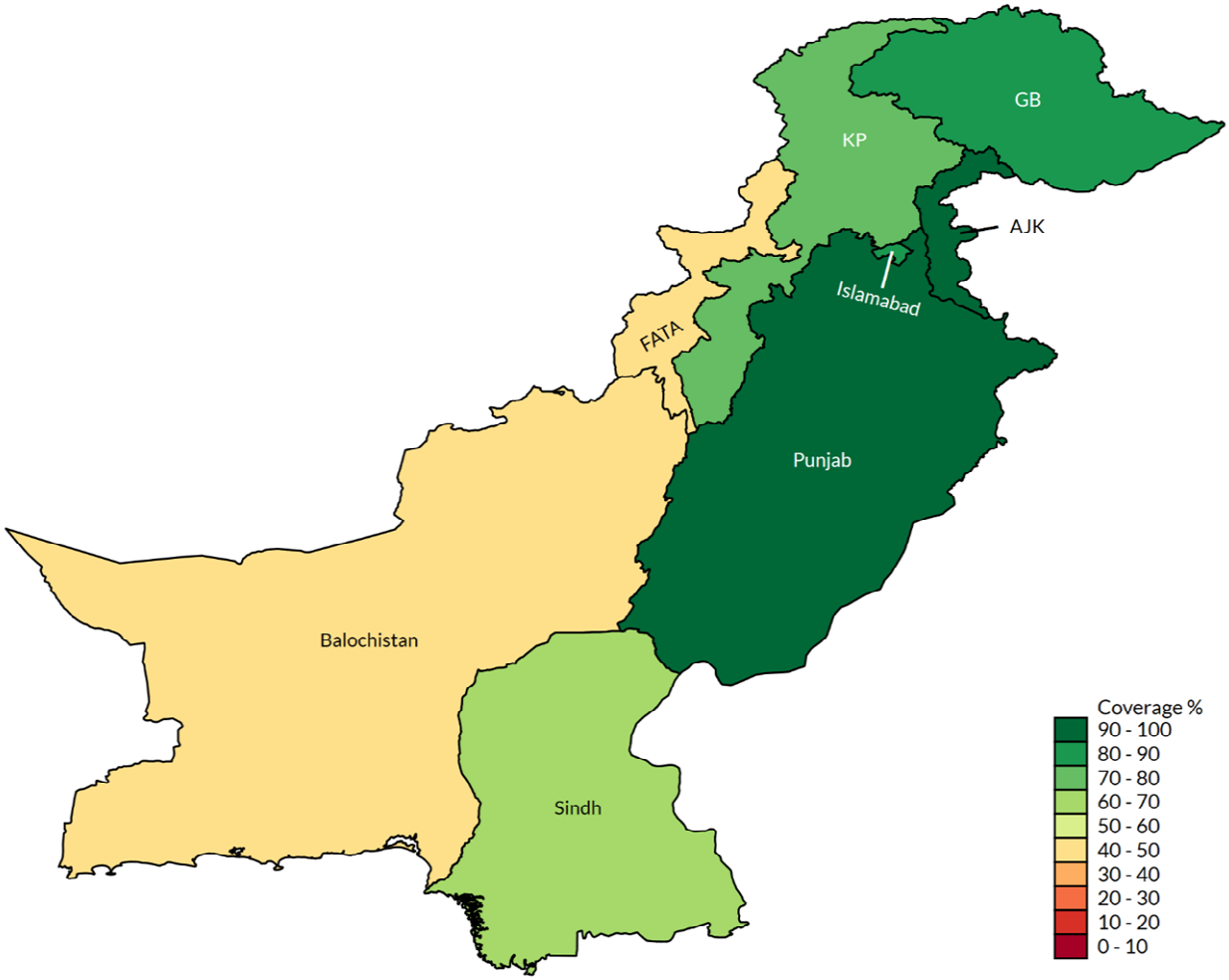
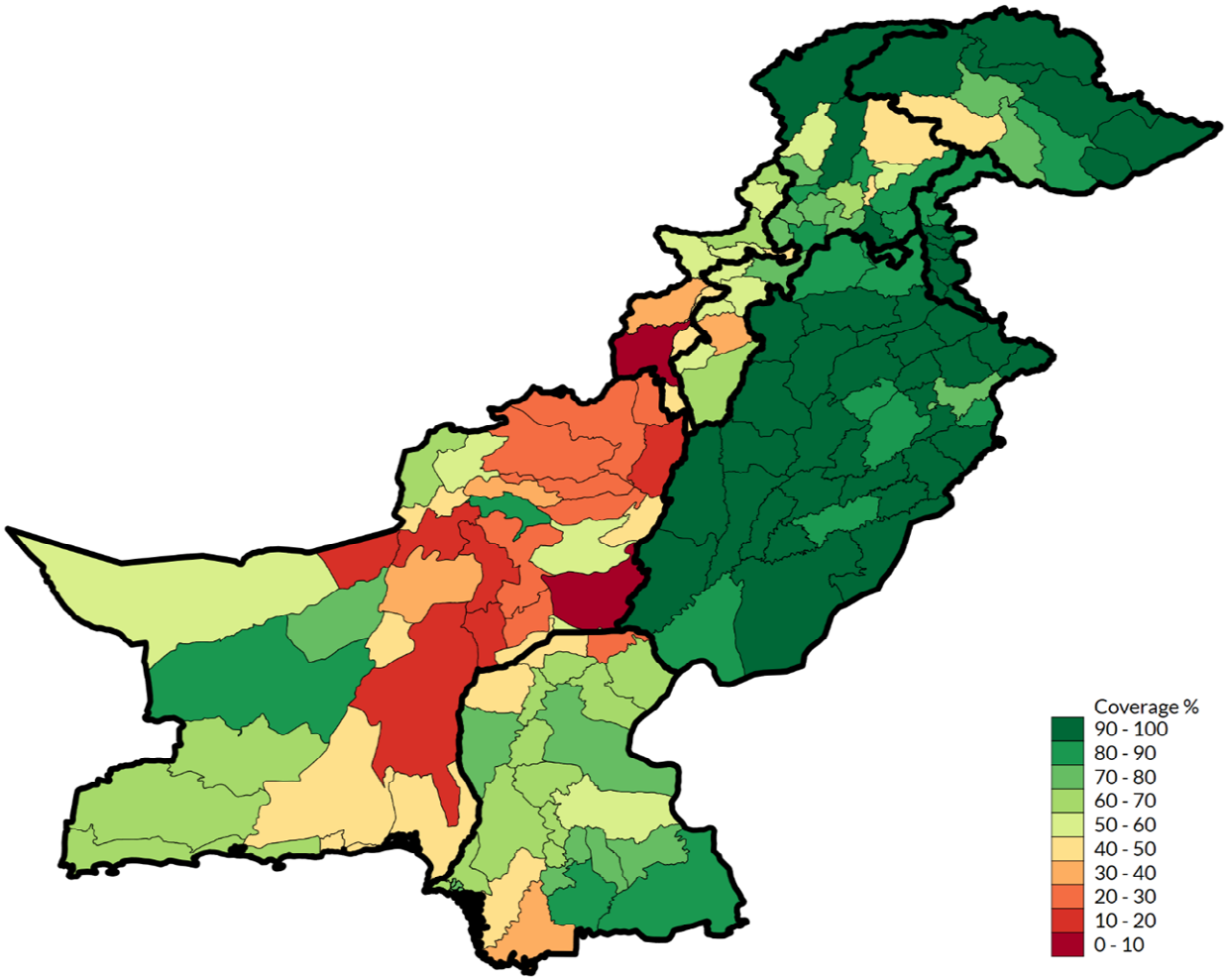


Figure 3-21. Crude coverage of MCV1, by district, Pakistan TPVICS 2020-21



Dropout

A child who receives the first dose in a series but had not received the last dose by the time of the survey might be said to have *dropped out* of the vaccination program before completing the full course of scheduled doses. Dropout is visually evident in VCQI's vaccination coverage and timeliness charts earlier in this report: the bars representing coverage of later doses are typically shorter than bars for early doses.

As with other coverage indicators, there are several traditions for how to calculate and report dropout. It is quite common to report a weighted estimate of coverage using this equation:

$$Dropout = \frac{(Early\ dose\ weighted\ coverage\ \% - Later\ dose\ weighted\ coverage\ \%)}{Early\ dose\ weighted\ coverage\ \%}$$

e.g., $$Penta\ Dropout = \frac{(Penta1\ coverage\ \% - Penta3\ coverage\ \%)}{Penta1\ coverage\ \%}$$

The numeric outcome is the percentage of children who began the series who did not go on to complete it. In this report, dropout is reported as an unweighted measure in accordance with VCQI's convention for indicators whose denominator is a subset of children in the dataset.

$$Dropout = \frac{(\#\ of\ children\ who\ receive\ the\ earlier\ dose - \#\ of\ children\ who\ receive\ the\ earlier\ and\ later\ doses)}{\#\ of\ children\ who\ receive\ the\ earlier\ dose}$$

In the VCQI analyses, dropout is summarized for Penta1-3, OPV1-3, PCV1-3, Rota1-2, MCV1-2, BCG-MCV1, and Penta1-MCV1 using tables, maps, and figures. Broadly speaking, the dropout among first year of life (1YL) dose results look quite similar for all dose pairs, so only one 1YL pair is summarized in the body of the report – Table 3-11 and Figures 3-22 and 3-23 document dropout from Penta1 to Penta3 – and the rest are documented thoroughly in the supplemental materials. Dropout from MCV1 to MCV2 is higher than dropout among 1YL doses, so the report summarizes it in Table 12 and Figures 3-24 and 3-25. Note in Tables 3-11 and 3-12 there is a characteristic stair-step pattern among colored bars that is common across outcomes in this report, indicating poorer outcomes for children whose mothers are poorly educated or whose families are poor.

Additional information about dropout is provided in Supplements 02, 06, 07, and 09.

Table 3-11. Dropout from Penta1 to Penta3, by region and demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	2.6	16.5	13.2	18.0	22.9	8.9	12.7	3.7	6.5
Maternal Education (years)									
None	2.9	20.3	16.8	17.9	25.6	22.3	17.1	7.2	7.9
Primary (1-5)	2.5	14.3	8.7	28.3	17.7	8.9	7.3	3.5	8.7
Middle (6-8)	3.0	13.6	10.6	16.7	11.7	9.8	7.7	3.2	6.8
Secondary (9-10)	2.2	9.7	7.7	11.9	14.4	6.8	6.4	2.3	5.4
Higher (11 and above)	2.1	5.8	7.4	18.0	9.2	4.1	5.1	1.7	4.2
Sex									
Boys	2.6	16.5	13.3	17.5	22.4	9.4	12.8	3.5	6.3
Girls	2.5	16.6	13.1	18.6	23.6	8.4	12.5	3.9	6.7
Wealth									
Lowest	2.3	22.0	24.7	19.9	23.7	47.6	21.1	9.7	7.8
Second	3.7	20.5	18.4	19.0	26.4	38.5	18.6	7.3	6.9
Middle	2.5	17.1	14.5	15.1	22.1	21.8	13.4	3.8	5.1
Fourth	2.3	15.1	9.6	19.2	15.3	8.9	8.4	2.6	7.2
Highest	2.6	9.8	8.2	11.2	19.8	5.9	6.2	1.7	6.6
Area									
Urban	3.8	13.4	10.3		21.5	9.4	11.2	3.9	9.3
Rural	2.2	19.2	13.6		23.3	8.3	13.2	3.6	6.1
N	23,725	19,585	13,908	3,577	13,795	1,377	75,967	7,448	5,033

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Results are scaled so that 100% would fill the entire cell.
Note: This measure is an unweighted summary of a proportion from the survey sample.
N is the number of persons who received Penta1.

Figure 3-22. Dropout from Penta1 to Penta3, by region, Pakistan TPVICS 2020-21

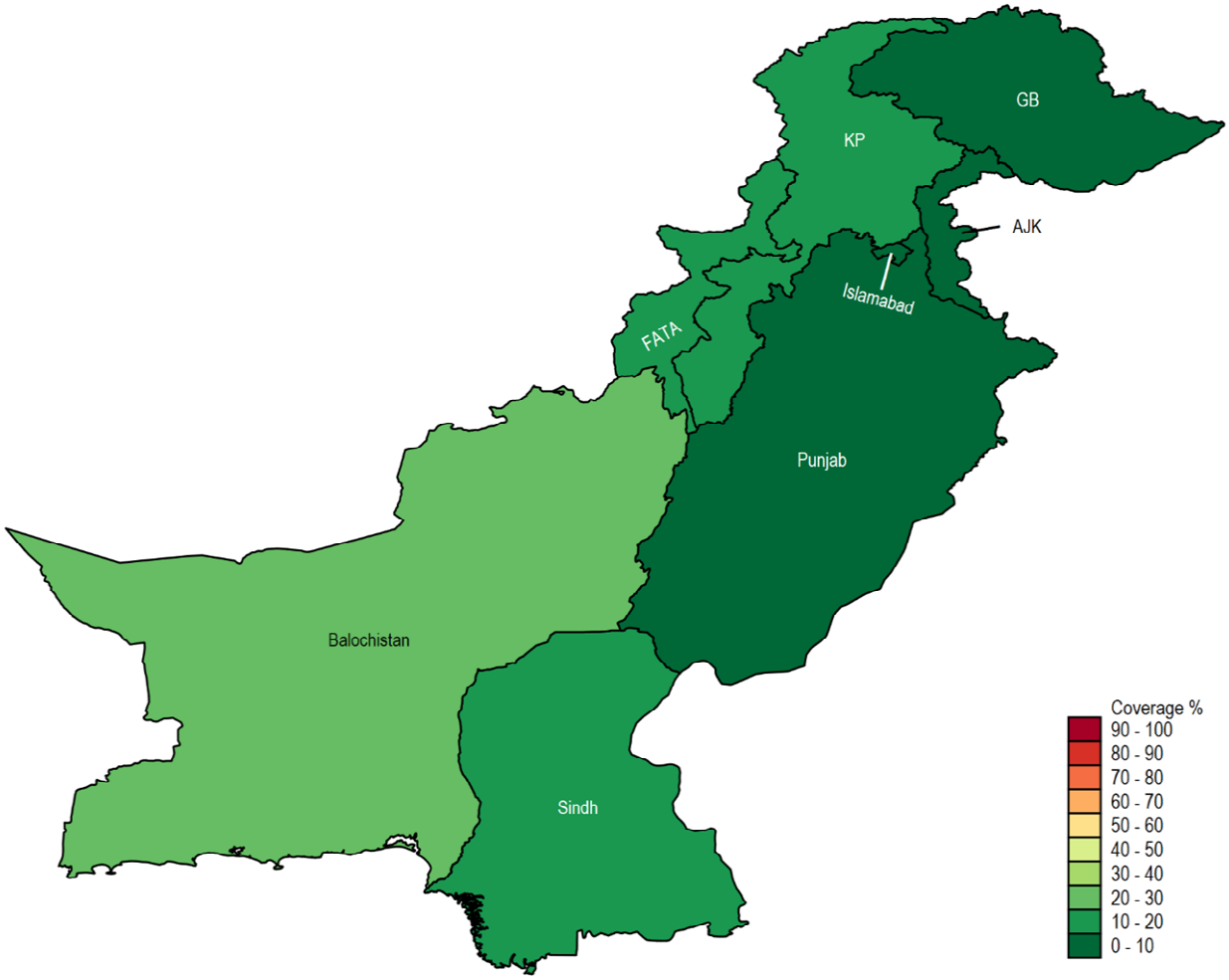


Figure 3-23. Dropout from Penta1 to Penta3, by district, Pakistan TPVICS 2020-21

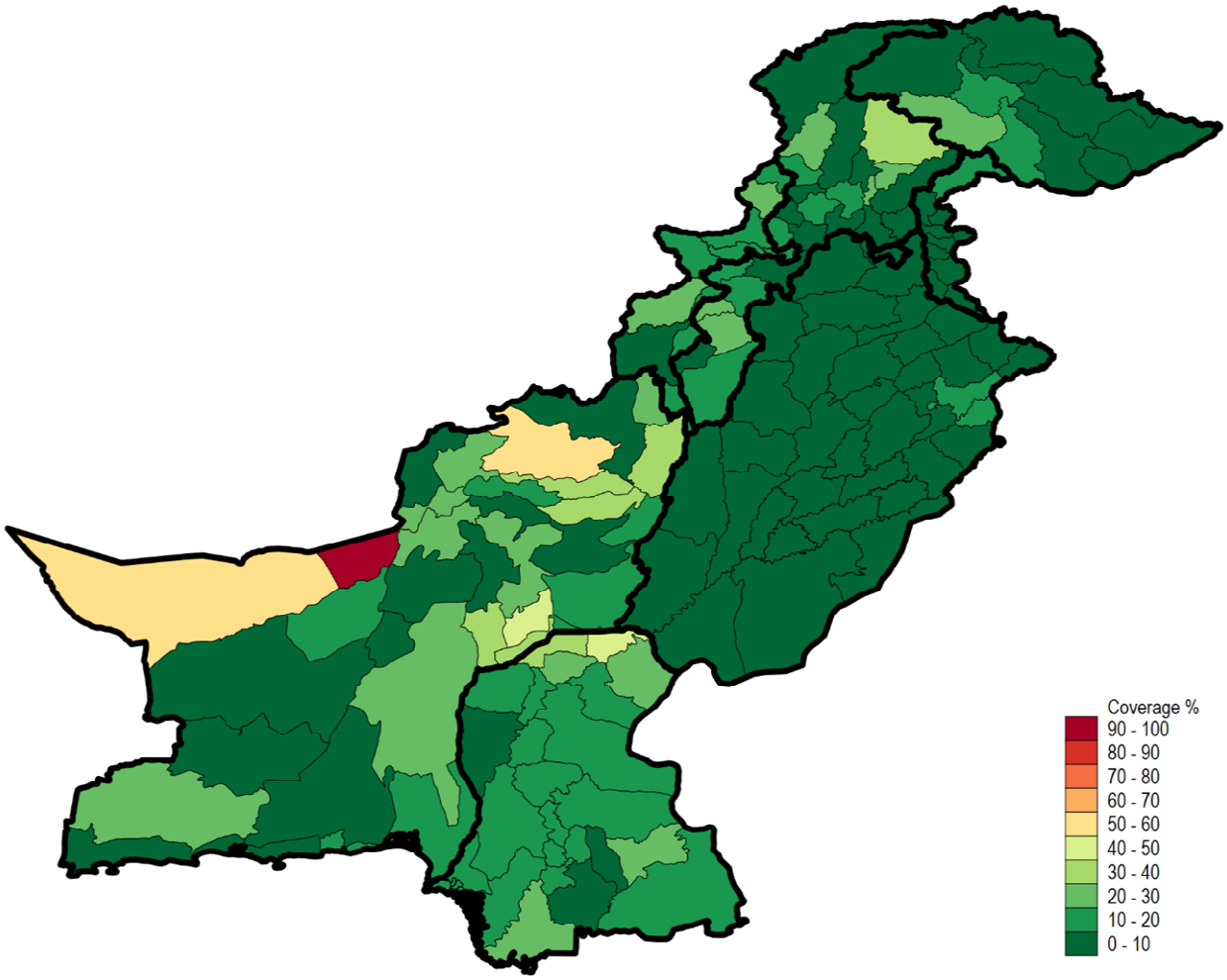


Table 3-12. Dropout from MCV1 to MCV2, by region and demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	2.6	16.5	13.2	18.0	22.9	8.9	12.7	3.7	6.5
Maternal Education (years)									
None	2.9	20.3	16.8	17.9	25.6	22.3	17.1	7.2	7.9
Primary (1-5)	2.5	14.3	8.7	28.3	17.7	8.9	7.3	3.5	8.7
Middle (6-8)	3.0	13.6	10.6	16.7	11.7	9.8	7.7	3.2	6.8
Secondary (9-10)	2.2	9.7	7.7	11.9	14.4	6.8	6.4	2.3	5.4
Higher (11 and above)	2.1	5.8	7.4	18.0	9.2	4.1	5.1	1.7	4.2
Sex									
Boys	2.6	16.5	13.3	17.5	22.4	9.4	12.8	3.5	6.3
Girls	2.5	16.6	13.1	18.6	23.6	8.4	12.5	3.9	6.7
Wealth									
Lowest	2.3	22.0	24.7	19.9	23.7	47.6	21.1	9.7	7.8
Second	3.7	20.5	18.4	19.0	26.4	38.5	18.6	7.3	6.9
Middle	2.5	17.1	14.5	15.1	22.1	21.8	13.4	3.8	5.1
Fourth	2.3	15.1	9.6	19.2	15.3	8.9	8.4	2.6	7.2
Highest	2.6	9.8	8.2	11.2	19.8	5.9	6.2	1.7	6.6
Area									
Urban	3.8	13.4	10.3		21.5	9.4	11.2	3.9	9.3
Rural	2.2	19.2	13.6		23.3	8.3	13.2	3.6	6.1
N	18,754	12,442	10,259	2,474	9,691	966	54,586	6,004	3,798

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Results are scaled so that 100% would fill the entire cell.
Note: This measure is an unweighted summary of a proportion from the survey sample.
N is the number of persons who received MCV1 and were age-eligible for MCV2 before the time of the TPVICS survey.

