

Supplementary Materials

Using Household Surveys to Assess Missed Opportunities for Simultaneous Vaccination: Longitudinal Examples from Colombia and Nigeria

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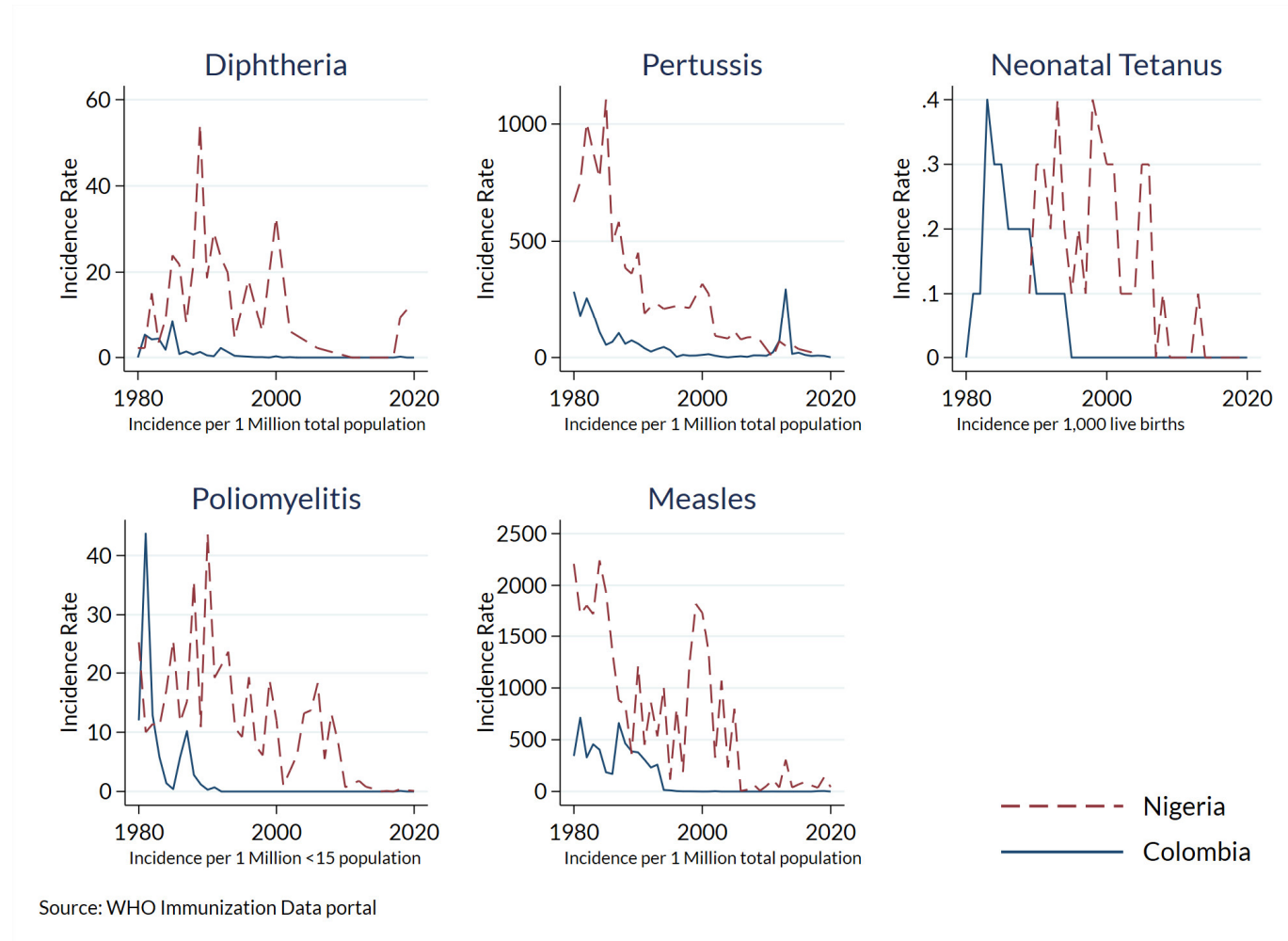
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INCIDENCE OF VACCINE PREVENTABLE DISEASES

Figure SVPD.1. Incidence rates for vaccine preventable diseases for Colombia & Nigeria, 1980-2020 [1]



PROVENANCE OF THE VCQI MOSV INDICATORS

MOV studies in the 1980s focused almost exclusively on a protocol for clinic-based visits. Caregivers with children are intercepted as they exit a health clinic and asked whether their child was vaccinated during the visit. Vaccination dates are copied from the child's home-based record (HBR or card) or from their facility-based record (FBR) and analyzed to determine whether they experienced MOVs at the clinic visit. Protocols for this type of study were developed at World Health Organization (WHO) headquarters in Geneva [2] and refined over the years at the Pan-American Health Organization (PAHO) [3,4] and again at WHO Geneva [5,6]. In clinic-based studies, even in recent years, the common analysis plan uses the child's vaccination dates from the card only to assess eligibility on a single day: the day of the clinic visit [7–9].

In the mid 1980s, the concept of analyzing whether all needed vaccines were administered during health service contacts was extended by one of us (FTC) to household surveys in Mozambique and subsequently Guinea Conakry – in the latter, caretakers were also asked about visits to health services for curative care [10]. In addition to estimating the prevalence of MOVs at preventive (Mozambique) and curative visits (Conakry and later also Central African Republic), survey authors estimated a “consequence indicator” of how much higher vaccination coverage would be if all the children in the study had received every eligible dose at every vaccination or growth monitoring visit and, in Conakry and CAR, at curative care [10,11]. Mothers' experience in being turned away from vaccination services (with reasons) and attitudes to vaccinating ill children were also assessed. While many of the early analyses were presumably conducted without using computers, later analyses of eligibility at every visit date used SAS programs written at the U.S. Centers for Disease Control. The programming was complex, as evidenced in archived source code from 1990/91 and documented with a comment early in the file:

```
|FUNCTION OF PROGRAM: DETERMINE MISSED OPPORTUNITIES FOR VACCINATION|  
|                               DRIVE EVERYONE COMPLETELY NUTS                               |1
```

The programming remains complex today. The VCQI modules that calculate MOV outcomes are some of the most complex of its 300+ Stata programs.

In the late 1980s, WHO sponsored development of DOS-based software named Coverage Survey Analysis System (COSAS)² and by 1991 COSAS documented and included indicators that assessed frequency of MOVs per clinic visit and per child, and consequence of MOVs at all of the child's documented vaccination dates [12,13]. COSAS was beloved by many immunization program staff³ and reportedly used to analyze many surveys per year [14]. But the software was not upgraded over time and was rarely cited after the early 1990s. WHO's 2005 coverage survey reference manual and 2007 mid-level manager's training on coverage surveys give broad guidance for analyzing coverage survey data but do not describe analysis of MOSVs or any analysis using COSAS [15,16].

After COSAS there was an extended period from the mid-1990s to 2015 when WHO and PAHO had protocols for clinic based MOV studies, but there were no standardized guidance or tools for MOSV analyses using coverage survey data. This period corresponds precisely to that covered in the 2014 MOV literature review [17]. There were some interesting and reasonable analyses of MOVs using dates from coverage surveys and vaccination records review in that timeframe, but they did not employ standardized indicator definitions or analysis programs.

¹ From the author's (FTC) archive of project files.

² Personal communication with Eric Brenner, September 12, 2020.

³ Personal communication with Pierre Claquin, Iqbal Hossain, Robert Steinglass & Alasdair Wylie.

In 2015 three of us (MLP & FTC & DAR) revisited definitions when we⁴ authored the MOV sections of the working draft of WHO’s updated vaccination coverage cluster survey reference manual (which was finalized in 2018) [18,19]. Note that the WHO manual uses the term MOV and in this manuscript we introduce the more specific phrase MOSV. That manual recommends using all the vaccination dates on each child’s record to assess the frequency of MOSVs with (a) the child and (b) the health facility visit as denominators, as well as the consequence of MOSVs. In a companion effort, WHO commissioned a list of standard indicators that may be calculated with coverage survey data [20]. WHO selected a set of indicators to be developed more fully into software specifications and implemented in Stata programs. We call the list of indicators and the programs that calculate them, the Vaccination Coverage Quality Indicators (VCQI) [21].

GRAPHICAL EXAMINATION OF MISSED OPPORTUNITIES

Figure S.1 is useful to describe VCQI’s indicator calculations. We use this type of figure to debug and validate VCQI indicator code, and these figures can be helpful for explaining and discussing MOVs with health workers. We formally call them “vaccination evidence and indicator plots” and informally “elbow plots”. Text Box S.1 lists important features of the elbow plot. In principle, the plot shows the vaccination evidence from HBR and caregiver recall (and sometimes from a document such as a register at a health facility, if this is included in the household survey) and annotations to show the values of variables that are derived from the evidence. The annotations appear in the right margin and sometimes on the plot itself. There are many indicators in VCQI so to minimize clutter in this supplement, for each child we repeat the evidence across several plots and annotate each with only a subset of variables and indicators. Figure 1 is what we call a ‘Crude MOV’ plot – a phrase that is described more fully below. Text Box S.2 narrates the vaccination experience of the children in Figures S.1 through S.3a-b.

Figure S.1 shows a basic WHO Expanded Programme on Immunization (EPI) vaccine schedule with 8 vaccine-doses: BCG at birth; oral polio vaccine (OPV) and pentavalent vaccine (Penta) at 6, 10 and 14 weeks, and measles vaccine at 9 months.

We have developed a publicly-available R Shiny application for exploring child-level MOSV results in VCQI datasets, available at https://biostat-global-consulting.shinyapps.io/MOV_Tool_Public/. The application summarizes, for each dose in each stratum, the portions of children who received the dose at the first eligible opportunity, who had a corrected MOSV for the dose, and who had an uncorrected MOSV for the dose. The application also shows stratum-level summaries of the portion of children who experienced no MOSVs for any dose, and the portions who had MOSVs, all, some, or none of which were corrected by the time of the survey. For the subset of children who had corrected MOSVs, the delay between the initial missed opportunity and the visit when the dose was received is summarized in time to correction figures for each dose in each stratum.