Figure 3-24. Dropout from MCV1 to MCV2, by region, Pakistan TPVICS 2020-21

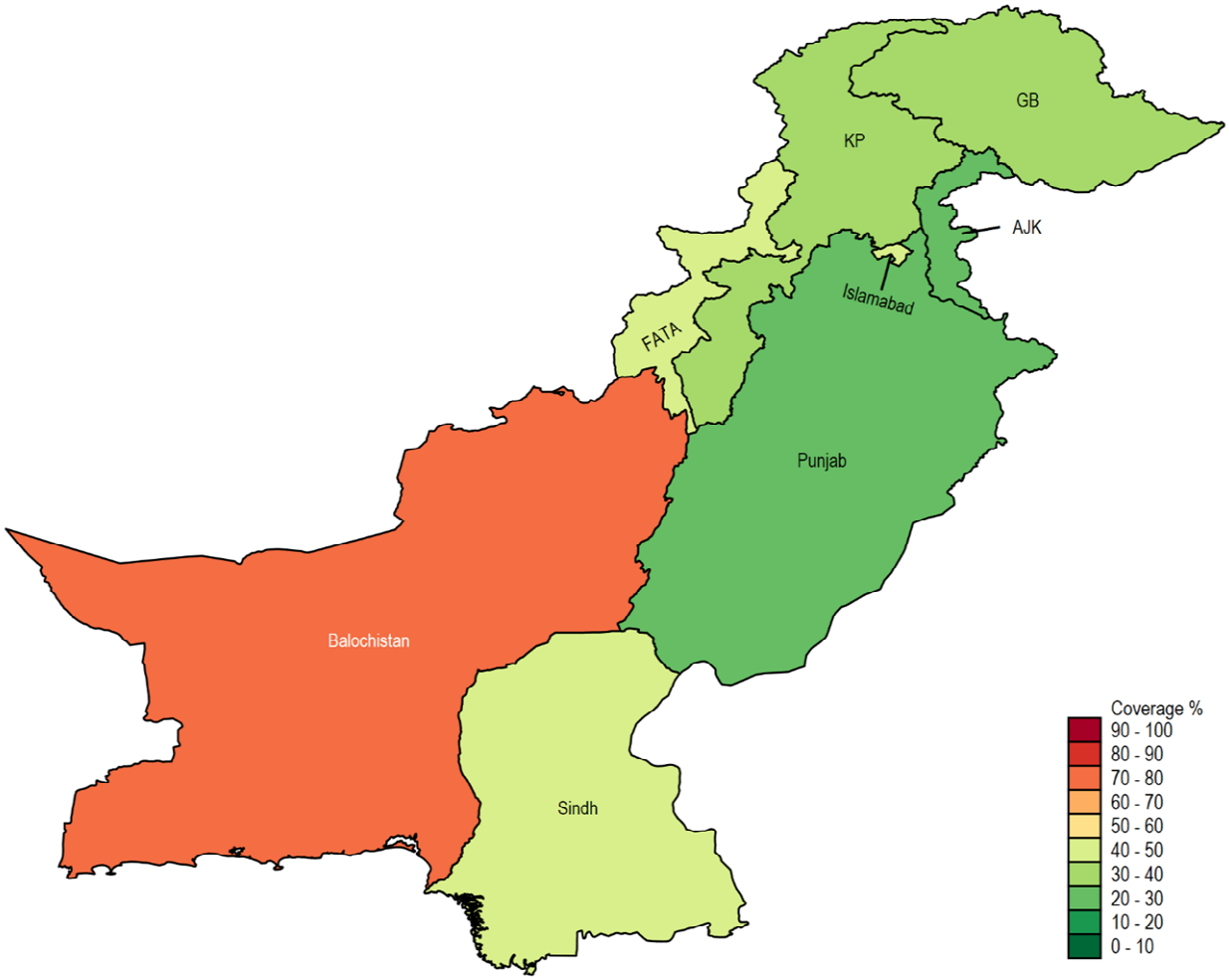
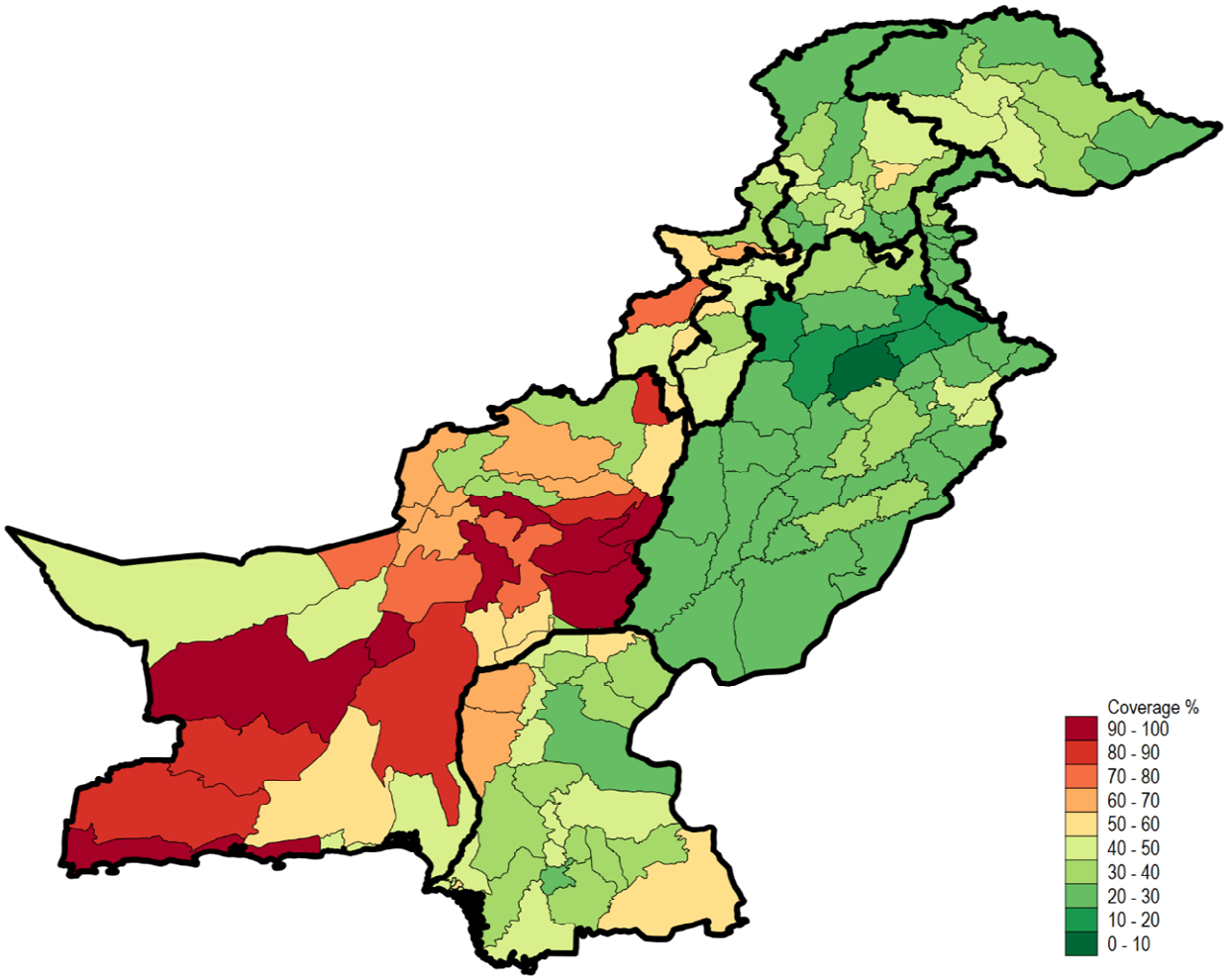


Figure 3-25. Dropout from MCV1 to MCV2, by district, Pakistan TPVICS 2020-21



Fully Vaccinated Children

The concept of the fully vaccinated child can be defined in different ways and sometimes different definitions yield different results. For purposes of comparison across countries and across time, it is common to report the percentage of children who receive all eight of the classic EPI doses (BCG, OPV1-3, DTP1-3 (or Penta1-3), and MCV1). In cases like Pakistan where many additional doses have been added to the national schedule, a more relevant outcome is the proportion of children who receive all of the doses due in the first year of life (1YL). But when the newest dose is still quite new and there have been challenges with either uptake or the supply chain, it is common to report the proportion of children who have received all the 1YL doses except the vaccine that was added to the schedule most recently.

Readers who want to explore sensitivity of the outcome to differences in the definition are directed to Annex C which uses four different definitions to explore this concept (the three definitions described above and a fourth definition, which was used to assess one of the NISP DLIs).

In this section of the report, results are reported for a single definition. In Table 3-13 and Figures 3-26 and 3-27, the child is considered to be fully vaccinated if they received all the doses due in the first year of life according to Pakistan's 2020 EPI schedule except that Rotavirus vaccine, the vaccine most recently added to the EPI schedule, is not required to be considered fully vaccinated.[6]

Additional information about fully vaccinated children is provided in Supplements 02, 07, 08, and 09.

[6] Annex C reports on a definition that uses all 1YL doses, including Rotavirus, so the curious reader can compare outcomes there.

Table 3-13. Fully vaccinated – All 1YL doses except Rota, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	90.0	61.2	68.5	42.9	37.7	71.0	76.5	88.9	73.4
Maternal Education									
None	89.2	53.4	60.7	44.7	35.6	57.6	68.0	79.6	64.1
Primary (1-5)	90.6	63.4	76.5	29.2	27.7	66.0	83.4	89.2	71.4
Middle (6-8)	88.6	62.4	78.6	34.8	36.7	75.2	81.4	89.4	76.2
Secondary (9-10)	90.8	71.8	79.3	32.0	48.4	74.6	84.0	92.5	82.8
Higher (11 and above)	91.2	81.6	82.5	43.3	66.3	77.6	87.2	93.0	83.8
Sex									
Boys	90.0	61.7	68.7	41.7	37.3	69.8	76.3	89.3	73.9
Girls	90.0	60.8	68.4	44.6	38.4	72.2	76.7	88.4	72.8
Wealth									
Lowest	89.3	52.5	40.4	35.7	26.7	31.1	53.8	69.2	63.3
Second	88.4	53.1	54.5	40.9	37.5	57.4	65.5	82.4	70.5
Middle	90.1	59.9	62.2	48.4	45.8	59.7	75.5	88.3	76.3
Fourth	91.5	59.4	75.4	51.5	49.4	68.5	81.4	90.6	78.8
Highest	89.5	71.9	80.9	76.3	48.8	74.1	83.9	92.5	77.3
Area									
Urban	86.9	65.4	75.2		48.5	69.8	76.8	85.3	68.6
Rural	91.8	56.6	67.0		33.8	72.0	76.3	89.7	74.4
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: To be fully vaccinated, the child must have received:
BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1

Figure 3-26. Fully vaccinated – All 1YL doses except Rota, by region, Pakistan TPVICS 2020-21

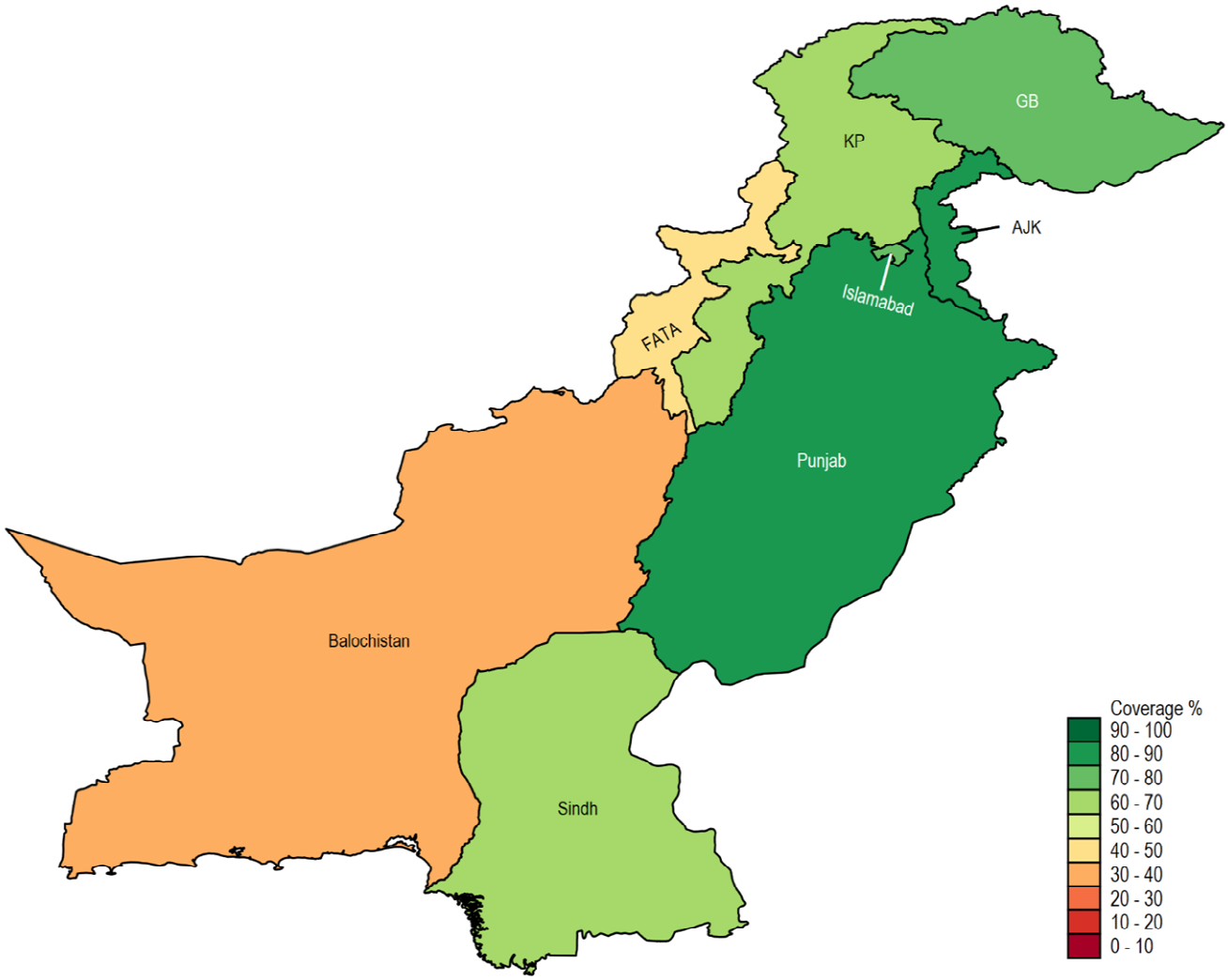
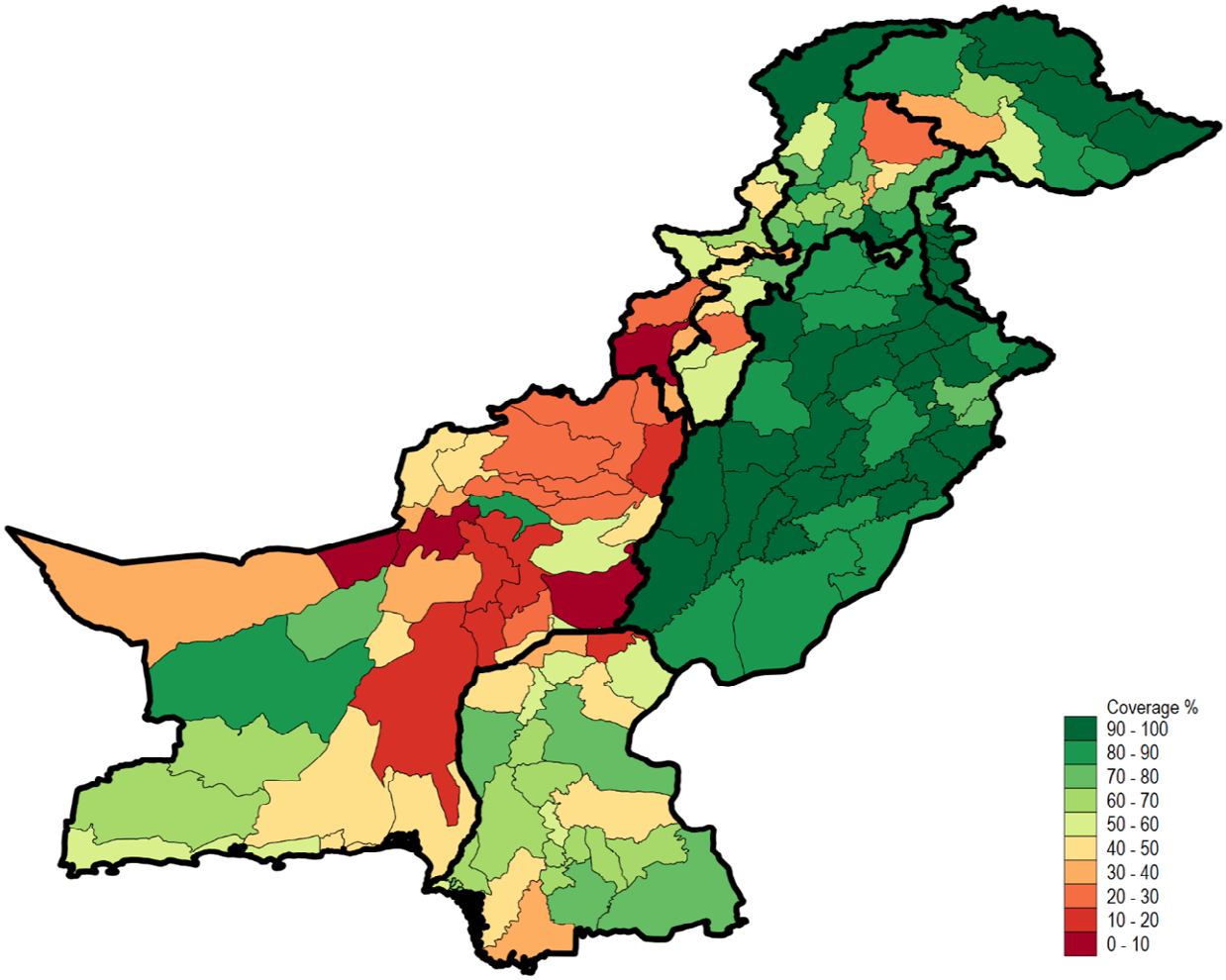


Figure 3-27. Fully vaccinated – All 1YL doses except Rota, by district, Pakistan TPVICS 2020-21



Zero-Dose Children

The simple concept of the zero-dose child may be subjected to sensitivity analysis like that used for the fully vaccinated child. The obvious definition is a child who did not receive any of the doses in the EPI schedule.

In this section of the report, results are reported for a single definition. In Table 3-14 and Figures 3-28 and 3-29, the child is considered to be not vaccinated (or *zero-dose*) if they received none of the doses due in the first year of life according to Pakistan's 2020 EPI schedule. (Rotavirus vaccine, the newest vaccine in Pakistan's EPI schedule, is excluded from the analysis, but only two children out of 110,790 in the TPVICS survey had evidence of receiving Rotavirus vaccine and no other vaccines.)

Annex D reports outcomes for six definitions of zero-dose child, including the Gavi proxy measure, which considers a child to be zero-dose if they have not received Penta1.

Additional information about zero-dose (unvaccinated) children are provided in Supplements 03, 06, 07, 08, and 09.

Table 3-14. Not vaccinated or Zero-Dose – Child received none of the 1YL doses, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	0.6	6.9	10.8	34.2	31.5	2.9	5.4	0.9	3.9
Maternal Education (years)									
None	1.0	10.6	14.8	32.1	33.5	7.6	9.5	2.8	7.1
Primary (1-5)	0.5	3.3	7.0	42.0	35.8	2.1	2.2	0.4	2.9
Middle (6-8)	0.4	2.3	6.1	45.8	29.6	4.2	2.4	0.6	3.1
Secondary (9-10)	0.3	1.0	4.7	52.8	18.0	1.9	1.4	0.6	1.1
Higher (11 and above)	0.0	0.7	3.7	36.0	11.3	0.4	0.8	0.2	0.4
Sex									
Boys	0.5	6.6	10.6	36.7	31.9	4.7	5.6	0.7	3.9
Girls	0.7	7.1	11.0	31.0	31.0	1.2	5.3	1.1	3.9
Wealth									
Lowest	2.4	13.2	26.7	43.8	41.9	0.0	17.9	5.9	6.6
Second	0.8	12.0	18.5	36.8	30.2	3.1	11.2	1.9	5.1
Middle	0.6	6.8	13.8	28.2	24.7	4.2	6.3	1.0	3.1
Fourth	0.6	4.2	7.2	17.0	24.6	2.3	3.0	0.5	1.9
Highest	0.3	1.9	4.3	6.5	17.5	3.0	1.2	0.2	2.4
Area									
Urban	0.6	3.5	6.6		23.6	1.2	2.8	1.4	4.5
Rural	0.5	10.6	11.8		34.4	4.5	7.0	0.8	3.8
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: This measure is a population estimate that incorporates survey weights.
Note: To be counted as not vaccinated, the child must not have received any of these doses: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1

Figure 3-28. Not vaccinated or Zero-Dose – Child received none of the 1YL doses, by region, Pakistan TPVICS 2020-21