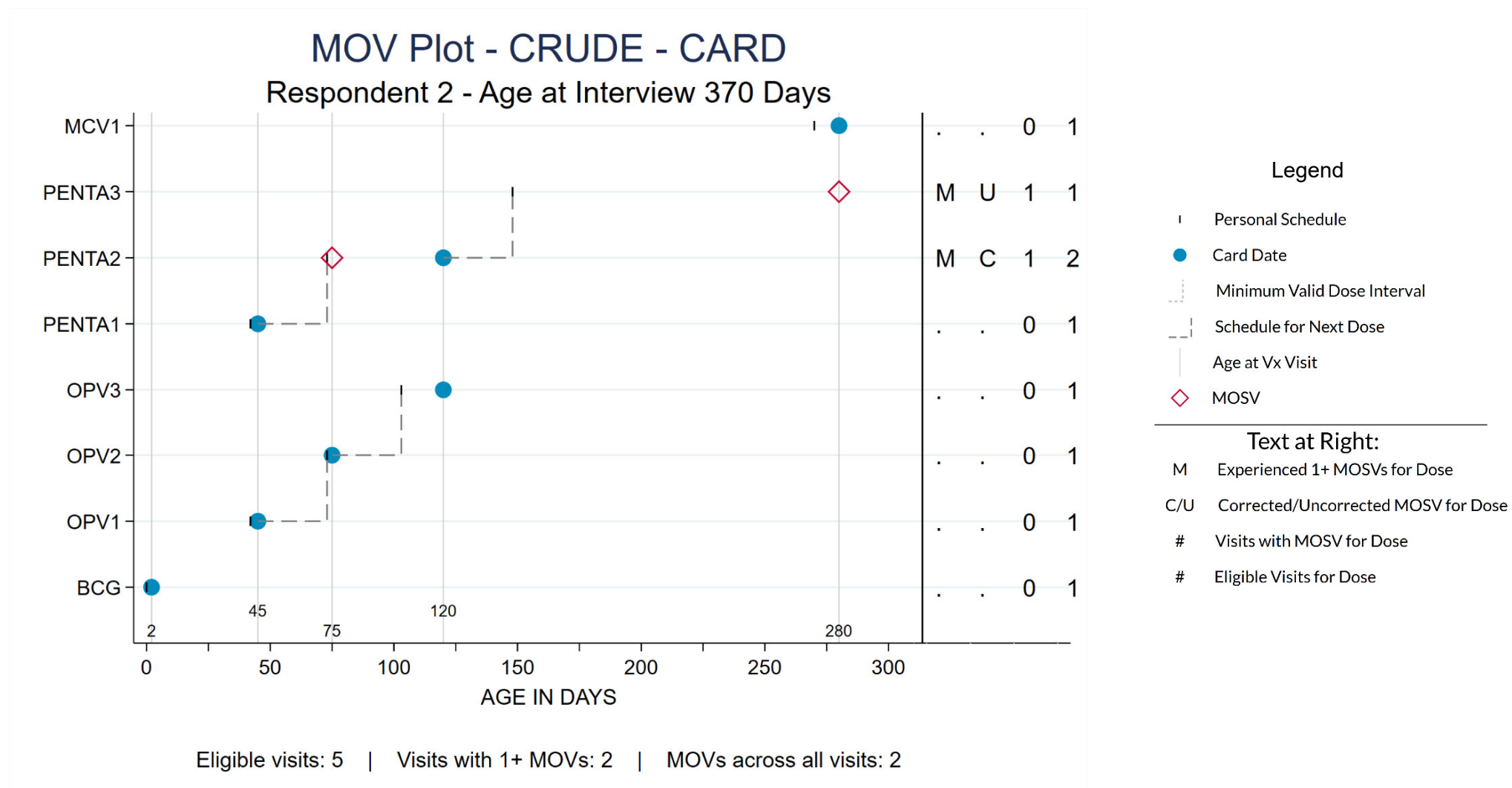
Figures 3 and 4 in the manuscript were generated from the MOV Occurrence tab of the Shiny application, and Figures 6 and 7 in the manuscript were generated from the Time to Correction tab of the application. Figure S.4 and Text Box S.4 provide additional detail on interpreting the time to correction plots.

A series of videos orienting users to the R Shiny application is available on YouTube:

1. Introduction: <https://youtu.be/GQ7Hcmh2czs>
2. Exploring MOVs: <https://youtu.be/oyyBJ-NzNug>
3. Time to Correction: <https://youtu.be/TS0ePSsbZRk>
4. Data Requirements: <https://youtu.be/gppzvsmKoVU>

⁴ Along with Dr. Pierre Claquin, WHO Consultant and Tony Burton, WHO Staff

Figure S.1. Vaccination Evidence and MOSV Indicators – Respondent 2 – had MOSVs for Penta2 and Penta3



Text Box S.1. Features of an “Evidence and Indicators Plot”

- The child’s age in days is shown on the x-axis and each vaccine-dose in the national schedule is represented with its own row.
- Doses that are scheduled to be given at birth appear at the bottom of the figure and those that are scheduled later appear near the top.
- Each series of multi-dose vaccines, like the 3-dose series of oral polio vaccine (OPV1-3) or pentavalent vaccine (Penta1-3) appear in adjacent rows.
- The age when the child becomes eligible to receive each dose is indicated with a small vertical bar (|) within the row.
- The age of eligibility for later doses in a series begin after a minimum interval has passed from the date when the earlier dose was received. These minimum intervals are indicated with right-angle connectors (*elbows*) that connect the date when the earlier dose was received to the date when the child becomes eligible for the next dose. These intra-dose minimum intervals are usually 4 weeks.
- Each health care contact visit is indicated with a tall vertical line that extends from the bottom to the top of the figure and lists the child’s age in days near the bottom.
- For each vaccine-dose documented with a date on the HBR, the chart shows a colored dot at the intersection of the vertical visit line and the dose row.
- If the evidence of vaccination is from a tick mark on the HBR or from caregiver recall, the entire row is colored, because we do not know at what age the child received the dose.
- A child is eligible to receive the vaccine-dose at any age to the right of the vertical bar (|).
- If a health system visit occurs at an age when the child is eligible and if they do not receive the dose at that visit, we say that an MOSV has occurred, and we draw a red diamond around the intersection of the visit line and the dose row.
- In these figures, the text at the far right lists the values of several derived variables.
 - If the child experienced an MOSV for the dose, the first column holds the letter “M”.
 - If the MOSV was later corrected, meaning that the child received the dose, but not at the first eligible visit, the second column holds the letter “C”.
 - If the MOSV was uncorrected, i.e. the child had still not received the dose at the time the data were collected, the second column holds the letter “U”.
 - The third column holds the number of contact visits at which the child experienced an MOSV for the dose.
 - The fourth column holds the number of contact visits when the child was eligible to receive the dose.

Text Box S.2. Vaccination experience for children in Figures S.1, S.2, and S.3a-b

The girl represented in Figure S.1 was 370 days old at the time of the survey.

- She received BCG at age 2 days.
- She received OPV1 and Penta1 at age 45 days meaning that she would be eligible for OPV2 and Penta2 from age $45+28 = 73$ days.
- She received OPV2 but not Penta2 at age 75 days, so experienced an MOSV for Penta2 at that visit. She would be eligible for OPV3 at $75+28 = 103$ days.
- She received OPV3 and Penta2 at age 120 days and would become eligible for Penta3 at $120+28 = 148$ days.
- She received MCV at age 280 days, experiencing an MOSV for Penta3 at that visit.
- She was age 370 days at the time of the survey.
- This girl experienced two MOSVs, one for Penta2 and one for Penta3.
- The time to correction for the Penta2 MOSV was $120-75 = 45$ days.
- At the time of the survey, the Penta3 MOSV was uncorrected, and she was $370-148 = 222$ days overdue for that dose.
- If this child had not experienced any MOSVs, she would have been fully vaccinated at the age of 280 days.

The boy in Figure S.2 was 400 days old at the time of the survey.

- Received BCG, OPV-1-3, and MCV exactly on time.
- Did not receive Penta at all.
- Experienced MOSVs for Penta1 at age 42, 70, 98, and 270 days.
- The MOSVs are all uncorrected.
- If there had been no MOSVs, he would have also received Penta1-3 and been fully vaccinated at age 270 days.

The boy in Figures S.3a and S.3b was 388 days old at the time of the survey.

- He received BCG at birth and Penta1 at age 28 days, which is two weeks before the scheduled age of 42 days.
- He received OPV1 at 42 days and received all other doses exactly on schedule at 70, 98, and 270 days.
- Figure S.3a shows the crude dose analysis. The early dose of Penta is counted as dose 1 in the series and he is not credited with any MOSVs.
- Figure S.3b shows the valid dose analysis. The dose at 28 days is ignored because it was too early. On day 42, the child is credited with an MOSV for Penta at the time he received OPV1. That MOSV is corrected when the dose of Penta at day 70 is counted as dose 1, the dose of Penta on day 98 is counted as dose 2, and he is credited with an uncorrected Penta 3 MOSV at age 270 days when he receives only measles vaccine.

Figure S.2. Vaccination Evidence and MOSV Indicators - Respondent 3 – had MOSVs for Penta1

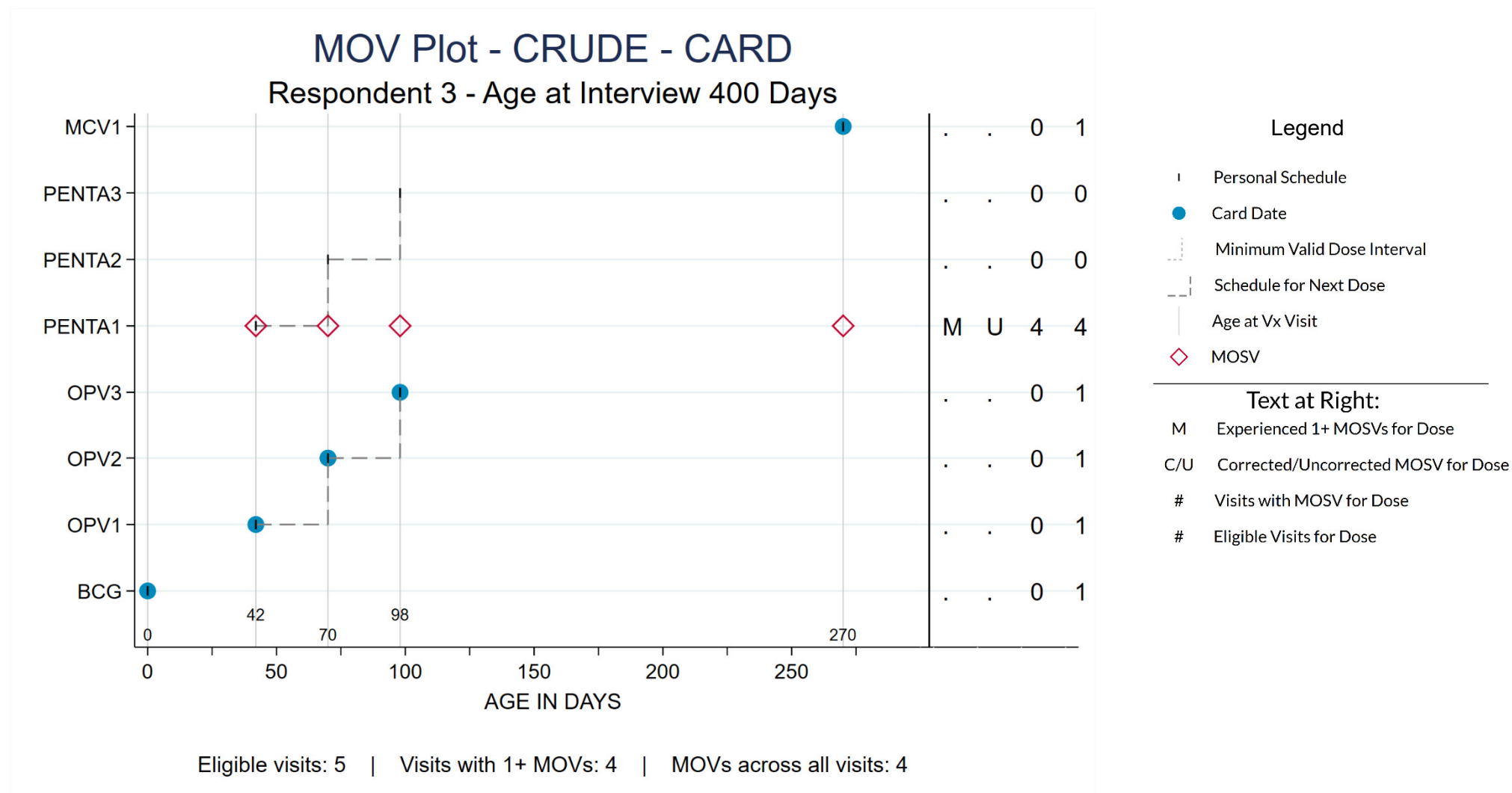


Figure S.3a. Vaccination Evidence and MOSV Indicators - Respondent 4 – VCQI crude dose analysis where early doses count