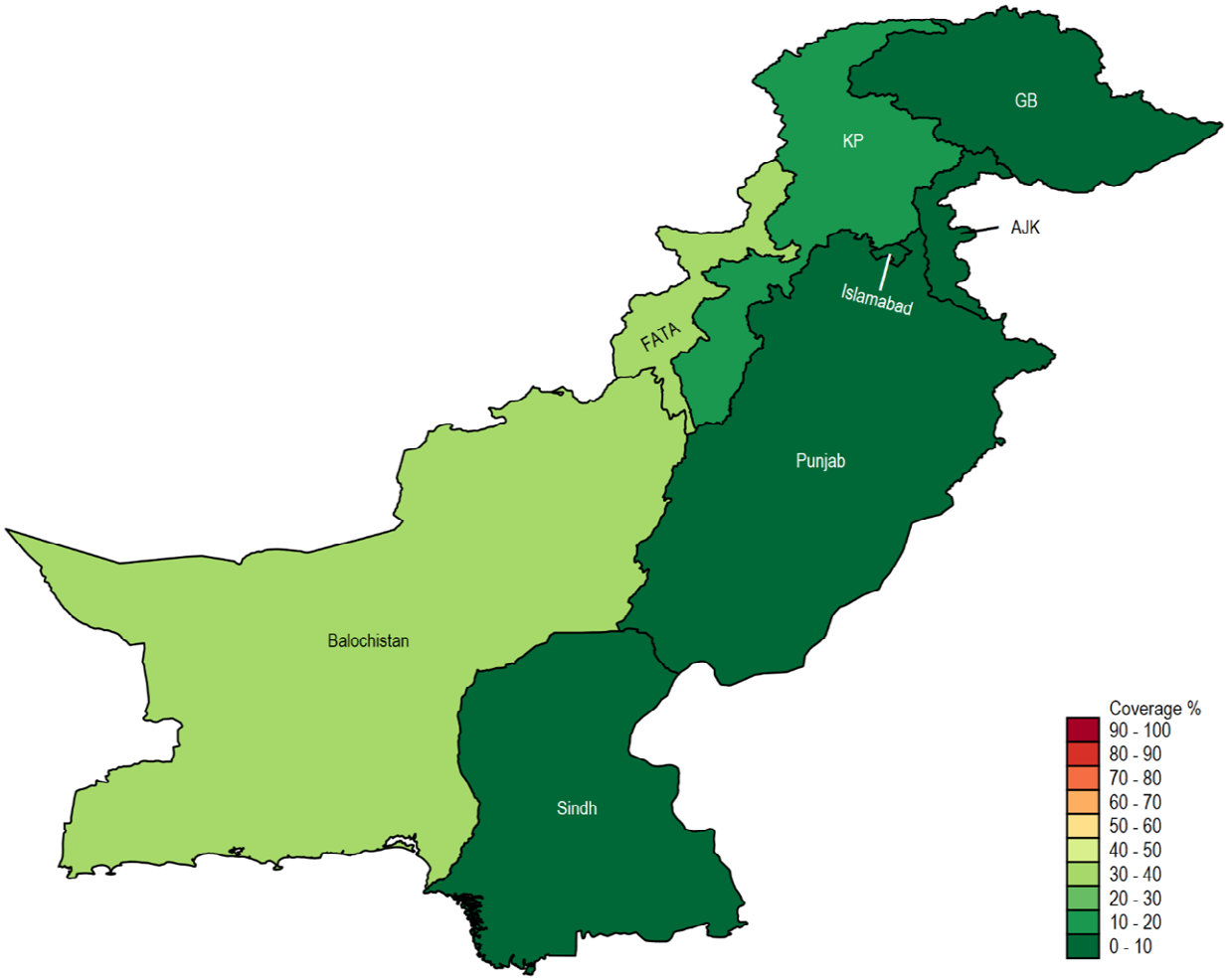
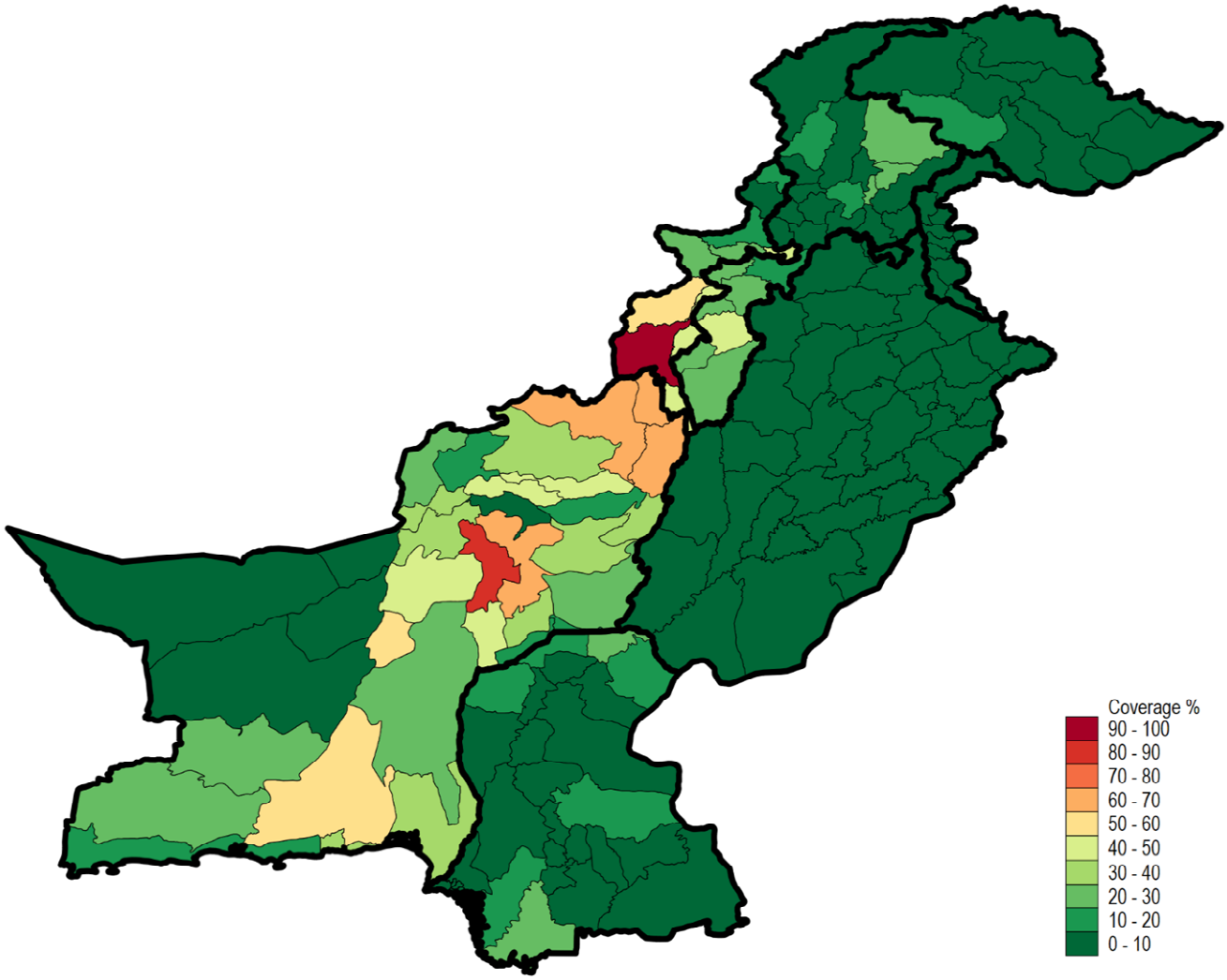


Figure 3-29. Not vaccinated or Zero-Dose – Child received none of the 1YL doses, by district, Pakistan TPVICS 2020-21



Documented Intra-Dose Intervals

To maximize the probability that doses in a series result in a biological response of immunity, the doses should be spaced at least four weeks apart. If the spacing is shorter than four weeks, the later doses are not considered to be valid doses. If the spacing is notably longer than four weeks then the child has spent unnecessary time under-protected against the vaccine-preventable diseases. VCQI assessed the dates on vaccination cards and classified children as having 1YL intradose intervals that were < 4 weeks (too short), 4-8 weeks (appropriate), or > 8 weeks (too long). The results are documented for Penta, OPV, PCV, and Rota in the supplements, but the results are very similar across doses, so only results for Penta intradose intervals are reported in the body of this report. Tables 3-15 to 3-17 show the proportion of Penta intradose intervals that are < 4 weeks, 4-8 weeks, and > 8 weeks, respectively. Figures 3-30 and 3-31 show the proportion, in particular, of Penta2 to Penta3 intervals that are > 8 weeks. Note in Tables 3-16 and 3-17, especially the stair-step patterns that indicate poorer outcomes (fewer children with intervals 4-8 weeks and more children with intervals > 8 weeks) for children from poor families and whose mothers have fewer years of education.

Additional information about intra-dose intervals is provided in Supplements 02, 06, 07, 08, and 09.

Table 3-15. Penta intradose intervals from HBR that are < 28 days (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	2.8	2.0	2.0	2.6	3.2	2.6	2.5	1.0	2.3
Maternal Education									
None	2.7	2.1	2.2	2.8	3.6	2.4	2.5	1.2	2.9
Primary (1-5)	2.8	2.0	1.2	1.4	1.2	1.4	2.4	1.2	2.6
Middle (6-8)	3.0	2.7	1.7	2.6	3.2	2.1	2.7	0.8	2.0
Secondary (9-10)	3.0	1.6	2.3	0.6	2.3	4.3	2.6	1.3	1.2
Higher (11 and above)	2.6	1.8	2.1	1.8	1.7	2.2	2.2	0.8	2.2
Sex									
Boys	2.7	2.0	2.1	3.0	3.6	2.5	2.5	1.0	2.0
Girls	2.9	2.0	2.0	2.2	2.8	2.6	2.5	1.1	2.5
Wealth									
Lowest	1.8	2.4	2.8	2.4	3.2	0.0	2.4	0.9	2.7
Second	2.7	2.2	2.5	2.6	3.3	3.2	2.6	1.5	3.0
Middle	2.7	1.8	2.2	2.5	3.5	0.0	2.5	1.5	2.0
Fourth	3.1	2.2	1.8	3.5	3.3	2.9	2.6	0.8	1.3
Highest	2.8	1.7	1.7	1.3	1.8	2.7	2.4	0.7	1.9
Area									
Urban	2.3	1.8	1.4		2.7	3.1	2.1	1.2	1.1
Rural	2.9	2.2	2.1		3.4	1.8	2.7	1.0	2.4
N	38,615	16,928	15,277	3,847	4,771	1,559	80,997	10,682	5,092

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*

KP results exclude FATA. FATA is almost entirely rural.

Color bars are scaled so that 100% would fill the entire cell.

For this indicator, N is the number of Dose 1 to Dose 2 intervals plus the number of Dose 2 to Dose 3 intervals for which respondents had vaccination dates. Some respondents will have contributed data for no intervals, some for one interval, and some for two intervals.

Table 3-16. Penta intradose intervals from HBR that are 4-8 weeks (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	85.0	74.4	66.2	60.1	69.5	80.3	77.0	90.2	81.5
Maternal Education									
None	83.7	68.2	62.2	58.9	68.0	70.2	72.2	85.0	76.0
Primary (1-5)	85.1	77.3	67.5	50.7	73.9	72.5	80.4	90.7	79.1
Middle (6-8)	84.9	75.0	68.9	64.8	62.6	78.6	79.4	92.7	82.0
Secondary (9-10)	85.4	81.0	70.1	76.8	74.1	81.6	81.2	91.8	85.2
Higher (11 and above)	87.7	85.6	73.8	71.2	77.8	85.2	83.9	91.9	86.9
Sex									
Boys	85.3	74.2	66.2	61.7	69.4	80.3	77.2	90.3	82.7
Girls	84.7	74.5	66.3	58.4	69.7	80.3	76.9	90.1	80.1
Wealth									
Lowest	86.4	62.1	60.0	57.1	68.7	57.9	68.1	81.2	74.7
Second	82.9	67.1	62.7	59.3	67.0	58.1	70.4	86.6	76.0
Middle	84.2	72.1	64.9	63.0	68.4	76.1	74.5	89.8	84.9
Fourth	84.3	76.7	67.6	59.1	73.8	78.0	78.0	91.6	85.9
Highest	86.2	82.1	69.5	69.7	75.6	82.1	82.9	92.2	88.4
Area									
Urban	85.8	79.0	68.5		72.7	78.1	80.4	90.0	85.5
Rural	84.7	68.5	65.9		68.4	83.3	75.7	90.3	81.0
N	38,615	16,928	15,277	3,847	4,771	1,559	80,997	10,682	5,092

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
For this indicator, N is the number of Dose 1 to Dose 2 intervals plus the number of Dose 2 to Dose 3 intervals for which respondents had vaccination dates. Some respondents will have contributed data for no intervals, some for one interval, and some for two intervals.

Table 3-17. Penta intradose intervals from HBR that are > 8 weeks (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	12.2	23.6	31.8	37.2	27.3	17.1	20.5	8.7	16.3
Maternal Education									
None	13.6	29.7	35.6	38.3	28.4	27.5	25.3	13.8	21.1
Primary (1-5)	12.0	20.7	31.3	47.9	24.9	26.1	17.2	8.1	18.3
Middle (6-8)	12.1	22.2	29.4	32.7	34.2	19.3	17.9	6.6	16.0
Secondary (9-10)	11.6	17.4	27.6	22.6	23.6	14.0	16.2	6.9	13.6
Higher (11 and above)	9.8	12.6	24.1	27.1	20.4	12.5	13.9	7.3	10.9
Sex									
Boys	12.0	23.8	31.8	35.2	27.1	17.2	20.4	8.6	15.2
Girls	12.5	23.5	31.8	39.5	27.5	17.1	20.6	8.8	17.4
Wealth									
Lowest	11.8	35.6	37.2	40.5	28.2	42.1	29.5	17.9	22.6
Second	14.4	30.6	34.9	38.1	29.7	38.7	27.0	11.9	20.9
Middle	13.1	26.1	32.9	34.5	28.1	23.9	23.0	8.8	13.2
Fourth	12.7	21.1	30.6	37.4	22.9	19.1	19.4	7.6	12.8
Highest	11.0	16.1	28.8	29.0	22.6	15.2	14.8	7.1	9.7
Area									
Urban	11.9	19.2	30.1		24.6	18.8	17.5	8.8	13.4
Rural	12.3	29.3	32.0		28.2	14.9	21.6	8.7	16.6
N	38,615	16,928	15,277	3,847	4,771	1,559	80,997	10,682	5,092

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
For this indicator, N is the number of Dose 1 to Dose 2 intervals plus the number of Dose 2 to Dose 3 intervals for which respondents had vaccination dates. Some respondents will have contributed data for no intervals, some for one interval, and some for two intervals.

Figure 3-30. Penta2 to Penta3 intradose intervals from HBR that are > 8 weeks, by region, Pakistan TPVICS 2020-21

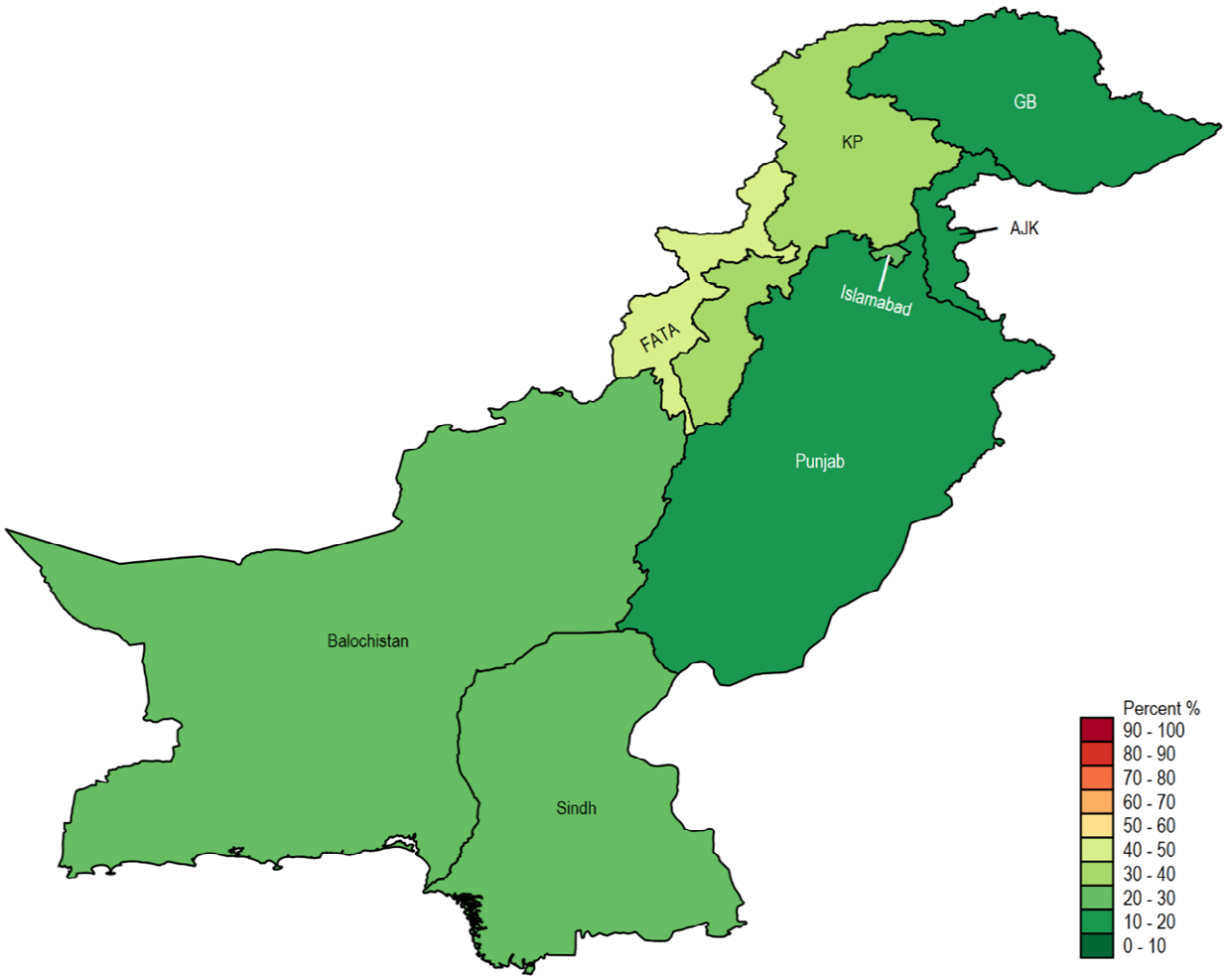
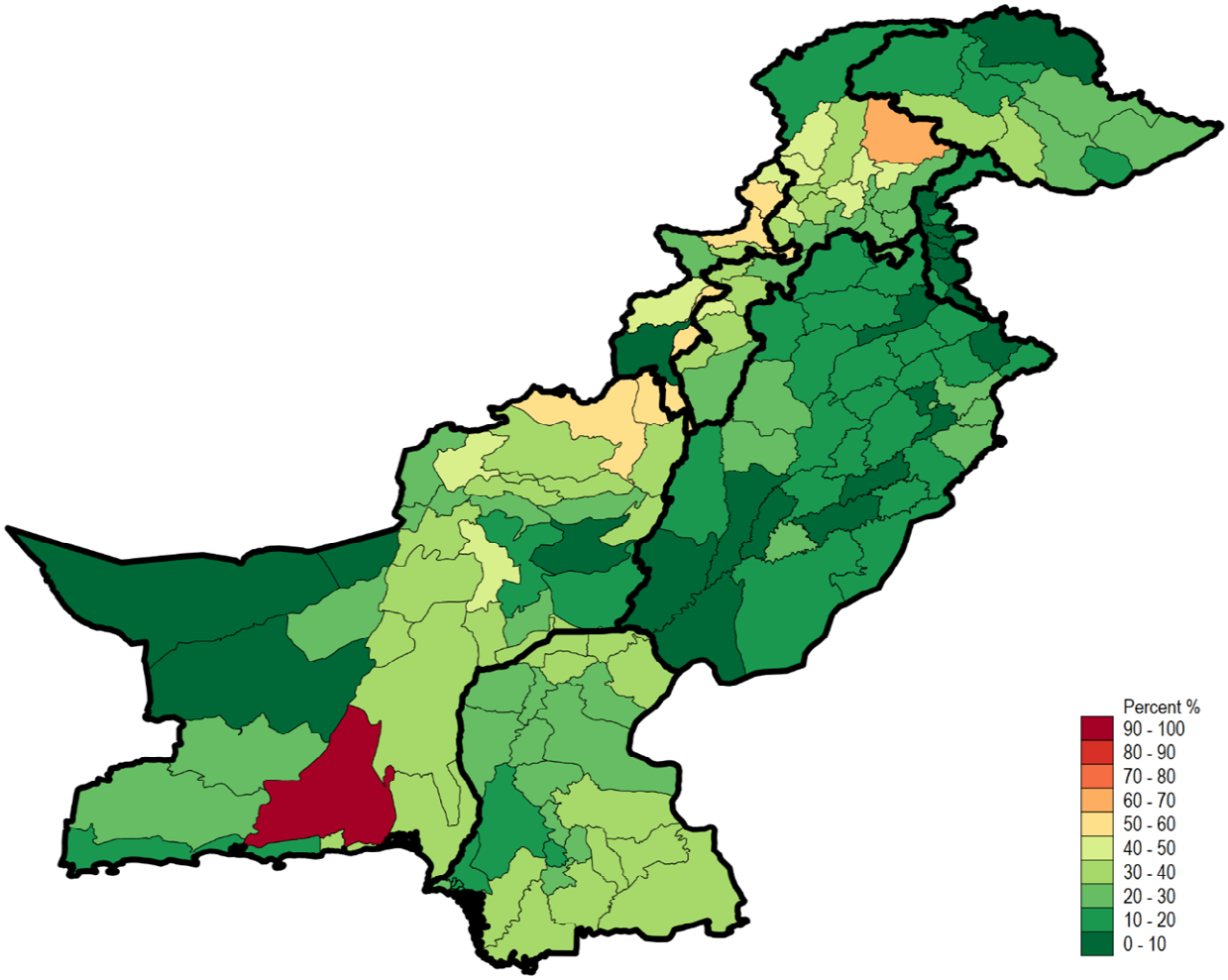


Figure 3-31. Penta2 to Penta3 intradose intervals from HBR that are > 8 weeks, by district, Pakistan TPVICS 2020-21



Missed Opportunities for Simultaneous Vaccination (MOSV)

A missed opportunity for vaccination (MOV) is when a child has contact with the health system and does not receive all the vaccine doses for which s/he is eligible on that day. More specifically, a missed opportunity for simultaneous vaccination (MOSV) is when a child receives a vaccine but does not receive all the vaccine doses for which s/he is eligible on that day. VCQI uses dates from vaccination cards to assess what proportion of documented vaccination visits result in MOSVs and to assess what proportion of children experience MOSVs.

MOSV[7] analyses are described in some detail in the WHO 2018 Vaccination Coverage Cluster Survey Reference Manual and in a recent 2021 peer-reviewed publication [3], [4]. MOSVs are often summarized

[7] The term MOV has been used for several decades and the term MOSV is brand new, having been introduced in that 2021 paper. In earlier documents, authors use the phrase MOVs to mean both the broader category of MOVs that happen in any health system contact, and to mean the more specific category of MOVs that occur at vaccination visits. Because the only health system contact dates that VCQI can know are the dates from the vaccination card, all of VCQI's analyses are of MOSVs, even if some VCQI documentation uses the older phrase: MOVs.

in two ways, analyzing the proportion of vaccination visits that include one or more MOSVs, and analyzing the proportion of children who experience MOSVs during one or more vaccination visits.

MOSV: Visit-Based Analyses

Table 3-18 and Figure 3-32 summarize the proportion of vaccination visits documented on cards in which a MOSV occurred. These data are quite encouraging. Fewer than 20% of all vaccination visits include a MOSV. That is to say that on more than 80% of documented vaccination visits, the health facility staff correctly assessed which doses the child should receive and administered them all. Note in the table that MOSVs occur in a higher percentage of visits at rural facilities and visits by children from poor families and children with less educated mothers.