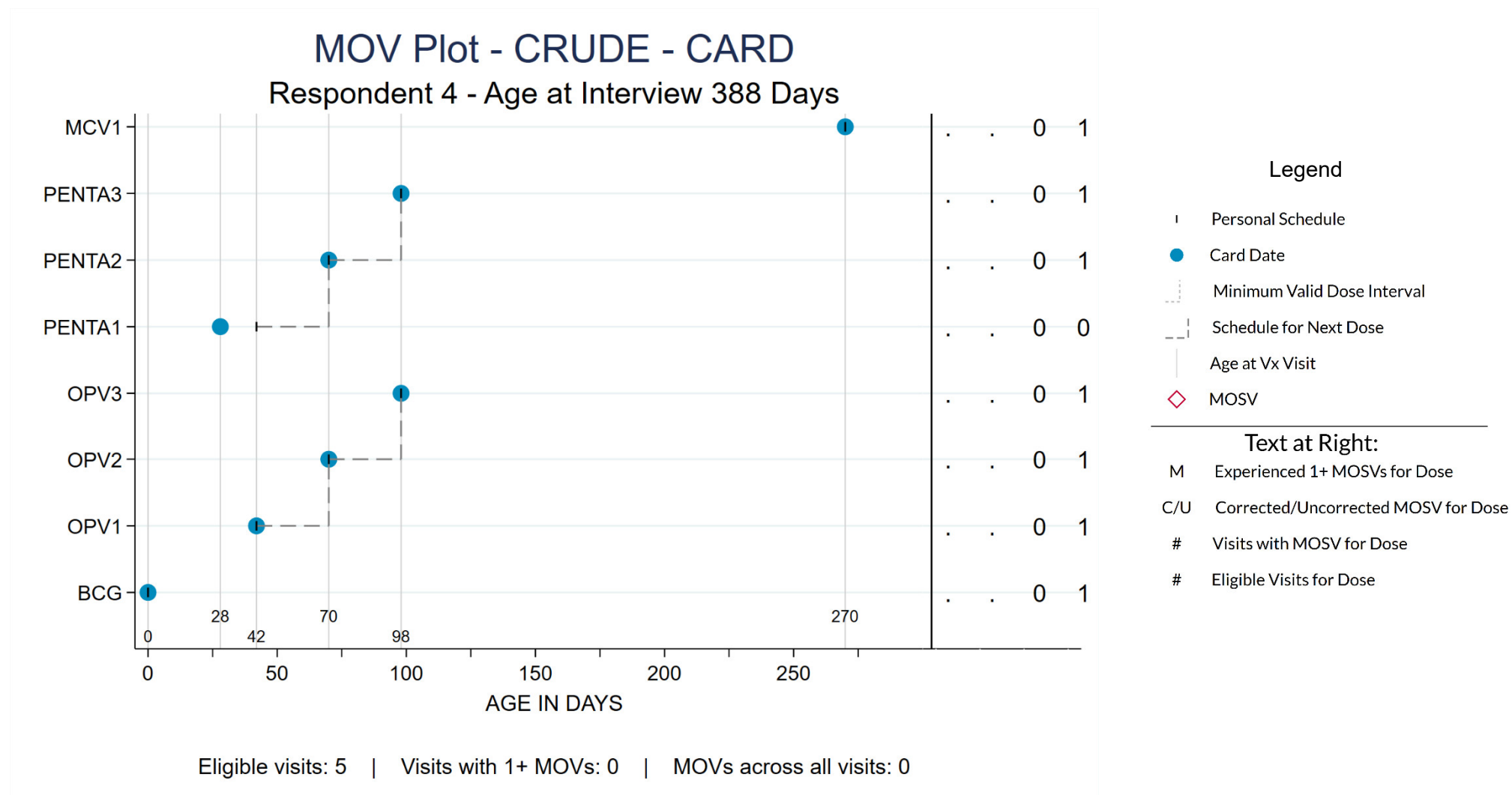


Figure S.3b. Vaccination Evidence and MOSV Indicators - Respondent 4 – VCQI valid dose analysis where early doses do not count

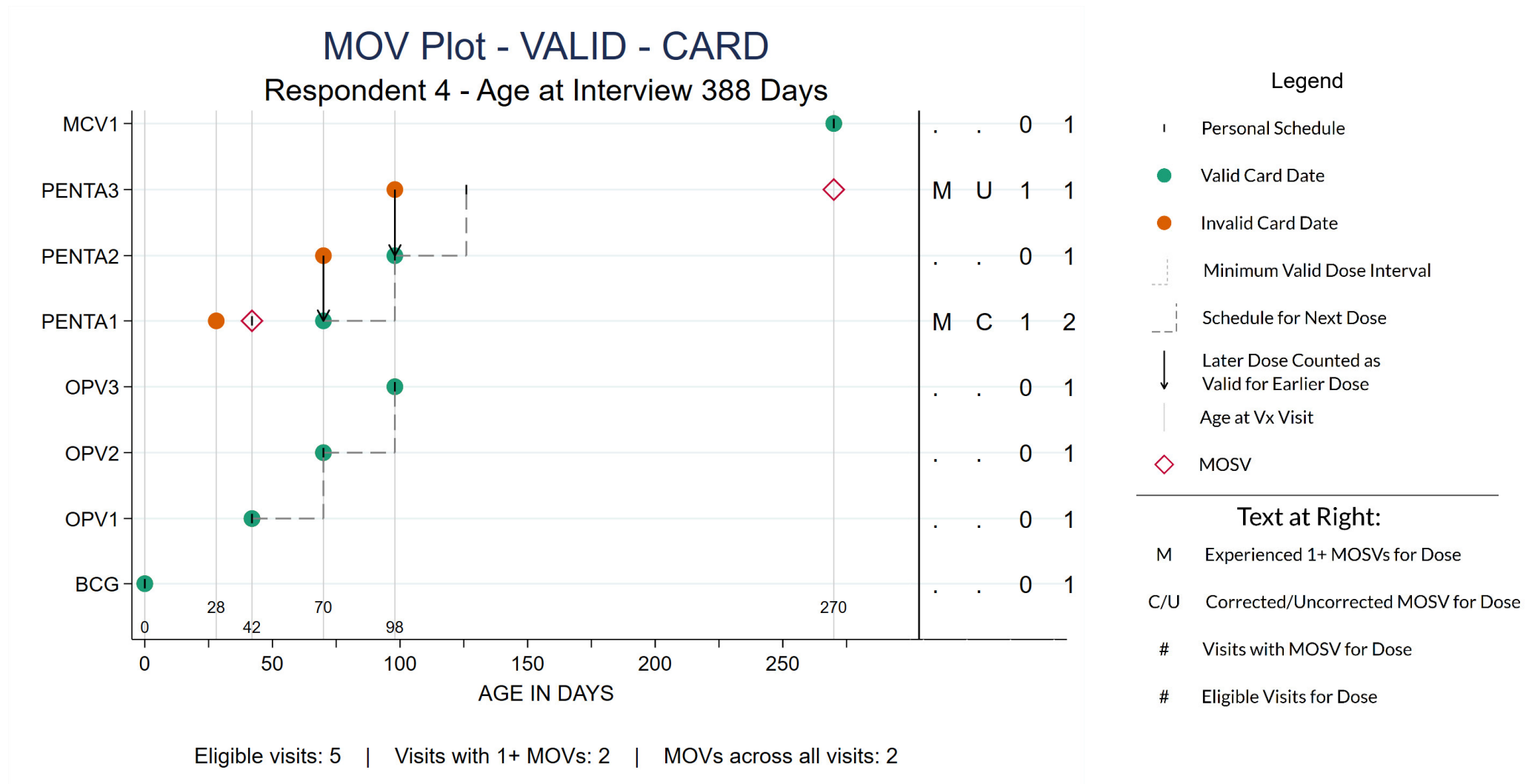
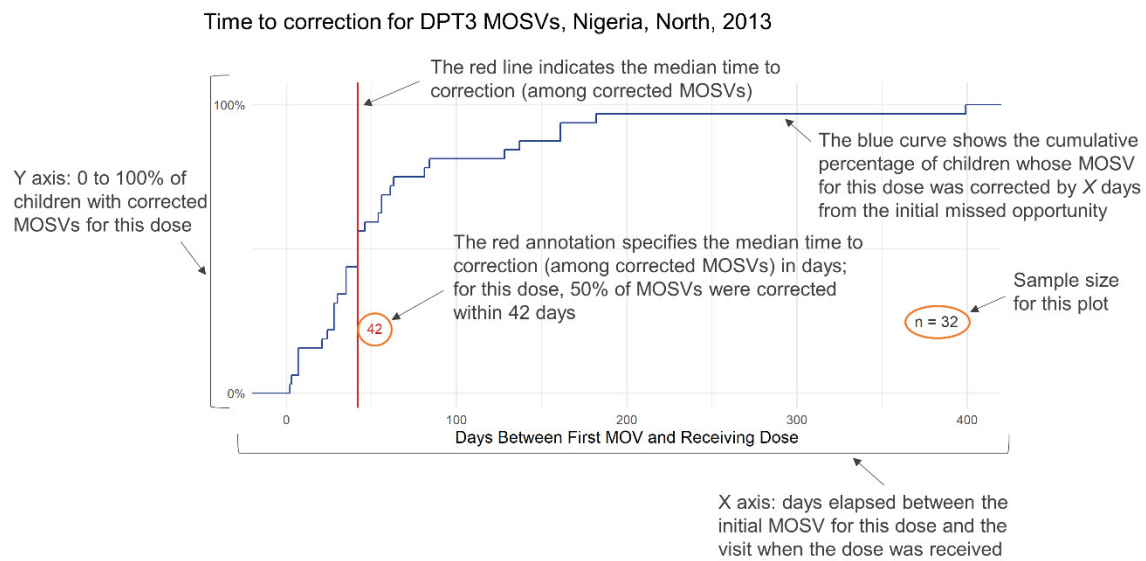


Figure S.4. Time to Correction Figure – Interpretation Guide



Text Box S.4. Features of a Time to Correction Plot

The time to correction figures in the manuscript show cumulative distributions of days until MOSV correction by stratum and dose. Figure S.4 is an annotated example of a single coverage curve figure, showing time to correction outcomes for children in a single stratum (the North zone of Nigeria) who had a corrected MOSV for a particular dose (DPT3). As time goes on, more children have their MOSVs corrected, until eventually 100% of the MOSVs that were corrected by the time of the survey have been corrected.

The blue curves in time to correction plots show the cumulative percentage of children whose MOSV was corrected by the number of days that have passed since the earliest opportunity to receive the dose. The red line and red annotation indicate the median time to correction in days. Sample size (n) is annotated in the bottom right of the plot.

MOSVs that were not corrected by the time of the survey are not represented in these plots because time to correction for those missed opportunities is not observed.

MOSV DATA QUALITY COMPLICATIONS

It is conceptually straightforward (though requiring complex programming) to identify MOSVs (or all MOVs if dates of other types of health contacts are available) and tally which were corrected, which were uncorrected, and to calculate the number of days the child spent under-protected because of their MOVs. But there are several practical issues that usually prevent the analyst from generalizing MOV results to the entire population.

Children without documented dates: In most household surveys in LMICs a notable portion of children do not show HBRs to interviewers so their MOVs cannot be assessed using the methods described here. This portion of children does not appear in the VCQI denominator for visit-based or child-based MOSV analyses and they never contribute to the numerator for children who would have received a valid dose if there had been no MOSVs.

Children with poor-quality documentation: There can be errors of omission and of commission for every element of the documented vaccination record: dates can be correct, incorrect, partial, illegible, missing, or written in the wrong spot on the HBR or FBR. Furthermore, the HBR can have different errors than the FBR, resulting in discordant evidence. Some doses that were not administered according to the documented evidence will be confidently vouched for by the caregiver (maybe she knows that she mistakenly left the HBR at home on the day of the most recent clinic visit).

Date data quality problems will have various consequences for MOV indicators. If evidence is from an unusable date or tick mark or from caregiver recall, then the dose cannot be assessed for MOVs. The analyst (and software) have no way of knowing at what visit or age the child received that dose. They also have no way of knowing whether the child experienced MOVs at the visit when they received the date-deficient dose. This removes some doses or entire visits from indicator denominators. If the date is complete but wrong, it can look like a legitimate visit that never occurred and it can add spurious observations to the denominator and the numerators. The errant dates appear in the analysis as visit dates and the software mistakenly counts some MOVs that never happened. Some errant dates will contribute to numerators and denominators (if the child would have been eligible for doses on the incorrect date) and some will be more benign if they fall in a time period when the child would not be eligible for any doses.