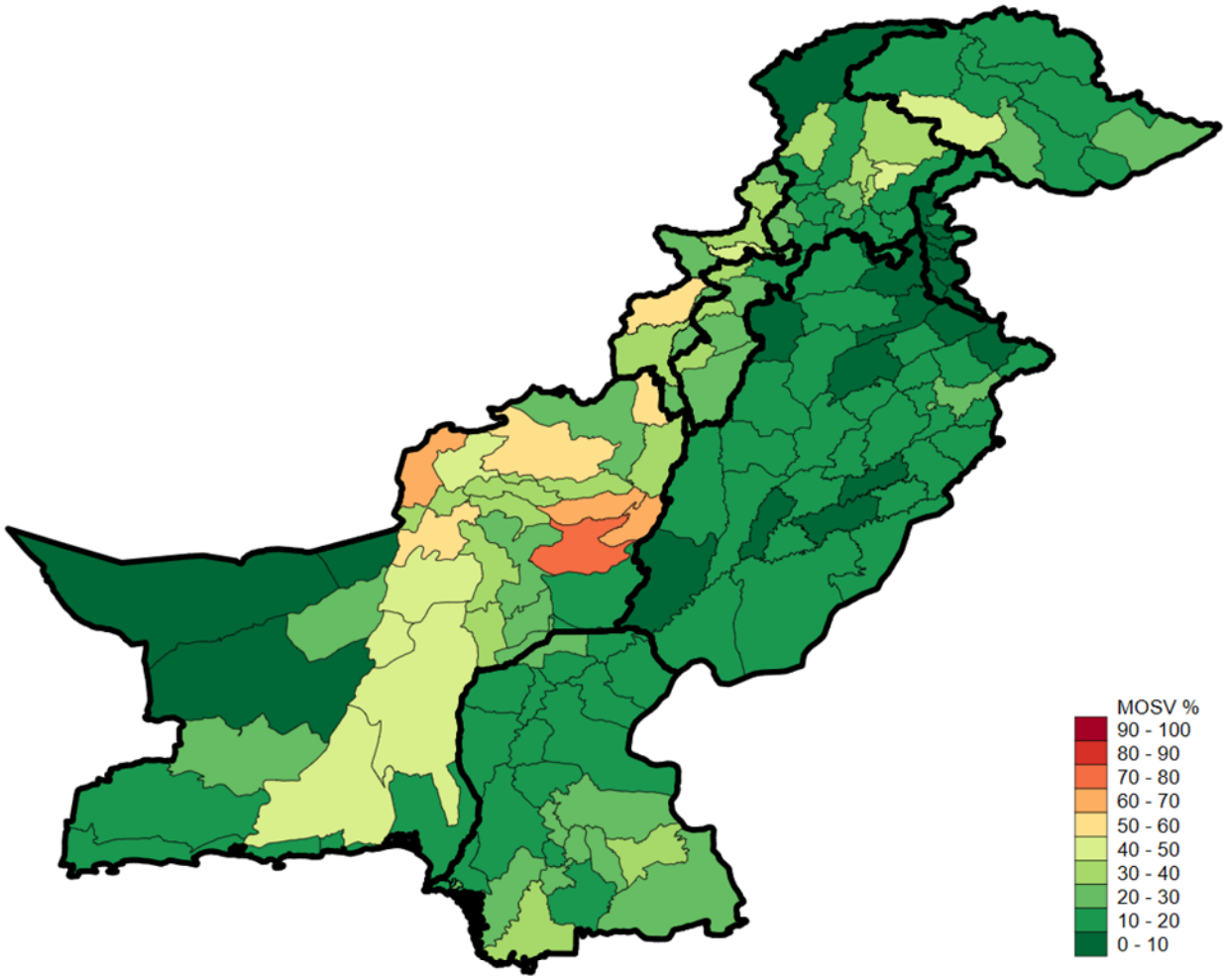
Additional information about MOSVs is provided in Supplements 02, 06, 07, 08 and 09.

Table 3-18. Vaccination visits with MOSV for any dose (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	13.0	18.4	22.1	34.2	30.7	12.6	17.6	7.3	15.7
Maternal Education (years)									
None	14.4	22.7	26.3	34.4	32.5	18.7	21.8	11.9	20.6
Primary (1-5)	13.5	16.1	19.5	32.2	20.6	18.1	15.1	7.3	17.5
Middle (6-8)	12.9	15.7	18.4	36.9	32.4	15.6	15.3	6.4	15.1
Secondary (9-10)	11.7	13.4	16.6	29.6	29.5	12.0	13.6	5.5	13.3
Higher (11 and above)	10.4	11.7	16.9	33.4	22.3	8.9	12.5	5.1	10.5
Sex									
Boys	13.0	18.3	22.1	34.1	30.4	13.3	17.6	7.2	15.4
Girls	13.0	18.4	22.1	34.2	31.1	11.9	17.6	7.3	15.9
Wealth									
Lowest	13.8	29.0	29.4	43.1	32.4	41.8	27.6	18.0	24.1
Second	15.0	23.3	27.2	35.6	33.3	26.7	23.6	13.0	19.9
Middle	14.3	18.6	24.6	28.4	32.3	15.5	19.7	8.0	13.7
Fourth	13.4	15.7	20.2	31.3	26.0	13.8	16.2	5.5	10.5
Highest	11.6	13.4	16.8	23.4	22.2	11.2	12.8	4.4	8.7
Area									
Urban	11.5	15.1	18.2		23.4	12.5	14.3	6.4	11.4
Rural	13.5	22.6	22.7		33.4	12.8	19.0	7.4	16.2
N	108,207	45,062	39,183	9,676	11,714	4,160	218,002	28,847	13,413

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Percent of visits where children were eligible for the dose and did not receive it.
Early doses are accepted in this analysis; all doses are considered valid doses.
N is the number of vaccination visits recorded on cards where the child was eligible to receive at least one dose.

Figure 3-32. Vaccination Visits with MOSV For Any Dose, (%), by region, Pakistan TPVICS 2020-21



MOSV: Child-Based Analyses

Table 3-19 summarizes the proportion of children who experienced one or more MOSVs by region and by demographic characteristics. Given that MOSVs are quite rare, occurring in fewer than 1 in every five visits, it is surprising to see that a high proportion of children experience MOSVs: more than half the children in the provinces excluding AJK & GB experienced at least on MOSV, with one in four in AJK (26.2%) and nearly half (45.4%) in GB. Figures 3-33 and 3-34 show that outcome on a map by district. Even in districts where nearly all of the children are fully vaccinated (see Figure 3-27), a notable proportion experienced one or more MOSVs.

Figure 35 illustrates the interesting point that MOSVs are quite rare for most of the doses in the first year of life except IPV, for which MOSVs were very common and MCV1, for which there were notably more MOSVs than for other doses. The explanation for this phenomenon goes back to the topic of timeliness. The vaccination coverage and timeliness charts earlier in the report illustrated with pink bar segments that a notable portion of children received their 6-week doses (Penta1, OPV1, PCV1, Rota1) one or more months late and an even larger proportion received their 10-week doses (Penta2, OPV, PCV2, Rota2) more

than one month late, meaning that they received the 10-week doses after they were 14 weeks of age.

But IPV is due at 14 weeks of age, and was usually not administered with those 10-week doses (or even sometimes the 6-week doses) that were being administered at age 14+ weeks. Instead, the vaccinators delayed the IPV dose and administered it later, with the other doses scheduled for 14 weeks (Penta3, OPV3, PCV3). Penta, OPV, and PCV are doses in a series and it is correct to wait at least four weeks after the 10-week doses before administering the series doses due at 14-weeks. But IPV is not in a dose series, and biologically and immunologically, it could be administered at the first visit after the child is 14 weeks of age, even if that meant administering it with the doses that were scheduled for 6 or 10 weeks of age.

So two factors work together to produce these IPV MOSVs: first, quite a few children receive their 6- and 10-week doses late – sometimes so late that they are being administered after the child has reached the age of 14 weeks. And second, Pakistan's vaccinators are very consistent about administering IPV at the same time as Penta3, OPV3, and PCV3. These factors combine to mean that those children spend extra weeks without the protection provided by IPV. Table 3-20 summarizes the proportion of children with vaccination cards and vaccination visits after age 14 weeks who experienced one or more MOSVs for IPV.

Furthermore, most of the children who receive 6-week and 10-week doses after the age of 14 week go on to later receive the 14-week doses, including IPV, but some do not. Some children who had a vaccination visit after the age of 14 weeks failed to receive IPV and then dropped out, never receiving Penta3, OPV3, PCV3, Rota2, or IPV.

When a child experiences an MOSV and then receives the dose at a later visit, we say that it was a *corrected MOSV*. When the child has not received the dose at the time of the vaccination coverage survey, we call it an *uncorrected MOSV.* Table 3-21 summarizes the proportion of IPV MOSVs that were uncorrected at the time of the TPVICS survey interview. Note that in some provinces children were less likely to have the MOSV corrected – meaning that they had not yet received the protection of IPV even though they have received at least one vaccine after the age of 14 weeks – if they were from a poor family or had a mother with fewer years of education.

Table 3-23 documents the proportion of visits when the child was experiencing their first MOSV for IPV, so the first vaccination visit after they were 14 weeks old, and what percent of those vaccination visits included receiving a valid dose of Penta1 (due at 6 weeks), what percent of those first IPV MOSV visits included receiving a valid dose of Penta2 (due at 10 weeks), and what percent included receiving a valid dose of Penta3. One-fourth (24.5%) of the 23,548 children who experienced an IPV MOSV were receiving their 6-week dose of Penta1 at a vaccination visit where they were 14+ weeks old. Two-thirds (65.5%) were receiving their 10-week dose of Penta2. And only 1% of children with IPV MOSVs were receiving the 14-week dose of Penta3 at the IPV MOSV visit (perhaps due to oversight or due to stock-out of IPV).

The situation with MCV1 is similar to IPV. There were 3,057 children with MOSVs for MCV1. Table 3-23

documents that at the first visit with an MCV1 MOSV (so the child would have been 9+ months old) 21.6% of those children were just receiving their 6-week Penta1 dose, and 24.5% were receiving a valid Penta2 and 37.7% were receiving their valid 14-week Penta3 dose. Even though the child was more than 9 months old, in those instances, the vaccinators did not also administer the MCV1 dose for which the child was eligible. Table 3-22 documents that in Pakistan excluding AJK and GB, 40.5% of the 2,843 children who experienced an MOSV for MCV1 had an uncorrected MOSV; they had not received MCV1 by the time of the TPVICS survey.

Table 3-19. Children aged 12-23m who experienced one or MOSVs for any dose (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	49.1	49.6	62.3	71.5	62.7	41.6	53.8	26.2	45.4
Maternal Education (years)									
None	53.1	56.8	67.0	71.6	64.3	51.4	59.8	38.0	52.9
Primary (1-5)	50.7	46.0	59.5	70.9	54.1	52.3	51.8	25.8	50.7
Middle (6-8)	49.4	45.7	60.0	74.0	64.6	53.7	52.2	23.7	45.4
Secondary (9-10)	44.9	40.3	55.5	67.0	60.0	42.2	46.7	21.1	41.6
Higher (11 and above)	41.3	34.7	53.8	72.1	54.4	31.8	42.4	20.5	35.0
Sex									
Boys	49.2	49.5	62.3	71.2	61.7	44.1	53.8	26.5	44.0
Girls	49.0	49.7	62.2	71.9	63.9	39.1	53.8	25.9	47.0
Wealth									
Lowest	47.8	64.6	64.5	78.9	65.6	80.0	63.5	50.2	55.3
Second	54.2	59.3	65.6	72.8	64.9	63.0	61.7	40.7	52.6
Middle	54.0	50.8	65.3	67.0	64.0	48.4	58.4	27.6	44.0
Fourth	51.1	44.8	61.3	67.1	55.8	44.9	53.3	22.0	34.5
Highest	44.4	39.6	56.0	64.9	54.5	38.1	44.6	17.4	31.1
Area									
Urban	42.7	43.0	59.5		54.2	41.7	45.0	21.6	35.3
Rural	51.2	57.5	62.7		65.6	41.4	57.3	26.9	46.7
N	20,045	10,618	8,967	2,605	3,167	904	46,306	5,786	2,952

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Percent of respondents who had date of birth and visit date data who failed to receive a vaccination for which they were eligible on an occasion when they received another vaccination.
Note: Early doses are accepted in this analysis; all doses are considered valid doses.

Figure 3-33. Children aged 12-23m who experienced one or MOSVs for any dose, by region, Pakistan TPVICS 2020-21

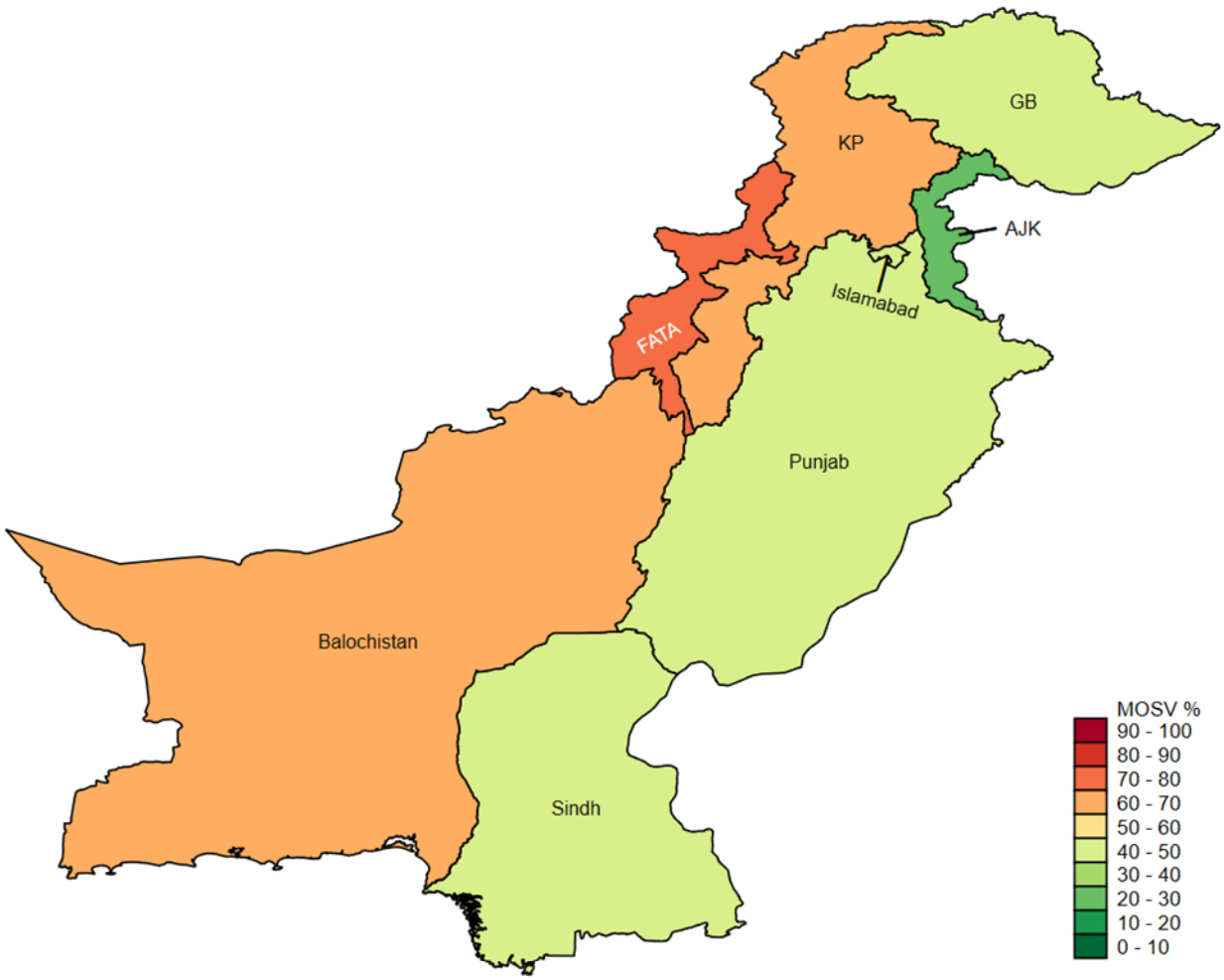


Figure 3-34. Children aged 12-23m who experienced one or MOSVs for any dose, by district, Pakistan TPVICS 2020-21

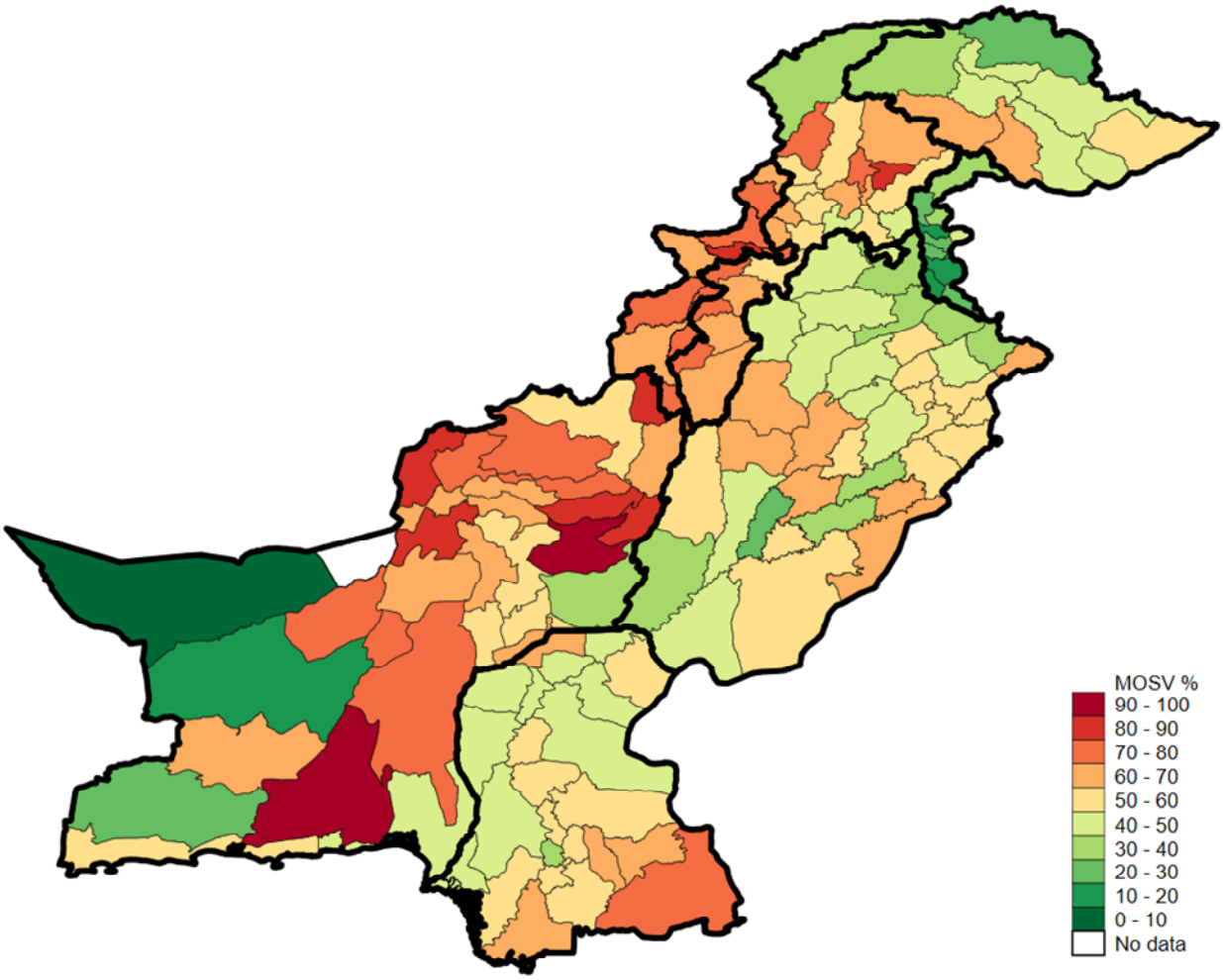


Figure 3-35. Children aged 12-23m who experienced one or MOSVs, by dose, by district, Pakistan TPVICS 2020-21

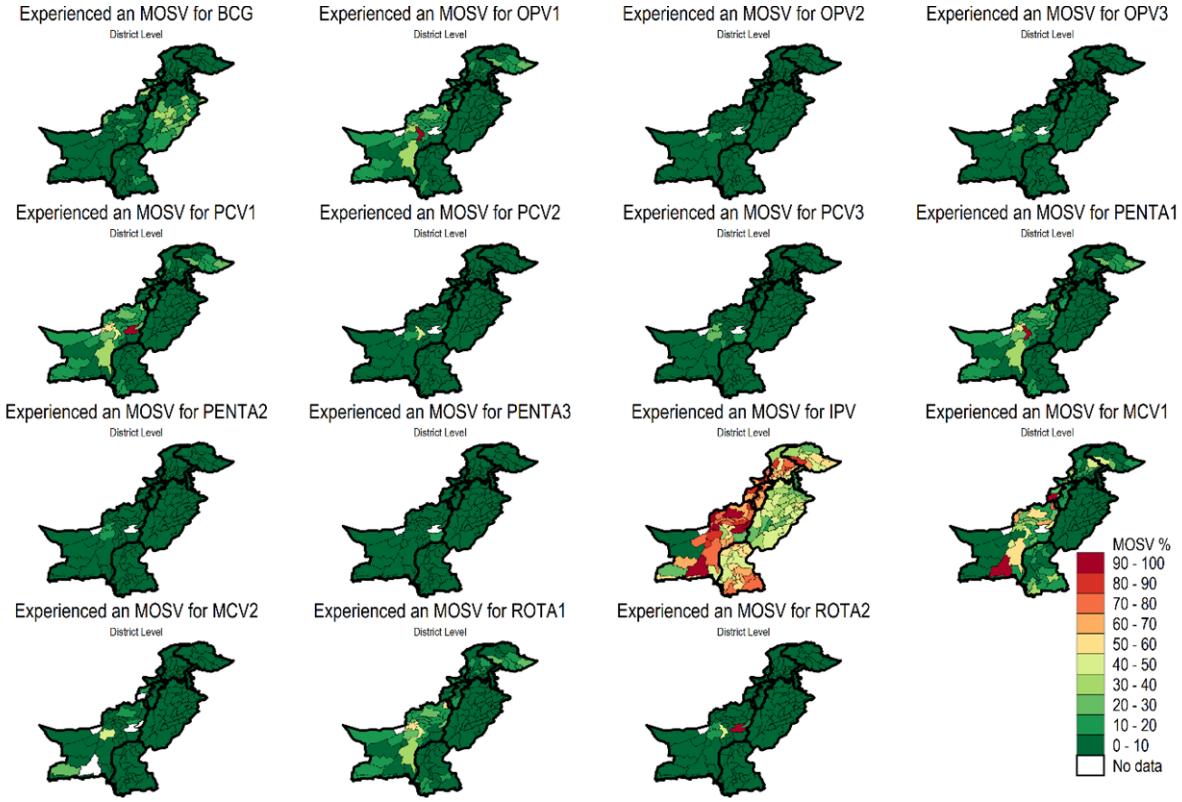


Table 3-20. Children aged 12-23m who experienced one or MOSVs for IPV (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	36.9	51.7	64.1	75.1	66.8	40.7	49.3	25.5	46.0
Maternal Education (years)									
None	39.8	61.1	69.9	75.2	69.0	53.3	57.4	37.7	54.8
Primary (1-5)	36.8	48.3	62.7	77.2	54.8	53.3	43.9	25.7	53.0
Middle (6-8)	37.9	45.9	60.9	80.9	72.1	52.6	45.8	23.8	44.8
Secondary (9-10)	34.1	39.6	56.5	67.4	63.3	40.4	40.9	19.7	42.7
Higher (11 and above)	32.1	32.9	52.6	72.3	55.6	30.5	37.6	19.2	33.3
Sex									
Boys	37.2	51.6	63.8	74.5	66.4	43.6	49.5	25.8	44.3
Girls	36.6	51.8	64.4	75.8	67.3	37.8	49.1	25.2	47.8
Wealth									
Lowest	39.4	70.4	70.7	81.8	70.4	78.6	65.7	51.3	57.3
Second	39.4	63.4	69.2	75.6	70.3	68.2	59.8	40.0	54.6
Middle	39.3	54.5	67.3	70.9	67.1	51.9	54.0	27.8	44.1
Fourth	37.9	46.3	62.5	72.2	59.2	45.2	47.1	21.0	34.9
Highest	34.3	39.0	56.8	69.4	56.3	36.9	38.8	16.7	27.2
Area									
Urban	35.8	43.7	60.3		57.6	41.0	42.8	20.7	35.1
Rural	37.3	61.2	64.7		69.8	40.3	51.9	26.2	47.4
N	19,380	9,109	8,183	2,258	2,695	815	42,440	5,422	2,680

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Percent of respondents who had date of birth and visit date data who failed to receive an IPV vaccination for which they were eligible on an occasion when they received another vaccination.
Note: Early doses are accepted in this analysis; all doses are considered valid doses.