MOSV CALCULATION COMPLICATIONS

VCQI is flexible and can accommodate differences in country vaccination schedule, type of survey sampling, whether the analysis should use survey weights and different combinations of vaccination evidence. No matter which combination is appropriate, VCQI analyzes the MOVs using the same programs, which are responsive to different input parameters.

That flexibility comes at the cost of the software being complex. Although VCQI is comprised of more than 300 Stata programs (.ado files), the user only interacts with one program, called the *control program* where they specify parameters to describe the vaccination schedule, the survey parameters, and which indicators to calculate. The vaccination schedule is specified with up to three parameters per dose: minimum age to receive a valid dose; optionally, a maximum age when the dose is valid; and for doses in a series, the minimum intra-dose interval.

There are two aspects of MOV calculation that require special flexibility.

Long intra-dose schedule versus minimum interval for valid doses: In countries where childhood diseases are prevalent, vaccination visits are usually scheduled four weeks apart so children can reach full protection as early as possible. In countries where disease is less prevalent, the vaccination visits

are sometimes spaced out farther. In Latin American countries, the OPV/Penta1-3 visits are scheduled eight weeks apart. A later dose is valid any time after four weeks have lapsed but the child is not scheduled to come back for eight weeks. This presents a computational challenge in evaluating eligibility. VCQI addresses this challenge using two parameters: the scheduled age for each dose, and the minimum interval required for the later dose to be considered valid.

Doses administered too early: Consider the child whose history is portrayed in Figure S.3a. The card says they received Penta1 at age 28 days when it was scheduled at 42 days. They receive Penta2 and 3 on time at 70 and 98 days. Dose 1 was invalid. What should the healthcare worker do when the child returns for MCV at age 270 days? Administer a fourth dose of Penta, which would be the child's third *valid* dose? If yes, where would they write that date on the HBR? The spaces for Penta1, 2 and 3 are already filled. What are the chances that the worker will even notice that the dose was early? And now to the point for MOVs, should VCQI count an MOV if the worker fails to administer the third valid dose along with MCV at age 270 days?

VCQI calculates MOSV outcomes two ways and then tabulates and graphs the set of outcomes that the user requests. The so-called *crude analysis* counts early doses and valid doses alike. If there is evidence on the HBR that they received the dose, then the clinic worker is not expected to repeat invalid doses at later visits, and VCQI does not count an MOSV if they fail to do so. Figure S.3a shows results of the crude analysis; VCQI did not count an MOSV for Penta3 at 270 days. In the more strict, so-called *valid analysis*, early doses do not count, and VCQI counts an MOSV if the child returns later but does not receive the full complement of valid doses. Figure S.3b shows results of the valid analysis for the same child, where VCQI finds an MOSV for Penta3. The valid analysis yields more MOSVs than the crude analysis. The crude analysis probably corresponds to the practice in many countries: If the dose appears on the card, it is not repeated – even if it was early. The valid analysis is more concerned with maximizing the number of valid doses and thereby maximizing the likelihood the child will develop immunity. When we run VCQI, it is our practice to examine the crude outcome first. If the crude MOSV numbers are concerning, there is no need to consult the valid analysis. If the crude analysis is not concerning, then it may be worthwhile to also examine results of the valid analysis.

In our opinion, the topic of crude versus valid analysis warrants more exploration. It would be helpful to have clear guidance from WHO and for countries to turn extant guidance [22,23] into clear national policies concerning whether health workers should repeat doses that were given too early, and if so, under what circumstances. In the early 2010s many countries only gave first-year-of-life (1YL) doses to children who were still in the first year of life. In recent years, some second year of life (2YL) doses have been introduced into the schedule and countries are encouraged to catch-up for doses that were missed in infancy. It would be feasible to recommend catching up for doses given too early, but there are practical concerns, such as how those repeated doses would be recorded on the HBR. At this time in LMICs the appropriate first MOSV analysis is the more conservative crude analysis because it is likely consistent with their vaccination practices and because if it shows a notable prevalence of MOSVs then stakeholder engagement is warranted for reducing MOSVs. If the crude analysis outcomes are acceptably low then one might look at the valid analysis, but the results will only differ if there are a lot of early doses, which should already have been observed when looking at other timeliness indicators that we have not detailed here.

VACCINATION SCHEDULES FOR MOSV ANALYSES

Tables SC.1 and SN.1 list the ages at which the MOSV analysis doses were scheduled in Colombia and Nigeria for the years of the surveys. Other doses in the datasets were scheduled for these same ages, but only the schedules of the analysis doses are relevant for the MOSV results.

Table SC.1. Vaccination schedule for doses in Colombia MOSV analysis

Age	Doses Analyzed for MOSVs
Birth	BCG
2 months	OPV1, DPT1
4 months	OPV2, DPT2
6 months	OPV3 DPT3
1 year	MCV

Table SN.1. Vaccination schedule for doses in Nigeria MOSV analysis

Age	Doses Analyzed for MOSVs
Birth	BCG
6 weeks	OPV1, DPT1
10 weeks	OPV2, DPT2
14 weeks	OPV3 DPT3
9 months	MCV