Table 3-21. Percent of MOSVs for IPV that were uncorrected (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	2.4	20.4	12.3	23.6	24.5	16.3	12.8	5.8	8.0
Maternal Education									
None	2.4	21.7	14.9	24.1	26.3	33.8	16.1	7.9	10.0
Primary (1-5)	2.3	18.7	9.1	33.8	18.8	12.5	8.0	5.9	7.2
Middle (6-8)	3.2	21.9	9.6	19.1	21.0	19.5	9.5	4.6	6.6
Secondary (9-10)	2.3	17.2	8.6	11.7	16.8	9.8	7.9	4.3	7.2
Higher (11 and above)	2.3	16.0	8.5	19.1	16.7	7.3	8.3	3.9	5.0
Sex									
Boys	2.3	20.0	12.6	24.9	23.6	15.5	12.7	5.7	7.1
Girls	2.5	20.8	12.1	22.1	25.4	17.2	12.8	5.9	9.0
Wealth									
Lowest	2.3	21.4	18.1	26.0	27.3	45.5	20.9	13.4	5.0
Second	2.9	19.7	15.2	24.9	25.2	60.0	17.0	8.2	7.5
Middle	1.9	19.9	14.1	20.0	22.1	32.1	12.8	2.8	8.4
Fourth	1.7	21.2	10.7	23.4	20.0	8.9	9.5	4.7	11.4
Highest	3.2	19.9	8.1	16.9	26.1	11.7	9.1	5.6	9.4
Area									
Urban	4.6	21.9	9.3		18.3	19.3	14.2	13.2	14.0
Rural	1.7	19.2	12.8		26.2	11.9	12.3	5.0	7.5
N	7,153	4,707	5,245	1,696	1,800	332	20,933	1,383	1,232

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
N is the number of children who had an MOSV for IPV.

Table 3-22. Percent of MOSVs for MCV1 that were uncorrected (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	12.6	51.0	31.6	47.0	47.9	48.8	40.5	25.8	35.9
Maternal Education									
None	9.4	54.8	33.3	47.6	47.2	50.0	43.6	31.1	36.5
Primary (1-5)	9.2	45.5	35.4	30.8	40.0	33.3	30.9	38.9	30.0
Middle (6-8)	30.8	39.0	32.7	52.4	71.4	40.0	40.4	0.0	28.6
Secondary (9-10)	19.4	46.2	23.4	20.0	51.9	50.0	33.6	7.7	45.0
Higher (11 and above)	9.1	30.9	22.4	77.8	44.0	55.6	28.7	25.0	29.4
Sex									
Boys	12.8	51.9	32.5	46.2	50.7	55.0	41.5	16.7	42.9
Girls	12.5	50.0	30.4	47.9	45.1	42.9	39.4	34.7	27.8
Wealth									
Lowest	0.0	51.2	33.3	48.8	54.5	66.7	49.0	50.0	31.8
Second	3.1	55.5	28.4	44.7	45.6	75.0	41.2	31.8	40.7
Middle	10.0	55.5	32.9	50.0	42.3	40.0	38.9	21.1	26.9
Fourth	15.2	50.0	34.9	45.1	47.1	33.3	37.9	22.2	46.2
Highest	16.5	44.8	25.5	50.0	47.8	47.8	34.0	6.7	0.0
Area									
Urban	17.4	47.9	30.5		34.1	51.6	39.8	17.6	30.0
Rural	10.5	53.1	31.7		51.3	40.0	40.7	27.5	36.4
N	277	837	824	434	430	41	2,843	97	117

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
N is the number of children who had an MOSV for MCV1

Table 3-23. 6-week and 10-week and 14-week doses of Penta received during MOSVs for IPV and MCV1, Pakistan TPVICS 2020-21

	MOSVs for:	
	IPV	**MCV1**
N Children with MOSV	23,548	3,057
Received Valid 6-week Dose of Penta1 at MOSV Visit (%)	24.5%	21.6%
Received Valid 10-week Dose of Penta2 at MOSV Visit (%)	65.5%	24.5%
Received Valid 14-week Dose of Penta3 at MOSV Visit (%)	1.0%	37.7%
Received Valid 6- or 10- or 14-week Dose of Penta at MOSV Visit (%)	91.0%	83.8%

4.0 Discussion

The 2020-21 Pakistan TPVICS survey is the largest vaccination coverage survey that these authors have ever analyzed: largest in terms of respondents aged 12-23 months (N=110,790) and largest in terms of number of administrative strata for which to summarize vaccination program performance (N=152 districts and N=8 subnational strata). To thoroughly document all vaccination coverage indicators for each stratum would take many hundreds of pages. Rather than document those here, this report is intended to serve as an overview of the available results and to facilitate further dialog with the stakeholders of vaccination in Pakistan.

While we have highlighted some features in the outcomes that caught our attention, we expect that persons more familiar with Pakistan's immunization challenges and successes and interventions and investments will be able to see other, more insightful features as they explore this report and the online tables and maps and figures that accompany it.

To recap some points briefly:

1. The dataset is representative of children aged 12-23 months at the time of the survey.
2. Vaccination evidence for half the children in the dataset come from photos of home-based vaccination records, which are also known as vaccination cards.
3. After incorporating survey weights, the children with cards represent two-thirds of Pakistan's children aged 12-23m at the time of the survey.
4. Of the more than 750,000 dates transcribed from those ~55,000 cards, 99% passed VCQI's data quality tests for expected relationships among dates.
5. Vaccination coverage indicators are summarized in tables, maps, and figures and results are stratified by geographic strata as well as demographic subgroups.
6. Vaccination coverage varies from very high in Punjab to very low in Balochistan. Individual indicators are tabulated and portrayed in figures for every district in the online files that accompany this report.
7. A notable portion of children with vaccination cards received their vaccination doses late. Many received them more than a month later than scheduled, and as the children got older they received more and more doses more than two months late.
8. Most tables with outcomes summarized by demographic category in this report show evidence of poorer outcomes among children of poorly educated mothers and children of poorer families. The education and wealth variables each have five levels and in many cases the color bars show monotonic stair-step evidence of correlation between the outcomes and those simple measures of

socioeconomic status. This dataset could form the basis for careful follow-up multivariable logistic regression to calculate adjusted odds ratios of various outcomes, accounting for several family and respondent characteristics that were measured in the survey.

9. There is very little evidence of disparity in outcomes between boys and girls, with the exception being in FATA, where 11 of 20 statistical hypothesis tests yielded significant differences; in ten of those differences, outcomes were better for girls than for boys[8].

10. Half of the 160 urban versus rural statistical hypothesis test comparisons were statistically significant. Three-fourths of the significant differences documented better outcomes among urban respondents. The other one-fourth documents better outcomes among rural respondents[8].

11. The data from cards indicates that in more than 80% of documented vaccination visits, the vaccinators gave the child all the doses s/he was eligible for.

12. Missed opportunities for simultaneous vaccination (MOSVs) were observed for about half the children who showed vaccination cards. When those children received either (Penta1/OPV1/PCV1/Rota1) or (Penta2/OPV2/PCV2/Rota2) after the age of 14 weeks, the vaccinators did not usually also administer IPV, although they could have.[9]

13. MOSVs were observed for about 5% of children who showed vaccination cards, and many of those children were also just receiving doses ostensibly due at 6- or 10- or 14-weeks even though they are more than 9 months old. Where MOSVs were observed, the vaccinators did not also administer MCV1 with the other doses.

14. For both IPV and MCV1, a portion of the children with MOSVs received the missed dose at a later visit (i.e., the MOSV was corrected), but a portion of them did not (i.e., it was uncorrected).

The online supplement files that accompany this report hold many hundreds of pages. They each have interesting features. If you only look at two of those files, we recommend:

a) Supplement 05 – Vaccination coverage and timeliness charts for every province, region, and district. Those figures hold a lot of potential insight per page.

b) Supplement 06 – Maps of most outcomes for all districts. When flipping through dozens of maps of outcomes, there are details to be noticed and an overall pattern of excellent outcomes in Punjab, poor outcomes in Balochistan and FATA and a mix of good and poor outcomes elsewhere. (But note from the coverage and timeliness charts that even in Punjab where coverage is high, many doses are administered late,

[8] Details are listed in the accompanying file named Supplement 10.
[9] We note here that this outcome is not limited to Pakistan. We also see a predominance of IPV MOSVs in the 2021 UNICEF MICS-NICS in Nigeria, whose report will be forthcoming later this spring

and note from the map of IPV MOSVs that many Punjabi children experience MOSVs for IPV.)

If any sections of this report raise questions in the reader's mind, we would be happy to have a discussion and either point you toward the appropriate part of a supplement that might shed light on your question, or to come up with a plan to query the survey microdata or results datasets in a helpful manner. If any of the supplements are confusing or overwhelming, we would be happy to schedule a videoconference to give a guided tour of what is available and to discuss what else might be possible. Finally, if it would be helpful to assemble some province-specific or region-specific subsets of tables and figures, we can give advice on where to find what is wanted or can assist with assembling those curated subsets of the VCQI output. Please do not hesitate to contact Dale Rhoda with questions. (E-mail: Dale.Rhoda@biostatglobal.com)

References

[1] Centre of Excellence in Women and Child Health, "Third-Party Verification Immunization Coverage Survey (TPVICS) Survey Report," Aga Khan University, Jun. 2021. Accessed: Feb. 21, 2022. [Online]. Available: https://www.aku.edu/coe-wch/Documents/TPVICS%20Survey%20Report.pdf

[2] Biostat Global Consulting, "Vaccination Coverage Quality Indicators (VCQI) - Resources," 2021. http://www.biostatglobal.com/VCQI_RESOURCES.HTML (accessed Mar. 29, 2021).

[3] World Health Organization, *Vaccination Coverage Cluster Surveys: Reference Manual*, March 2021 (WHO/IVB/18.09). License: CC BY-NC-SA 3.0 IGO. Geneva, Switzerland: World Health Organization, 2018. Accessed: Jul. 27, 2021. [Online]. Available: https://apps.who.int/iris/handle/10665/272820

[4] D. A. Rhoda *et al.*, "Using Household Surveys to Assess Missed Opportunities for Simultaneous Vaccination: Longitudinal Examples from Colombia and Nigeria," *Vaccines*, vol. 9, no. 7, p. 795, Jul. 2021, doi: 10.3390/vaccines9070795.

[5] D. Filmer and L. H. Pritchett, "Estimating wealth effects without expenditure data—or tears: An application to educational enrollments in states of India," *Demography*, vol. 38, no. 1, pp. 115–132, Feb. 2001, doi: 10.1353/dem.2001.0003.

[6] "Household definitions in other statistical standards," in *OECD Guidelines for Micro Statistics on Household Wealth*, OECD, 2013, pp. 275–277. doi: 10.1787/9789264194878-18-en.

[7] StataCorp, *Stata Statistical Software: Release 17*. College Station, TX: StataCorp LLC., 2021.

[8] D. A. Rhoda, M. K. Trimner, M. L. Prier, and Clary, Caitlin B., *VCQI User's Guide, Draft Version 2.9*. Biostat Global Consulting, 2021. Accessed: May 26, 2021. [Online]. Available: http://www.biostatglobal.com/downloads/VCQI%20User's%20Guide.pdf

[9] D. A. Rhoda, M. L. Prier, and M. K. Trimner, "VCQI Forms and Variable List (FVL) Document, Draft Version 1.7." Biostat Global Consulting, Feb. 2021. Accessed: May 26, 2021. [Online]. Available: http://www.biostatglobal.com/downloads/VCQI%20Forms%20and%20Variable%20List%20(FVL)%20Document.pdf

[10] D. A. Rhoda, *VCQI Indicator List with Specifications, Draft Version 2.2*. Biostat Global Consulting, 2021. Accessed: May 31, 2021. [Online]. Available: http://www.biostatglobal.com/downloads/VCQI%20Indicator%20List%20with%20Specifications.pdf

[11] D. A. Rhoda, M. K. Trimner, and T. Albani, *VCQI Interpretation Quick Reference, Draft Version 1.4*. Biostat Global Consulting, 2019. Accessed: Apr. 16, 2020. [Online]. Available: http://www.biostatglobal.com/downloads/VCQI%20Interpretation%20Quick%20Reference.pdf

[12] Biostat Global Consulting and Aga Khan University, "TPVICS Advanced Analyses Report - Folder Holding Supporting Files," 2022. https://www.dropbox.com/sh/dv7y5sq7erkd563/AADe6vUuBUulsV92lngQZ9Iua?dl=0 (accessed Feb. 22, 2022).

[13] J. N. K. Rao and A. J. Scott, "A Simple Method for the Analysis of Clustered Binary Data," *Biometrics*, vol. 48, no. 2, p. 577, Jun. 1992, doi: 10.2307/2532311.

[14] J. N. K. Rao and A. J. Scott, "On Chi-Squared Tests for Multiway Contingency Tables with Cell Proportions Estimated from Survey Data," *Annals of Statistics*, vol. 12, no. 1, pp. 46–60, Mar. 1984, doi: 10.1214/aos/1176346391.

[15] A. Scott, "Rao-Scott corrections and their impact," presented at the Proceedings of the 2007 joint statistical meetings, Salt Lake City, Utah, 2007.

[16] R. L. Wasserstein and N. A. Lazar, "The ASA's Statement on *p* -Values: Context, Process, and Purpose," *The American Statistician*, vol. 70, no. 2, pp. 129–133, Apr. 2016, doi: 10.1080/00031305.2016.1154108.

[17] L. S. Hosmer DW Jr. Sturdivant RX, *Applied Logistic Regression, 3rd Edition*. 2013. [Online]. Available: https://www.wiley.com/en-us/Applied+Logistic+Regression,+3rd+Edition-p-9780470582473

[18] M. G. Natrella, "The Relation between Confidence Intervals and Tests of Significance-A Teaching Aid," *The American Statistician*, vol. 14, no. 1, p. 20, Feb. 1960, doi: 10.2307/2682129.

[19] M. E. Payton, M. H. Greenstone, and N. Schenker, "Overlapping confidence intervals or standard error intervals: what do they mean in terms of statistical significance?," *Journal of Insect Science*, vol. 3, no. 1, p. 34, 2003, doi: 10.1093/jis/3.1.34.

[20] N. Schenker and J. F. Gentleman, “On judging the significance of differences by examining the overlap between confidence intervals,” *The American Statistician*, vol. 55, no. 3, pp. 182–186, 2001, doi: 10.1198/000313001317097960.

Annex A. Sample Design and Survey Weights

Government of Pakistan
Pakistan Bureau of Statistics
Sample Design Section
Islamabad

Subject: **WRITE UP OF SAMPLE DESIGN FOR THIRD PARTY VERIFICATION IMMUNIZATION COVERAGE SURVEY-2020**

Ministry of National Health Services, Regulation and Coordination Islamabad (MONHSRC) in collaboration with Agha Khan University (AKU), Karachi and with the technical support of Pakistan Bureau of Statistics (PBS) being National Statistical Office (NSO) and custodian of sampling frame carried out district based Third Party Verification Immunization Coverage Survey (TPVICS) 2020. The basic aim of the survey was to verify the progress reported by Provincial Expanded Program of Immunization (EPI) in agreement with the Federal EPI and to provide additional data on indicators that measure service delivery performance and demand side issues impacting immunization coverage rate in Pakistan.

1. OBJECTIVES OF TPVICS: The details of the primary and secondary objectives of the survey are as under:

Primary Objectives: To verify progress reported by provincial EPI programs, in agreement with Federal EPI, on four out of the ten Disbursement Linked–Indicators (DLIs) under the NISP.

- DLI 1: Percentage of children aged between 12-23 months in each province who are fully immunized.
- DLI 3: Percentage of districts in each province reporting at least 80% coverage of Penta3 immunization in children between 12-23 months of age.
- DLI 8: Percentage of children under two years of age with vaccination cards available in each project province and,
- DLI 10: Percentage of children aged 12 to 23 months in each targeted city who are fully immunized.

Secondary Objectives: The secondary objectives are to provide additional data on indicators that measure demand-side issues impacting immunization coverage rate in Pakistan such as:

- Estimate the differences in immunization coverage across different wealth quintiles,
- Determine the coverage of BCG, four doses of OPV, three doses of DTP-HepB-Hib pentavalent vaccine, three doses of Pneumococcal conjugate vaccine (PCV10).
- Assess the sources of vaccinations; reasons for not vaccinations; vaccination card availability.
- Assess the coverage by urban/rural residency, sex of the child, level of maternal education, and household living standards.
- Ascertain the reasons for the lack of utilization of vaccination services across the country.
- Determine the coverage at provincial and national levels.

2. UNIVERSE

The universe of the survey consists of household-based population in all urban and rural areas of

four provinces of Pakistan, including Islamabad, Azad Jammu & Kashmir (AJ&K) and Gilgit-Baltistan (GB).

The cantonment areas being restricted areas have been excluded from the scope of the survey.

3. SAMPLING FRAME

Updated Sampling frame of Population & Housing Census 2017 used for the Survey. PBS has divided the whole country into small compact areas called enumeration blocks (E.Bs) comprising of 200-250 houses on an average, having digitized maps containing prominent landmarks within the boundaries of these blocks.

3A. Urban Areas

Each city/town has been divided into a number of small compact areas called Enumeration Blocks (EBs). Each enumeration block consists of on average 200 to 250 houses with well-defined boundaries recorded in the prescribed forms and maps thereof along with physical features available within the blocks.

3B. Rural Areas

The Rural Areas Frame consists of list of enumeration blocks (E.Bs) where an enumeration block can be either a whole village or part of a village. There EBs is called as Primary Sampling Units (PSUs).

Each PSU of Urban and Rural areas has well defined geographical boundaries described on a specified form along with map.

Total number of enumeration blocks/PSUs of 2017-Population & Housing Census is given below:-

Table A-1. Number of enumeration blocks in the 2017 Pakistan Population & Housing Census

Sr.no	NAME OF PROVINCE	NO OF BLOCKS		
		RURAL	URBAN	TOTAL
1	Khyber Pakhtunkhuwa (KP)	18,356	3,221	21,577
2	Punjab	60,048	26,958	87,006
3	Sindh	17,223	21,916	39,139
4	Balochistan	8,386	1,826	10,212
5	Fata	4,184	43	4,227
6	Islamabad	787	727	1,514
	Total	**108,984**	**54,691**	**163,675**
7	Azad Jammu & Kashmir (AJ&K)*	3,496	526	4,022
8	Gilgit-Baltistan (GB)*	1,098	148	1,246
	Total	**4,594**	**674**	**5,268**
	Grand Total	**113,578**	**55,365**	**168,943**

*According to the constitution of Pakistan, Pakistan constitutes of four provinces, Islamabad Capital Territory (ICT) whereas Gilgit-Baltistan & Azad Jammu & Kashmir are two independent territories. Therefore, whenever estimates or results of Pakistan are prepared, Gilgit-Baltistan & Azad Jammu & Kashmir are never covered. These two territories are treated separately and their results/reports are published separately. Similarly, here TPVICS estimates of Pakistan level will not cover Azad Jammu & Kashmir and Gilgit-Baltistan.

4. SAMPLE SIZE ESTIMATION

- **Estimated Immunization Coverage:** Several variable i.e. full Immunization, doses of DTP-HepB-Hib, Polio, Measles used to estimated sample size. The most conservative estimate of 50% coverage had been considered for districts with coverage <80% and 80% for districts with coverage of >80%. Three data sources EPI data 2018, MICS 2018 and NNS 2018 of Immunization Coverage variable used and minimum value among these have taken as prevalence indication against each district.
- **Precision:** Absolute precision of ± 5.5% at district level used.
- **Design Effect:** design effect of 2.5 was used.
- **Sample Size:** The total of 8786 PSUs covering 114,218 households was estimated.

Formula used for sample size calculations:-

$$n = \frac{Deff*4*r*(1-r)}{d^2*RR*pb*hh}$$

Where each component of the above formula is defined as in Table A-2:

Table A-2. Components of sample size equation

Sr.no	Component	Value	Source
1	t= Level of Significance= 95%	1.96	
2	r= Prevalence indicator or variable under reference = stunting (moderate) 12-23 months old children,		Minimum value taken from three sources i.e. EPI, NNS & MICS
3	Deff = Design Effect	2.5	
4	RR= Response Rate	95%	
5	d= margin of error to be tolerated at 95% level of confidence, defined as absolute margin of error	5.5%	Provided by AKU, Karachi
6	"Pb" is the Proportion of Children (12-23 months) in population upon which the indicator, r is based	2.7%	1. value provided by AKU, Karachi 2. Used fixed value for all districts
7	h= Average Household Size	(value for each district used)	value taken from 2017 Population & Housing Census
8	N= Total number of estimated households		

5. STRATIFICATION PLAN

Urban and Rural Domains

Each administrative district in four Provinces, Azad Jammu & Kashmir, and Gilgit-Baltistan has been treated as independent and explicit stratum. Urban and Rural part of an administrative district have been considered urban and rural domain respectively.

6. SAMPLE SIZE ALLOCATION

Keeping in view the variability for the characteristics for which estimates are to be prepared, population distribution and main objectives of the survey, an estimated sample of 8786 PSUs (enumeration blocks) comprising of 114,218 households (13 households per PSUs) has been selected from the sampling frame covering all districts is considered to be appropriate.

The detailed district wise sample size allocation is at annex, whereas Province wise sample size allocation is given below:

Table A-3. Sample PSU allocation by province or region

SR.NO	NAME OF PROVINCE	SAMPLE PSUs		
		RURAL	**URBAN**	**Total**
1	Khyber Pakhtunkhuwa	1693	160	1853
2	Punjab	1382	457	1839
3	Sindh	1055	801	1856
4	Balochistan	1792	320	2112
5	Islamabad	49	64	113
TOTAL		**5971**	**1802**	**7773**
7	Azad Jammu and Kashmir	509	71	580
8	Gilgit-Baltistan	382	51	433
TOTAL		**891**	**122**	**1013**
GRAND TOTAL		**6882**	**1924**	**8786**

7. DROPPED AREAS

Province and district wise summary of Dropped PSUs/Blocks is given below:-

Table A-4. Dropped PSUs

Name of Province/Area	S.No	Name of District/Agency	No of PSUs
Balochistan	01	Jhal Magsi	01
	02	Kalat	03
	03	Kharan	02
	04	Khuzdar	02
	05	Killa Saifullah	02
	06	Lasbela	01
	07	Pishin	01
	08	Ziarat	06
Khyber Pakhtunkhwa	09	Batagram	08
Sindh	10	Thatta	01
Total			**27**

The detailed summary of remaining 8759 PSUs is given below:-

Table A-5. TPVICS PSU allocation by province and urban/rural

Sr.no	NAME OF PROVINCE/AREA	RURAL	URBAN	TOTAL
1	Khyber Pakhtunkhwa	1,685	160	1,845
2	Punjab	1,382	457	1,839
3	Sindh	1,054	801	1,855
4	Balochistan	1,774	320	2,094
5	Islamabad	49	64	113
	TOTAL	**5,944**	**1,802**	**7,746**
6	Azad Jammu and Kashmir	509	71	580
7	Gilgit-Baltistan	382	51	433
	TOTAL	**891**	**122**	**1,013**
	GRAND TOTAL	**6,835**	**1,924**	**8,759**

8. SAMPLE DESIGN

A two-stage stratified sample design has been adopted for this survey.

i. Selection of Primary Sampling Units (PSUs)

Sample PSUs from each stratum have been selected with probability proportionate to size method (PPS) where total numbers of households within a PSU have been considered as measure of size (MOS) for all sample PSUs.

ii. Selection of Secondary Sampling Units (SSUs)

Based on specialized household listing undertaken in respect of each sampled PSU by the Field Staff of Agha Khan University Karachi, thirteen (13) households have been selected from rural and urban PSUs adopting systematic random sampling technique with a random start.

iii. Sampling Weights

Two stage sampling weights have computed for the survey based on selection probabilities, separately for each sampling stage and for each cluster (i.e. EB), briefly explained below;

P_{1hi}: first stage sampling probability of the i^{th} cluster in h^{th} stratum

P_{2hi}: second stage sampling probability within i^{th} cluster (households selection)

Overall probability of selection of a household in ith cluster of h^{th} stratum is

$$P_{hi} = P_{1hi} * P_{2hi}$$

First stage selection probability computed using sampling frame information as explained below;

n_h: Number of clusters selected in h^{th} stratum,

N_{hi} : Total number of households in a cluster as per sampling frame

N_{hi}^{*}: Total number of households in h^{th} stratum as per sampling frame

The probability of selection of i^{th} cluster in the survey is calculated as

$$P_{1hi} = n_h * N_{hi} / N_{hi}^{*}$$

P_{2hi}: Second stage selection probability computed using field information provided by AKU, Karachi as explained below:

M_{hi}: The number of households listed during households listing operation in i^{th} cluster and h^{th} stratum

m_{hi}: Number of households selected within the cluster (here 13 households)

$$P_{2hi} = m_{hi} / M_{hi}$$

Two stage sampling weight (w_t) is the reciprocal of the overall selection probability by which a household is selected in the sample,

$$w_t = 1/P_{hi}$$

or

$$w_t = \frac{1}{P_{1hi} * P_{2hi}}$$

Adjustment of non- response Households:-

Household non-response adjustment factor is computed as given below:-

R_{hh}= Total number of households completed / Total number of households found

Two stage sampling weights with households non response adjustment is

$$W_{t\,hh} = W_t/R_{hh}$$

Final note #1: Per e-mail clarification with the Pakistan Bureau of Statistics, the weights are adjusted to align with the 2017 Population & Housing Census (population proportion). However, it is pertinent to mention here, that sampling weights are not post stratified with respect to households and ages. Further, the weights could be used to calculate total population, total households, and proportions as well.

Final note #2: For the VCQI analysis, the weights were all adjusted by a fixed multiplicative factor to make the sum of weights for the TPVICS 12-23m respondents equal to the number of children aged 12-23m in the analysis. So the sum of weights in these analyses may not be used to estimate total population or total households, but may be used to estimate proportions. It would be possible to re-scale (or un-adjust) the weights and repeat the analyses if there were an analytic goal of estimating totals.

Annex B. Maps Showing District Names

Figure B-1. Districts in Azad Jammu and Kashmir

Figure B-2. Districts in Balochistan

Figure B-3. Districts in FATA

Figure B-4. Districts in Gilgit-Baltistan

Figure B-5. Islamabad is a single health district

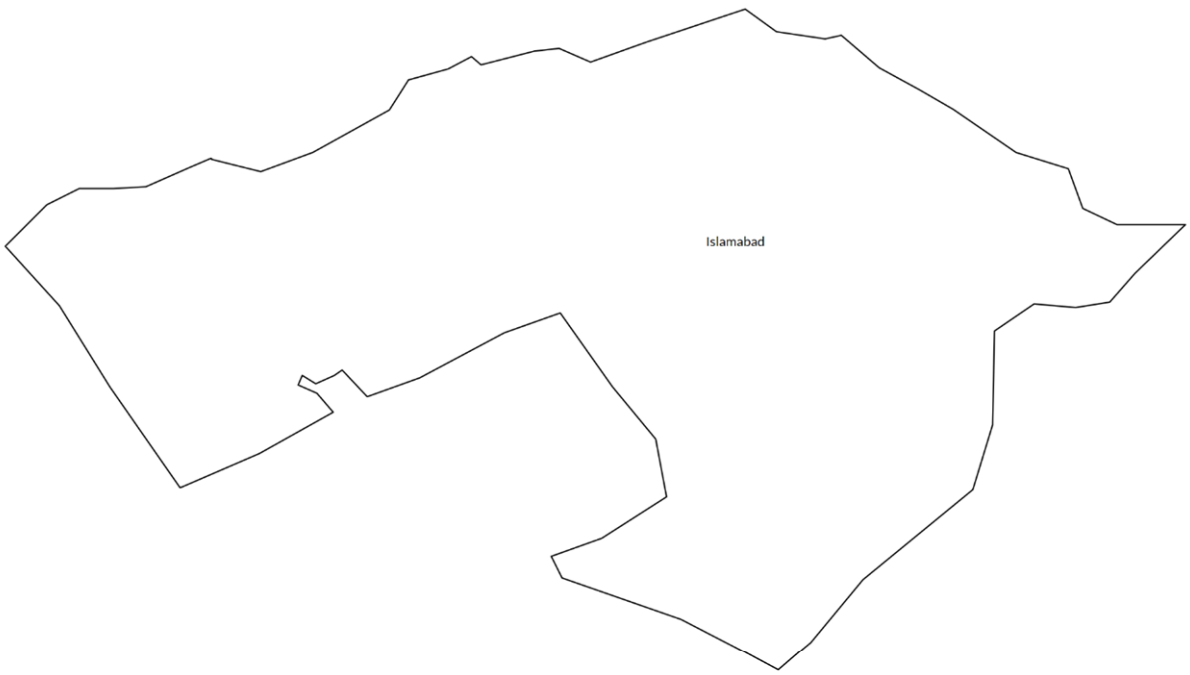


Figure B-6. Districts in Khyber Pakhtunkhwa

Figure B-7. Districts in Punjab

Figure B-8. Districts in Sindh

Annex C. Sensitivity Analysis – Definitions of Fully Vaccinated Child

Annex C is a sensitivity analysis to explore how the percentage of children declared to be *fully vaccinated* varies depending on which list of doses is used to define what we mean by fully vaccinated.

Four definitions of fully vaccinated are compared here:

1. Received all eight of the classic EPI doses: BCG, OPV1-3, DTP1-3 (or Penta1-3), and MCV1
2. Received all doses due in the first year of life (1YL):
   BCG, OPV0, OPV1-3, Penta1-3, PCV1-3, IPV, MCV1, Rota1-2
3. Received all doses in the DLI definition of fully vaccinated: BCG, OPV1-3, Penta1-3, PCV1-3, MCV1
4. Received all doses due in the first year of life except Rota (the vaccine added to the schedule most recently): BCG, OPV0, OPV1-3, Penta1-3, PCV1-3, IPV, MCV1

Table C-1 indicates that at the province level, all four definitions give nearly the same results. Tables C-2 through C-5 provide additional detail for demographic sub-groups. Figures C1-C4 show detail at the district level. District level estimates are tabulated in the file named:
Supplement 02 - TPVICS VCQI tables - overview output - 2022-02-25.xlsx

Table C-1. Fully vaccinated – Overall Comparison Across Four Definitions (%), Pakistan TPVICS 2020-21

Received All of the:	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
1. Traditional EPI Doses	91.1	63.7	69.7	44.4	39.0	72.4	78.0	89.3	75.8
2. 1YL Doses	89.0	59.1	67.7	42.3	37.1	70.4	75.3	88.6	70.2
3. Doses in the DLI Definition	90.5	62.1	69.1	43.7	38.4	71.4	77.1	89.1	74.2
4. 1YL doses (excluding Rota)	90.0	61.2	68.5	42.9	37.7	71.0	76.5	88.9	73.4
** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*									
KP results exclude FATA. FATA is almost entirely rural.									
Color bars are scaled so that 100% would fill the entire cell.									
Note: This measure is a population estimate that incorporates survey weights.									

Table C-2. Fully vaccinated – Definition 1: Basic 8 EPI doses, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	91.1	63.7	69.7	44.4	39.0	72.4	78.0	89.3	75.8
Maternal Education									
None	90.4	55.4	61.8	46.1	36.9	58.3	69.5	80.1	65.9
Primary (1-5)	91.5	65.3	78.0	30.7	29.8	66.0	84.5	89.7	73.1
Middle (6-8)	89.8	67.4	79.6	36.7	37.2	76.9	83.3	89.7	80.3
Secondary (9-10)	91.7	74.7	80.2	32.5	50.4	75.4	85.4	92.8	84.9
Higher (11 and above)	92.0	85.0	83.7	45.8	66.6	79.9	88.7	93.4	87.2
Sex									
Boys	91.0	64.1	69.8	43.2	38.7	71.2	77.7	89.7	75.9
Girls	91.1	63.3	69.5	45.9	39.5	73.5	78.3	88.8	75.6
Wealth									
Lowest	90.4	54.0	42.5	36.9	27.4	31.1	55.2	70.0	65.0
Second	90.3	55.1	56.0	42.7	39.2	59.5	67.3	83.3	72.4
Middle	91.1	62.0	63.6	50.0	47.9	59.7	76.9	88.9	79.6
Fourth	92.2	62.6	76.4	52.1	50.6	68.5	82.6	90.9	81.2
Highest	90.6	75.0	81.4	76.8	49.3	76.0	85.5	92.7	79.8
Area									
Urban	88.1	68.7	75.9		50.2	71.3	78.7	85.5	72.9
Rural	92.8	58.2	68.2		34.9	73.4	77.5	90.1	76.4
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: To be fully vaccinated, the child must have received: BCG MCV1 PENTA1 PENTA2 PENTA3 OPV1 OPV2 OPV3

Figure C-1. Fully vaccinated, Definition 1: Basic 8 EPI doses, by district, Pakistan TPVICS 2020-21

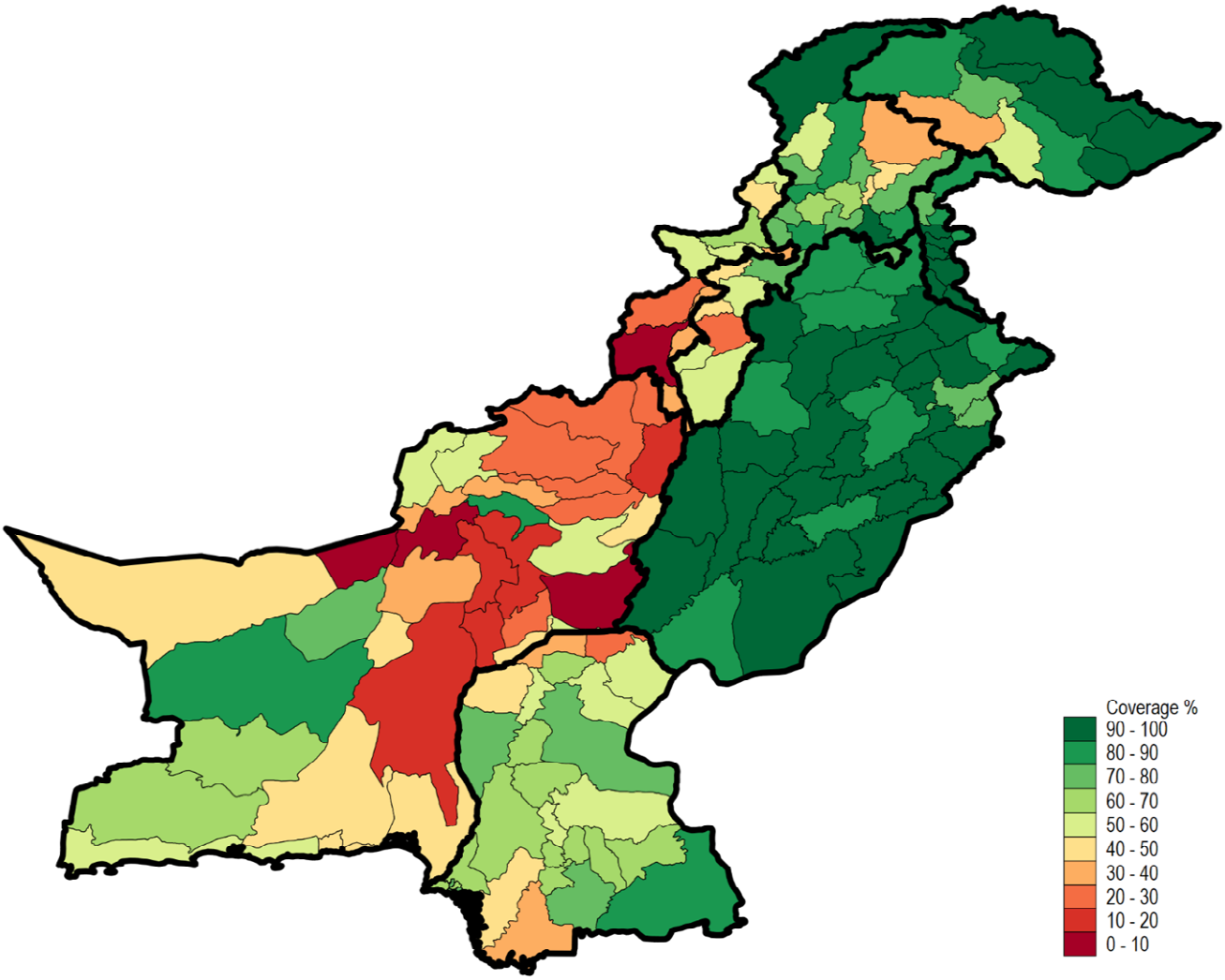


Table C-3. Fully vaccinated – Definition 2: All Pakistan first year of life (1YL) doses, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	89.0	59.1	67.7	42.3	37.1	70.4	75.3	88.6	70.2
Maternal Education									
None	87.8	50.9	59.7	44.0	35.0	56.5	66.5	79.5	60.5
Primary (1-5)	89.6	62.0	75.8	28.9	26.7	66.0	82.4	88.9	68.2
Middle (6-8)	88.0	61.0	78.0	33.8	36.1	75.2	80.7	88.9	73.8
Secondary (9-10)	90.0	70.5	78.6	32.0	46.9	74.0	83.1	92.3	80.2
Higher (11 and above)	90.5	79.2	82.2	42.4	65.0	77.0	86.1	92.7	80.8
Sex									
Boys	89.0	59.5	68.0	40.8	36.6	68.8	75.1	89.1	70.6
Girls	89.0	58.6	67.4	44.1	37.7	71.9	75.5	88.1	69.8
Wealth									
Lowest	87.6	50.4	40.1	35.6	26.1	31.1	52.3	68.8	61.2
Second	87.6	50.6	53.9	39.9	36.8	56.1	64.1	81.9	67.1
Middle	88.9	57.1	61.2	47.2	44.9	59.0	74.0	88.0	73.2
Fourth	90.2	57.3	74.3	51.3	48.5	67.1	80.0	90.4	75.0
Highest	88.8	70.0	80.3	76.3	48.5	73.7	83.0	92.4	74.9
Area									
Urban	86.1	63.6	74.6		47.7	69.5	75.6	85.0	65.5
Rural	90.7	54.0	66.1		33.1	71.2	75.0	89.4	71.3
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: To be fully vaccinated, the child must have received:
BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1 ROTA1 ROTA2

Figure C-2. Fully vaccinated – Definition 2: All Pakistan first year of life (1YL) doses, by district, Pakistan TPVICS 2020-21

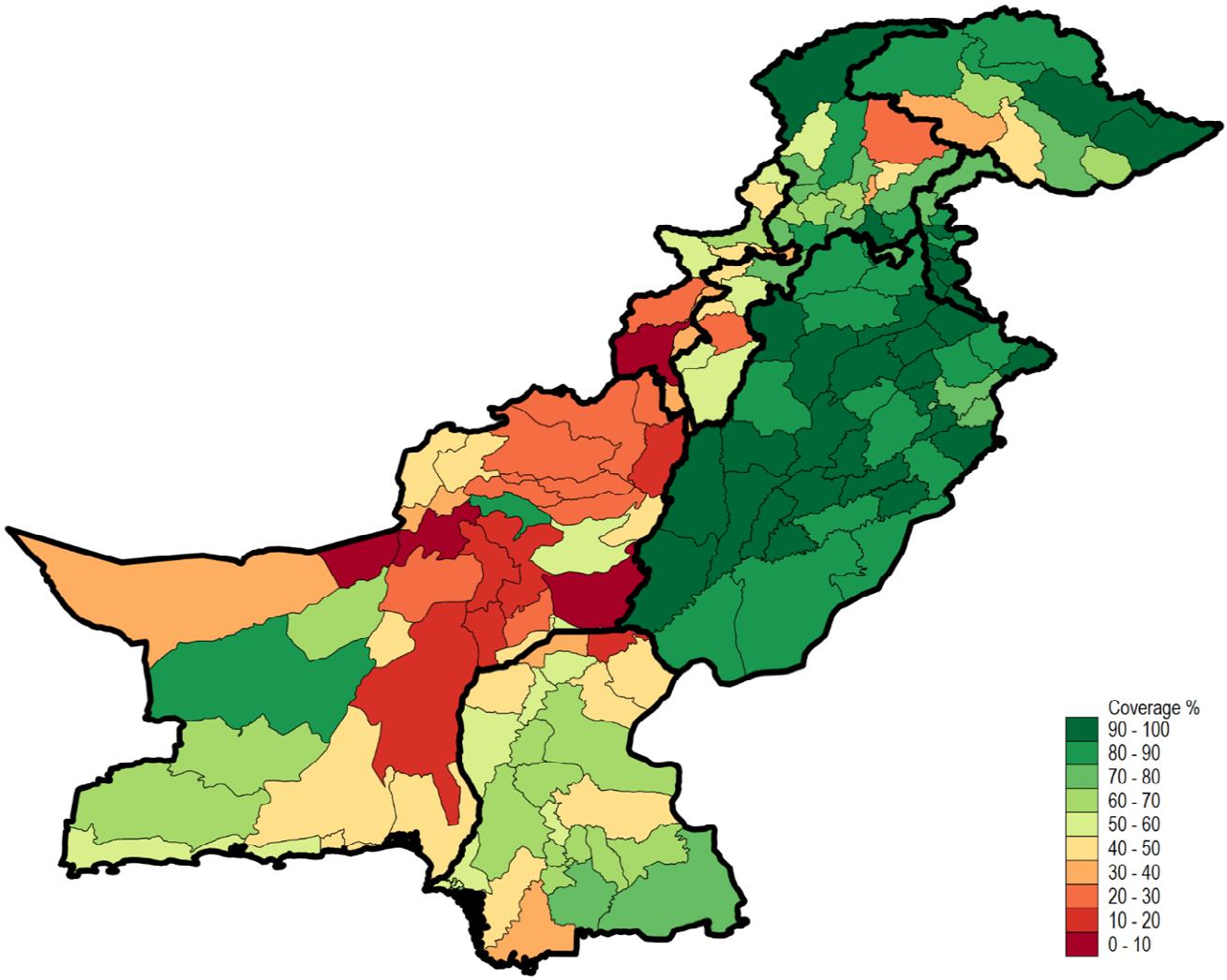


Table C-4. Fully vaccinated – Definition 3: DLI doses, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	90.5	62.1	69.1	43.7	38.4	71.4	77.1	89.1	74.2
Maternal Education									
None	89.8	53.8	61.2	45.5	36.3	57.6	68.6	79.9	65.1
Primary (1-5)	91.1	64.4	76.9	29.8	29.2	66.0	84.0	89.3	72.1
Middle (6-8)	89.3	64.7	79.2	36.3	36.9	75.7	82.4	89.7	77.3
Secondary (9-10)	91.3	73.0	79.7	32.3	48.8	74.6	84.6	92.8	83.5
Higher (11 and above)	91.6	83.1	83.2	45.6	66.4	78.4	87.9	93.2	84.4
Sex									
Boys	90.5	62.5	69.3	42.5	37.9	70.1	76.9	89.5	74.5
Girls	90.5	61.5	68.8	45.4	39.0	72.6	77.3	88.7	73.9
Wealth									
Lowest	90.1	52.8	41.3	36.5	26.8	31.1	54.3	69.2	63.8
Second	89.3	53.5	55.4	42.1	38.5	57.4	66.2	83.1	71.3
Middle	90.4	60.6	62.9	48.9	46.9	59.7	76.0	88.7	77.2
Fourth	91.8	60.6	75.6	51.9	50.0	68.5	81.9	90.8	79.8
Highest	90.1	73.1	81.1	76.3	49.2	74.7	84.7	92.6	78.4
Area									
Urban	87.6	66.7	75.4		49.4	69.8	77.7	85.5	70.2
Rural	92.2	56.9	67.6		34.3	72.8	76.8	89.9	75.1
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: To be fully vaccinated, the child must have received:
BCG OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 MCV1

Figure C-3. Fully vaccinated – Definition 3: DLI doses, by district, Pakistan TPVICS 2020-21

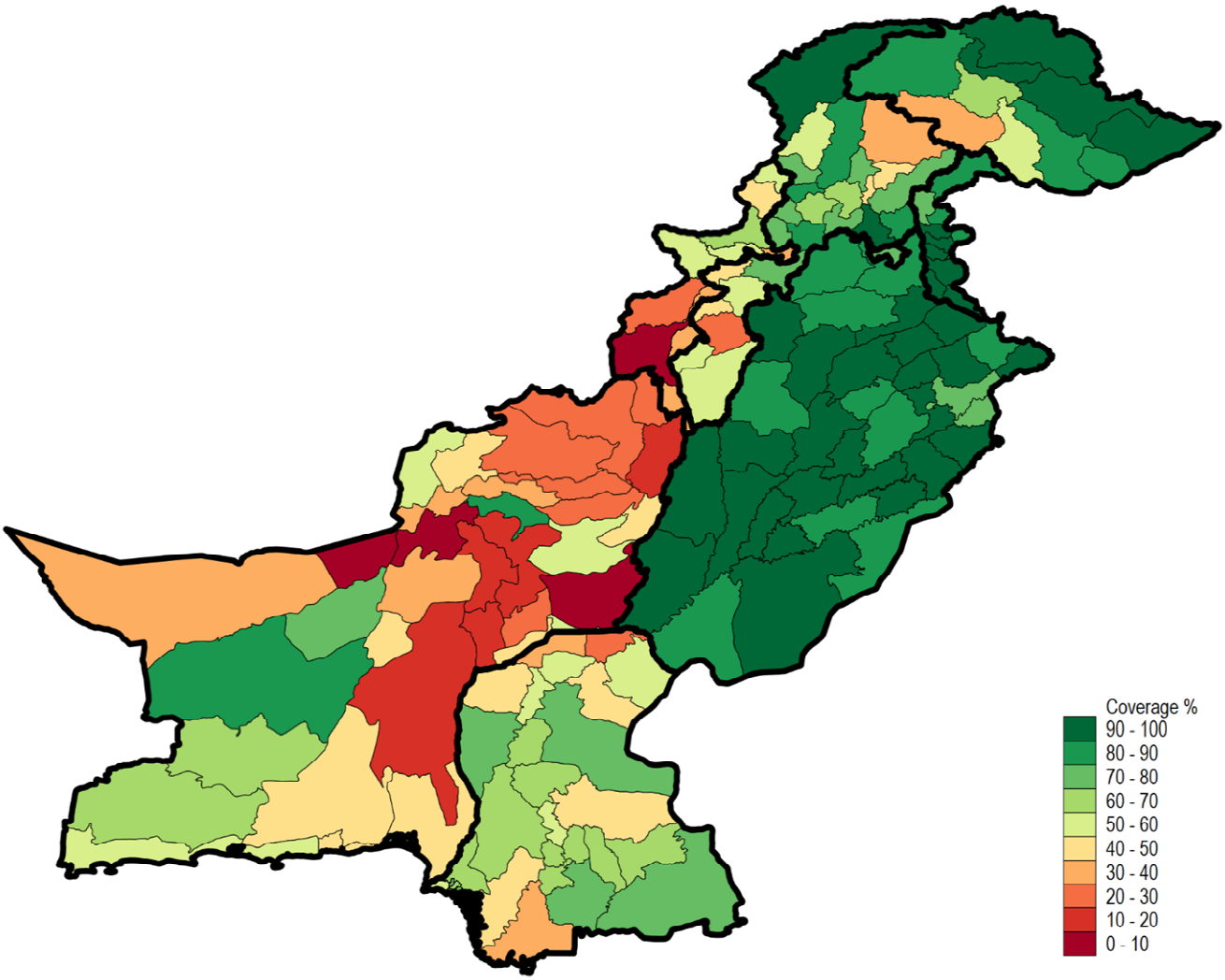
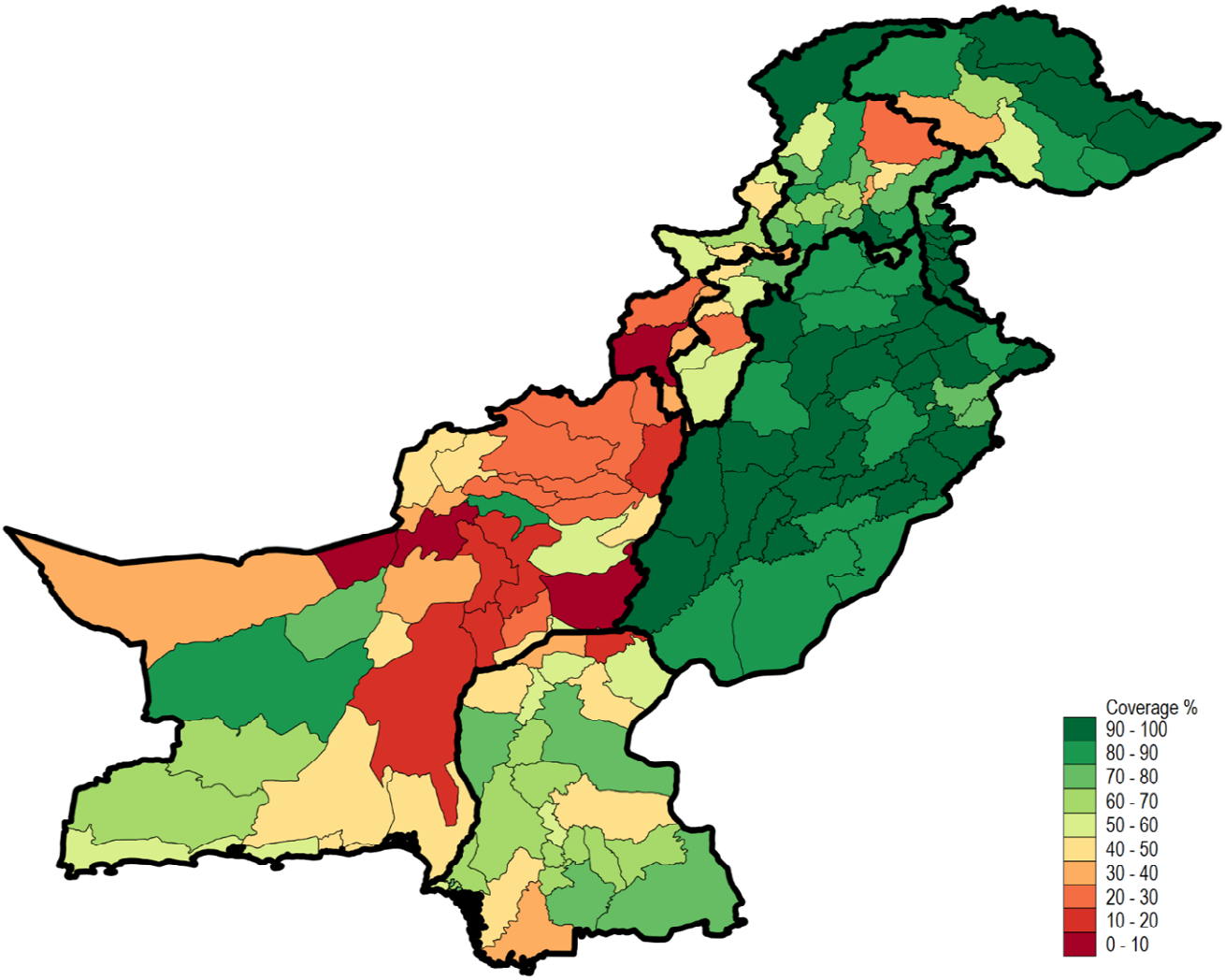


Table C-5. Fully vaccinated – Definition 4: All 1YL doses except Rota, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	90.0	61.2	68.5	42.9	37.7	71.0	76.5	88.9	73.4
Maternal Education									
None	89.2	53.4	60.7	44.7	35.6	57.6	68.0	79.6	64.1
Primary (1-5)	90.6	63.4	76.5	29.2	27.7	66.0	83.4	89.2	71.4
Middle (6-8)	88.6	62.4	78.6	34.8	36.7	75.2	81.4	89.4	76.2
Secondary (9-10)	90.8	71.8	79.3	32.0	48.4	74.6	84.0	92.5	82.8
Higher (11 and above)	91.2	81.6	82.5	43.3	66.3	77.6	87.2	93.0	83.8
Sex									
Boys	90.0	61.7	68.7	41.7	37.3	69.8	76.3	89.3	73.9
Girls	90.0	60.8	68.4	44.6	38.4	72.2	76.7	88.4	72.8
Wealth									
Lowest	89.3	52.5	40.4	35.7	26.7	31.1	53.8	69.2	63.3
Second	88.4	53.1	54.5	40.9	37.5	57.4	65.5	82.4	70.5
Middle	90.1	59.9	62.2	48.4	45.8	59.7	75.5	88.3	76.3
Fourth	91.5	59.4	75.4	51.5	49.4	68.5	81.4	90.6	78.8
Highest	89.5	71.9	80.9	76.3	48.8	74.1	83.9	92.5	77.3
Area									
Urban	86.9	65.4	75.2		48.5	69.8	76.8	85.3	68.6
Rural	91.8	56.6	67.0		33.8	72.0	76.3	89.7	74.4
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: To be fully vaccinated, the child must have received:
BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1

Figure C-4. Fully vaccinated – Definition 4: All 1YL doses except Rota, by district, Pakistan TPVICS 2020-21



Annex D. Sensitivity Analysis – Definitions of Zero-Dose Child

Annex D is a sensitivity analysis to explore how the percentage of children declared to be *not vaccinated* or *zero-dose* varies depending on which list of doses is used to define what we mean by not vaccinated.

Six definitions of zero-dose are compared in this sensitivity analysis:

1. Did not receive any of the eight classic EPI doses: BCG, OPV1-3, DTP1-3 (or Penta1-3), and MCV1
2. Did not receive any doses due in the first year of life (1YL):
   BCG, OPV0, OPV1-3, Penta1-3, PCV1-3, IPV, MCV1, Rota1-2
3. Did not receive any doses in the DLI definition of fully vaccinated:
   BCG, OPV1-3, Penta1-3, PCV1-3, MCV1
4. Gavi proxy: did not receive Penta1
5. Measles proxy: did not receive MCV1
6. Did not receive any doses due in the first year of life (1YL) excluding Rota (the vaccine added to the schedule most recently): BCG, OPV0, OPV1-3, Penta1-3, PCV1-3, IPV, MCV1

Table D-1 indicates that at the province level, definitions 1-3 and 6 give nearly the same results and definitions 4 and 5 yield somewhat higher estimates of % zero dose. Tables D-2 through D-7 provide additional detail for demographic sub-groups. Figures D-1 through D-6 show detail at the district level. District level estimates are tabulated in the file named:
Supplement 02 - TPVICS VCQI tables - overview output - 2022-02-25.xlsx

Table D-1. Not vaccinated – Overall Comparison Across Six Definitions (%), Pakistan TPVICS 2020-21

Received None of the:	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
1. Traditional EPI Doses	0.6	6.9	10.9	34.2	31.6	2.9	5.5	0.9	3.9
2. 1YL Doses	0.6	6.9	10.8	34.2	31.5	2.9	5.4	0.9	3.9
3. Doses in DLI Definition	0.6	6.9	10.8	34.2	31.6	2.9	5.5	0.9	3.9
4. Penta1	1.7	13.7	15.4	40.2	45.8	5.5	9.2	1.4	10.0
5. MCV1	7.4	32.8	26.9	50.5	57.3	18.2	19.5	6.8	18.8
6. 1YL doses (excluding Rota)	0.6	6.9	10.8	34.2	31.5	2.9	5.4	0.9	3.9
** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*									
KP results exclude FATA. FATA is almost entirely rural.									
Color bars are scaled so that 100% would fill the entire cell.									
Note: This measure is a population estimate that incorporates survey weights.									

Table D-2. Not vaccinated – Definition 1: Basic 8 EPI doses, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	0.6	6.9	10.9	34.2	31.6	2.9	5.5	0.9	3.9
Maternal Education (years)									
None	1.0	10.7	14.9	32.1	33.6	7.6	9.6	2.8	7.2
Primary (1-5)	0.5	3.3	7.1	42.0	35.8	2.1	2.3	0.4	2.9
Middle (6-8)	0.4	2.3	6.4	45.8	29.6	4.2	2.4	0.6	3.1
Secondary (9-10)	0.3	1.0	4.8	52.8	18.1	1.9	1.4	0.6	1.1
Higher (11 and above)	0.0	0.7	3.7	36.0	11.3	0.4	0.8	0.2	0.4
Sex									
Boys	0.5	6.6	10.6	36.7	31.9	4.7	5.6	0.7	3.9
Girls	0.7	7.1	11.1	31.0	31.1	1.2	5.3	1.1	4.0
Wealth									
Lowest	2.7	13.2	26.8	43.8	42.0	0.0	18.0	5.9	6.7
Second	0.8	12.0	18.6	36.8	30.3	3.1	11.2	1.9	5.2
Middle	0.6	6.8	13.8	28.2	24.8	4.2	6.3	1.0	3.1
Fourth	0.6	4.2	7.2	17.0	24.7	2.3	3.0	0.5	1.9
Highest	0.3	1.9	4.4	6.5	17.5	3.0	1.2	0.2	2.4
Area									
Urban	0.6	3.5	6.6		23.7	1.2	2.8	1.4	4.5
Rural	0.5	10.7	11.8		34.5	4.5	7.1	0.8	3.8
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: To be counted as not vaccinated, the child must not have received any of these doses:
BCG MCV1 PENTA1 PENTA2 PENTA3 OPV1 OPV2 OPV3

Figure D-1. Not vaccinated – Definition 1: Basic 8 EPI doses, by district, Pakistan TPVICS 2020-21

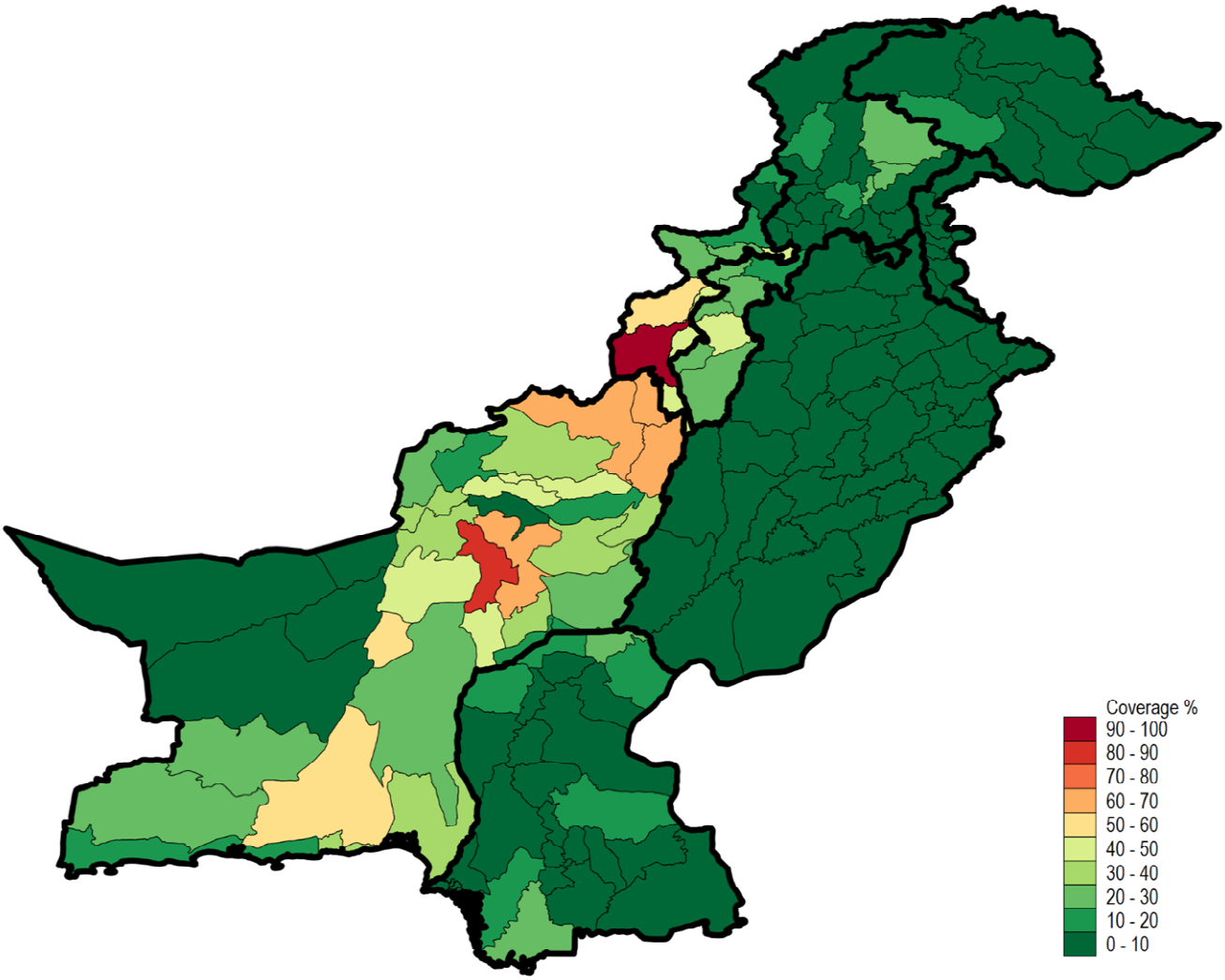


Table D-3. Not vaccinated – Definition 2: All Pakistan first year of life (1YL) doses, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	0.6	6.9	10.8	34.2	31.5	2.9	5.4	0.9	3.9
Maternal Education (years)									
None	1.0	10.6	14.8	32.1	33.5	7.6	9.5	2.8	7.1
Primary (1-5)	0.5	3.3	7.0	42.0	35.8	2.1	2.2	0.4	2.9
Middle (6-8)	0.4	2.3	6.1	45.8	29.6	4.2	2.4	0.6	3.1
Secondary (9-10)	0.3	1.0	4.7	52.8	18.0	1.9	1.4	0.6	1.1
Higher (11 and above)	0.0	0.7	3.7	36.0	11.3	0.4	0.8	0.2	0.4
Sex									
Boys	0.5	6.6	10.6	36.7	31.9	4.7	5.6	0.7	3.9
Girls	0.7	7.1	11.0	31.0	31.0	1.2	5.3	1.1	3.9
Wealth									
Lowest	2.4	13.2	26.7	43.8	41.9	0.0	17.9	5.9	6.6
Second	0.8	12.0	18.5	36.8	30.2	3.1	11.2	1.9	5.1
Middle	0.6	6.8	13.8	28.2	24.7	4.2	6.3	1.0	3.1
Fourth	0.6	4.2	7.2	17.0	24.6	2.3	3.0	0.5	1.9
Highest	0.3	1.9	4.3	6.5	17.5	3.0	1.2	0.2	2.4
Area									
Urban	0.6	3.5	6.6		23.6	1.2	2.8	1.4	4.5
Rural	0.5	10.6	11.8		34.4	4.5	7.0	0.8	3.8
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: This measure is a population estimate that incorporates survey weights.
Note: To be counted as not vaccinated, the child must not have received any of these doses: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1 ROTA1 ROTA2

Figure D-2. Not vaccinated – Definition 2: All Pakistan first year of life (1YL) doses, by district, Pakistan TPVICS 2020-21

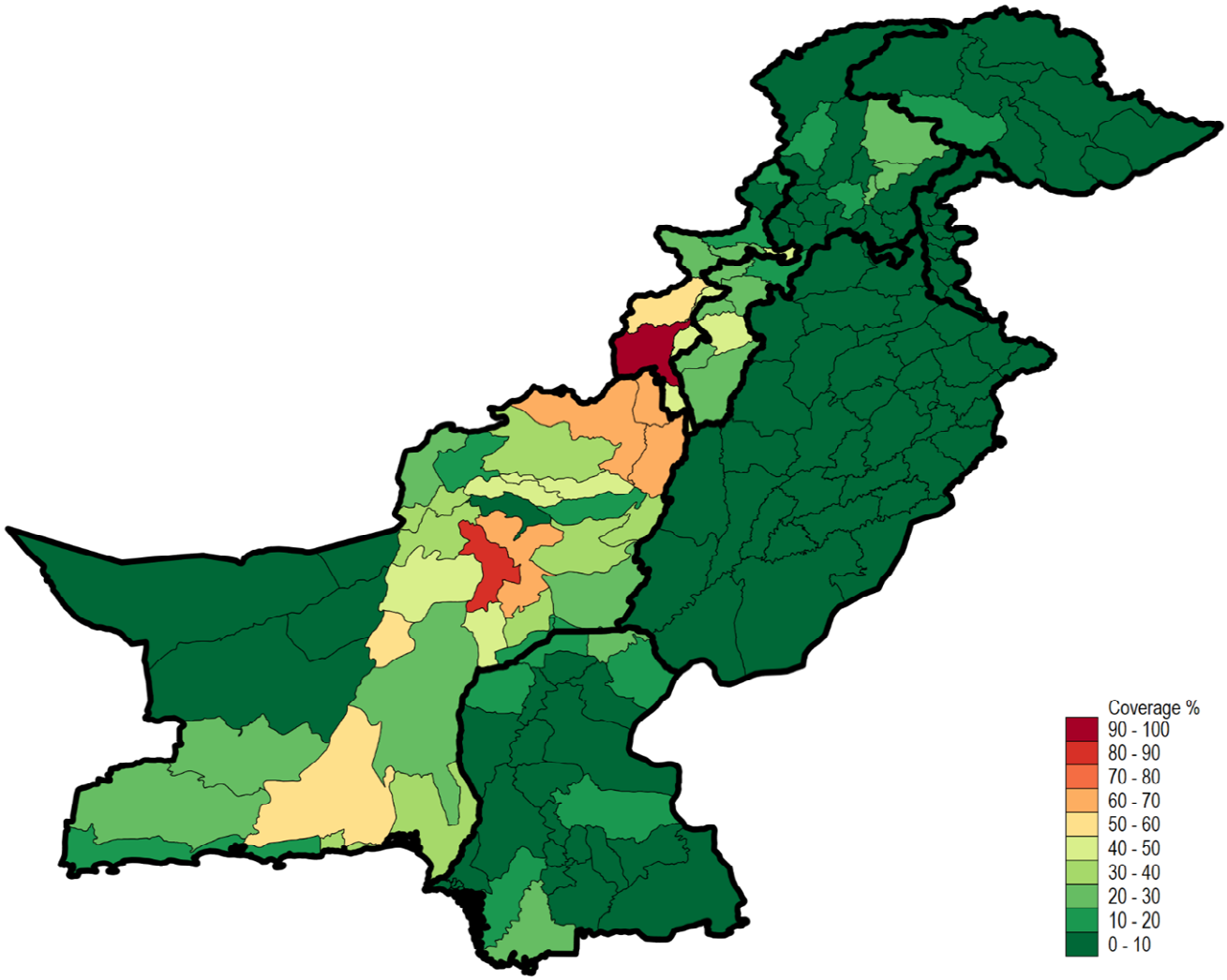


Table D-4. Not vaccinated – Definition 3: DLI doses, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	0.6	6.9	10.8	34.2	31.6	2.9	5.5	0.9	3.9
Maternal Education (years)									
None	1.0	10.7	14.9	32.1	33.6	7.6	9.6	2.8	7.2
Primary (1-5)	0.5	3.3	7.1	42.0	35.8	2.1	2.3	0.4	2.9
Middle (6-8)	0.4	2.3	6.1	45.8	29.6	4.2	2.4	0.6	3.1
Secondary (9-10)	0.3	1.0	4.8	52.8	18.1	1.9	1.4	0.6	1.1
Higher (11 and above)	0.0	0.7	3.7	36.0	11.3	0.4	0.8	0.2	0.4
Sex									
Boys	0.5	6.6	10.6	36.7	31.9	4.7	5.6	0.7	3.9
Girls	0.7	7.1	11.1	31.0	31.1	1.2	5.3	1.1	4.0
Wealth									
Lowest	2.7	13.2	26.8	43.8	42.0	0.0	18.0	5.9	6.7
Second	0.8	12.0	18.6	36.8	30.3	3.1	11.2	1.9	5.2
Middle	0.6	6.8	13.8	28.2	24.8	4.2	6.3	1.0	3.1
Fourth	0.6	4.2	7.2	17.0	24.7	2.3	3.0	0.5	1.9
Highest	0.3	1.9	4.3	6.5	17.5	3.0	1.2	0.2	2.4
Area									
Urban	0.6	3.5	6.6		23.7	1.2	2.8	1.4	4.5
Rural	0.5	10.7	11.8		34.5	4.5	7.1	0.8	3.8
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: This measure is a population estimate that incorporates survey weights.
Note: To be counted as not vaccinated, the child must not have received any of these doses: BCG OPV1 OPV2 OPV3

Figure D-3. Not vaccinated – Definition 3: DLI doses, by district, Pakistan TPVICS 2020-21

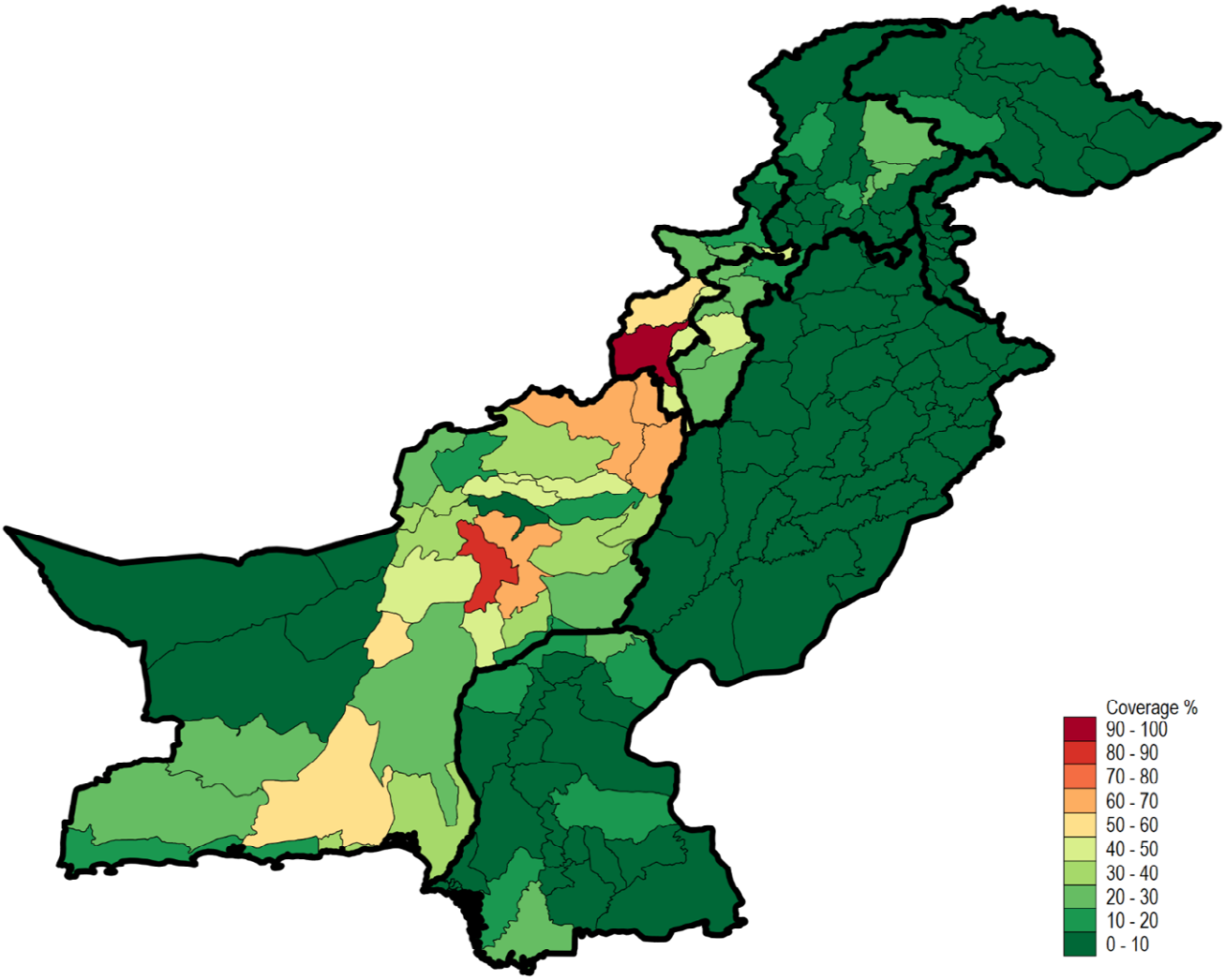


Table D-5. Not vaccinated – Definition 4: Penta1, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	1.7	13.7	15.4	40.2	45.8	5.5	9.2	1.4	10.0
Maternal Education (years)									
None	2.6	19.7	20.9	38.5	47.6	14.8	15.3	3.8	18.6
Primary (1-5)	1.5	9.7	10.2	49.3	59.2	5.9	4.7	0.6	8.2
Middle (6-8)	1.6	8.2	8.6	50.2	46.6	4.7	4.8	1.4	7.2
Secondary (9-10)	0.9	4.9	7.4	55.9	35.1	2.5	3.3	0.8	1.9
Higher (11 and above)	0.6	1.9	6.0	37.1	20.6	1.3	1.8	0.5	1.1
Sex									
Boys	1.5	13.0	15.3	43.0	46.8	7.1	9.2	1.1	9.9
Girls	1.8	14.5	15.6	36.6	44.4	4.1	9.1	1.7	10.2
Wealth									
Lowest	3.5	23.6	38.1	49.6	60.0	18.9	27.6	7.9	19.0
Second	2.4	20.8	26.0	41.7	43.7	10.7	17.2	2.7	12.9
Middle	2.1	13.7	19.2	34.3	34.8	11.0	10.2	1.3	8.2
Fourth	1.7	11.5	10.3	27.2	35.1	5.7	5.9	1.0	4.2
Highest	1.2	5.3	6.8	14.0	34.9	4.5	3.0	0.5	4.9
Area									
Urban	2.0	8.7	9.8		35.8	4.3	6.1	2.0	8.7
Rural	1.5	19.3	16.8		49.5	6.6	11.1	1.2	10.3
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: This measure is a population estimate that incorporates survey weights.
Note: To be counted as not vaccinated, the child must not have received any of these doses: PENTA1

Figure D-4. Not vaccinated – Definition 4: Penta1, by district, Pakistan TPVICS 2020-21

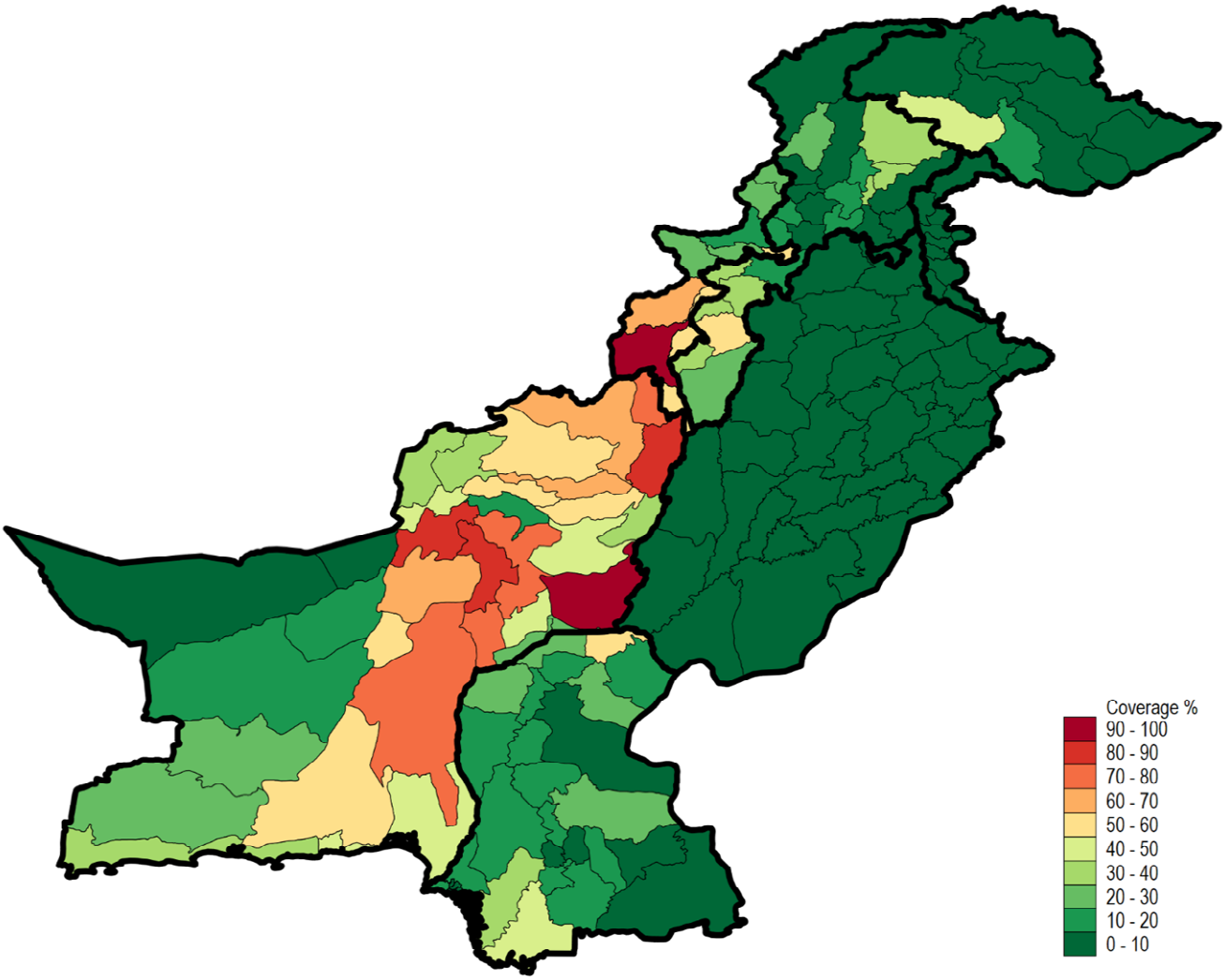


Table D-6. Not vaccinated – Definition 5: MCV1, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	7.4	32.8	26.9	50.5	57.3	18.2	19.5	6.8	18.8
Maternal Education (years)									
None	8.4	40.6	34.0	48.7	59.4	33.4	27.6	14.6	29.3
Primary (1-5)	7.1	31.7	19.9	60.6	66.6	26.6	13.6	5.2	19.0
Middle (6-8)	8.4	29.1	18.0	61.0	59.9	16.8	14.5	7.1	14.4
Secondary (9-10)	6.6	23.6	17.1	64.2	44.2	16.7	12.6	4.5	10.1
Higher (11 and above)	6.1	12.1	13.9	48.6	30.0	8.5	8.8	3.2	6.4
Sex									
Boys	7.4	32.5	26.6	51.6	57.7	20.8	19.8	6.6	18.7
Girls	7.4	33.2	27.2	49.0	56.6	15.7	19.3	7.0	18.8
Wealth									
Lowest	8.6	42.2	52.0	57.2	70.0	68.9	41.6	20.4	29.1
Second	8.2	41.1	39.1	51.3	56.6	37.4	29.6	13.0	23.6
Middle	7.8	34.5	32.5	45.7	47.3	36.4	20.8	8.0	15.8
Fourth	6.9	32.8	21.0	45.9	46.0	20.5	15.3	5.1	11.5
Highest	7.3	22.6	15.8	19.0	46.9	14.1	12.1	3.6	11.7
Area									
Urban	10.0	27.9	21.2		46.5	21.4	18.6	9.6	19.6
Rural	6.0	38.3	28.2		61.3	15.2	20.1	6.2	18.6
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: This measure is a population estimate that incorporates survey weights.
Note: To be counted as not vaccinated, the child must not have received any of these doses: MCV1

Figure D-5. Not vaccinated – Definition 5: MCV1, by district, Pakistan TPVICS 2020-21

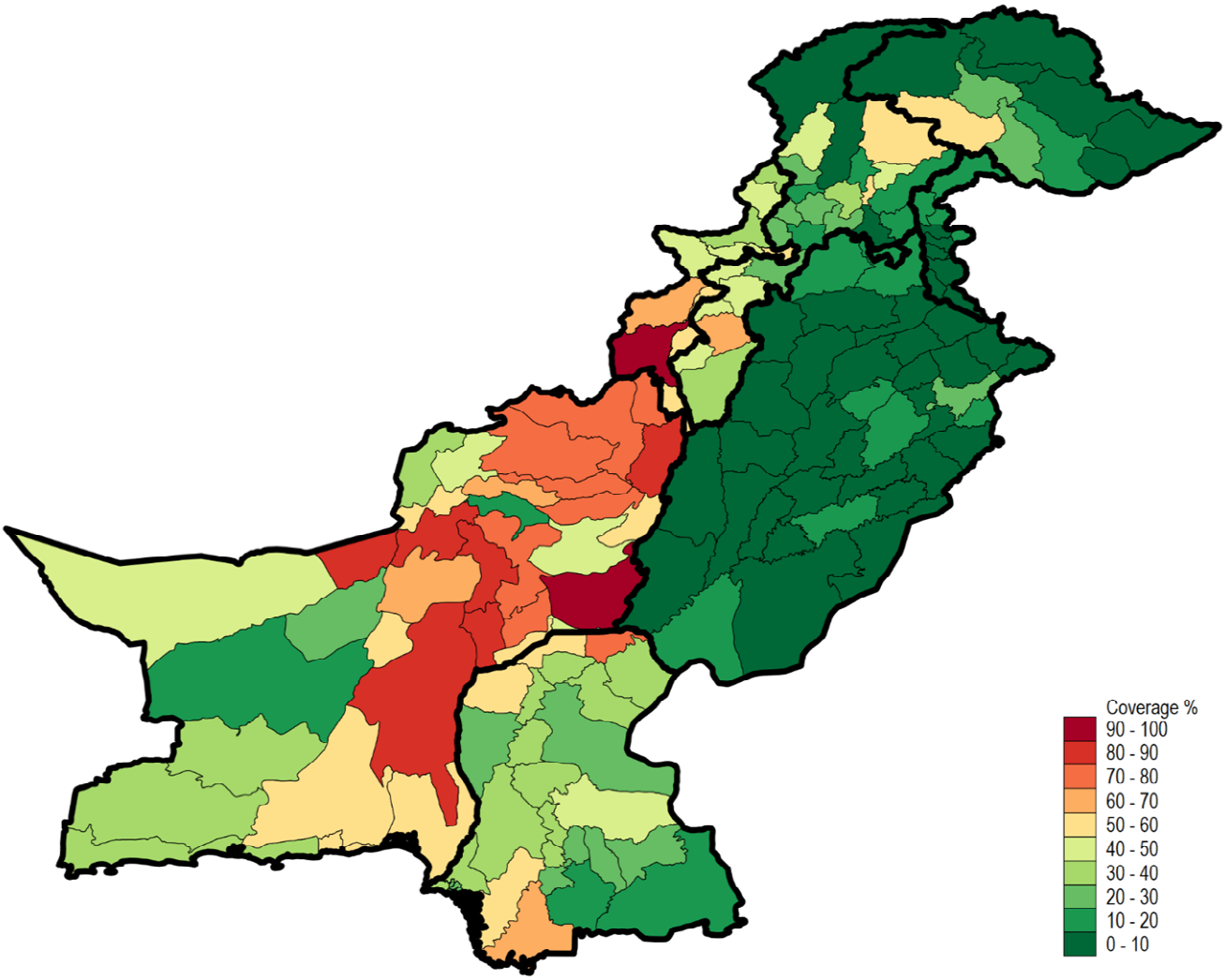


Table D-7. Not vaccinated – Definition 6: All 1YL doses except Rota, by region & demographic category (%), Pakistan TPVICS 2020-21

	Punjab	Sindh	KP	FATA	Balochistan	Islamabad	Total*	AJK	Gilgit-Baltistan
Overall	0.6	6.9	10.8	34.2	31.5	2.9	5.4	0.9	3.9
Maternal Education (years)									
None	1.0	10.6	14.8	32.1	33.5	7.6	9.5	2.8	7.1
Primary (1-5)	0.5	3.3	7.0	42.0	35.8	2.1	2.2	0.4	2.9
Middle (6-8)	0.4	2.3	6.1	45.8	29.6	4.2	2.4	0.6	3.1
Secondary (9-10)	0.3	1.0	4.7	52.8	18.0	1.9	1.4	0.6	1.1
Higher (11 and above)	0.0	0.7	3.7	36.0	11.3	0.4	0.8	0.2	0.4
Sex									
Boys	0.5	6.6	10.6	36.7	31.9	4.7	5.6	0.7	3.9
Girls	0.7	7.1	11.0	31.0	31.0	1.2	5.3	1.1	3.9
Wealth									
Lowest	2.4	13.2	26.7	43.8	41.9	0.0	17.9	5.9	6.6
Second	0.8	12.0	18.5	36.8	30.2	3.1	11.2	1.9	5.1
Middle	0.6	6.8	13.8	28.2	24.7	4.2	6.3	1.0	3.1
Fourth	0.6	4.2	7.2	17.0	24.6	2.3	3.0	0.5	1.9
Highest	0.3	1.9	4.3	6.5	17.5	3.0	1.2	0.2	2.4
Area									
Urban	0.6	3.5	6.6		23.6	1.2	2.8	1.4	4.5
Rural	0.5	10.6	11.8		34.4	4.5	7.0	0.8	3.8
N	24,037	23,290	17,432	5,779	25,764	1,458	97,760	7,547	5,483

** Excludes respondents from Azad Jammu and Kashmir and Gilgit-Baltistan.*
KP results exclude FATA. FATA is almost entirely rural.
Color bars are scaled so that 100% would fill the entire cell.
Note: This measure is a population estimate that incorporates survey weights.
Note: To be counted as not vaccinated, the child must not have received any of these doses: BCG OPV0 OPV1 OPV2 OPV3 PENTA1 PENTA2 PENTA3 PCV1 PCV2 PCV3 IPV MCV1

Figure D-6. Not vaccinated – Definition 6: All 1YL doses except Rota, by district, Pakistan TPVICS 2020-21