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ADDITIONAL DETAILS TO SUPPLEMENT FIGURES IN THE MANUSCRIPT

Map SC.1. Map of Colombia Showing Region Names


































































































Table SN.2a. Visit-based MOSV analysis – Nigeria – BCG and OPV1-3

Year	Stratum	Visits with MOSV for BCG (%)	N	Visits with MOSV for OPV1 (%)	N	Visits with MOSV for OPV2 (%)	N	Visits with MOSV for OPV3 (%)	N
1990	Nigeria	 5.4	441	 16.0	438	 1.0	300	 3.6	253
1999	Nigeria	 16.5	236	 47.4	268	 5.9	135	 22.2	117
2003	Nigeria	 13.5	244	 46.4	233	 7.1	112	 18.6	97
2008	Nigeria	 35.3	1,548	 37.7	1,219	 12.9	774	 10.0	647
2013	Nigeria	 26.7	2,068	 34.7	1,750	 12.0	1,237	 12.6	1,102
2018	Nigeria	 24.2	2,774	 13.9	1,668	 4.1	1,403	 4.7	1,373
1990	North	 8.7	172	 13.1	153	 3.2	93	 5.6	71
1999	North	 31.7	41	 51.3	39	 .0	18	 38.5	13
2003	North	 12.6	127	 56.3	135	 9.1	44	 23.7	38
2008	North	 49.6	714	 44.3	503	 23.5	302	 16.1	230
2013	North	 33.8	904	 38.5	736	 12.4	469	 17.1	391
2018	North	 27.9	1,644	 17.8	987	 6.3	766	 5.1	707
1990	South	 3.3	269	 17.5	285	 .0	207	 2.7	182
1999	South	 14.1	142	 46.2	173	 8.8	91	 25.3	79
2003	South	 14.5	117	 32.7	98	 5.9	68	 15.3	59
2008	South	 23.1	834	 33.0	716	 6.1	472	 6.7	417
2013	South	 21.1	1,164	 32.1	1,014	 11.8	768	 10.1	711
2018	South	 18.8	1,130	 8.2	681	 1.4	637	 4.4	666
Scale		 100.0		 100.0		 100.0		 100.0	

Notes for this table appear after Table SN.2c

Table SN.2b. Visit-based MOSV analysis – Nigeria – DPT1-3 and MCV1 and any dose

Year	Stratum	Visits with MOSV for DPT1 (%)	N	Visits with MOSV for DPT2 (%)	N	Visits with MOSV for DPT3 (%)	N	Visits with MOSV for MCV1 (%)	N	Visits with MOSV for any dose (%)	N
1990	Nigeria	 17.7	440	 1.0	301	 2.8	250	 25.6	324	 14.1	1,351
1999	Nigeria	 50.5	277	 7.8	129	 16.2	105	 28.2	149	 38.5	732
2003	Nigeria	 42.0	238	 5.8	120	 15.4	104	 32.3	124	 33.3	655
2008	Nigeria	 29.2	1,267	 6.6	828	 6.8	766	 27.0	937	 32.7	4,222
2013	Nigeria	 36.2	1,963	 14.1	1,332	 12.6	1,164	 24.3	1,253	 29.8	6,599
2018	Nigeria	 15.4	1,711	 3.1	1,424	 3.9	1,384	 23.3	1,350	 16.9	7,690
1990	North	 17.5	154	 1.1	91	 4.3	70	 33.1	139	 21.0	424
1999	North	 25.7	35	 8.0	25	 40.0	20	 48.4	31	 46.8	111
2003	North	 42.2	128	 7.5	53	 16.7	48	 44.8	67	 41.8	318
2008	North	 34.6	534	 10.7	317	 8.8	284	 31.3	386	 45.2	1,650
2013	North	 36.1	795	 15.7	508	 16.2	421	 31.9	518	 35.6	2,528
2018	North	 19.8	1,019	 4.5	771	 5.2	718	 32.2	733	 22.0	4,155
1990	South	 17.8	286	 1.0	210	 2.2	180	 20.0	185	 10.9	927
1999	South	 54.5	178	 7.6	79	 14.3	63	 20.9	91	 37.5	472
2003	South	 41.8	110	 4.5	67	 14.3	56	 17.5	57	 25.2	337
2008	South	 25.2	733	 4.1	511	 5.6	482	 24.0	551	 24.7	2,572
2013	South	 36.3	1,168	 13.1	824	 10.6	743	 19.0	735	 26.2	4,071
2018	South	 9.0	692	 1.4	653	 2.6	666	 12.8	617	 10.9	3,535
Scale		 100.0		 100.0		 100.0		 100.0		 100.0	













































































































Notes for this table appear after Table SN.2c

Table SN.2c. Visit-based MOSV analysis – Nigeria – Any Dose, MOSVs per visit & Visits between MOSVs

Year	Stratum	MOSVs per Visit	N	Visits between MOSVs
1990	Nigeria	0.205	1,351	4.9
1999	Nigeria	0.559	732	1.8
2003	Nigeria	0.504	655	2.0
2008	Nigeria	0.450	4,222	2.2
2013	Nigeria	0.424	6,599	2.4
2018	Nigeria	0.221	7,690	4.5
1990	North	0.281	424	3.6
1999	North	0.649	111	1.5
2003	North	0.632	318	1.6
2008	North	0.636	1,650	1.6
2013	North	0.520	2,528	1.9
2018	North	0.296	4,155	3.4
1990	South	0.170	927	5.9
1999	South	0.549	472	1.8
2003	South	0.383	337	2.6
2008	South	0.331	2,572	3.0
2013	South	0.365	4,071	2.7
2018	South	0.134	3,535	7.5
Scale		1.000		10













































































































Notes
Percent of visits where children were eligible for the dose and did not receive it.
This is a crude dose analysis, meaning that early doses are accepted and counted in this analysis.
The final two measures on this sheet, MOSVs per visit and Visits between MOSVs are NOT percentages.
These analyses are unweighted.
The 1999 survey included a stratum named 'Central' which is included in the rows labeled 'Nigeria' but is excluded from the North vs. South comparison.
Blue columns labeled (%) are shaded such that 100% would fill the entire table cell.
The orange column labeled 'MOSVs per visit' are shaded such that 1.0 would fill the entire cell.
The pink column labeled 'Visits between MOSVs' is shaded such that 10.0 would fill the entire table cell. It can be interpreted as showing e.g. that an MOSV occurred on average once in every 3 visits for the South in 2008, compared to once in every 8 visits in the South in 2018.

Table SC.2a. Visit-based MOSV analysis – Colombia – BCG and OPV1-3

Year	Stratum	Visits with MOSV for BCG (%)	N	Visits with MOSV for OPV1 (%)	N	Visits with MOSV for OPV2 (%)	N	Visits with MOSV for OPV3 (%)	N
1995	Colombia	 29.5	786	 7.9	534	 6.3	378	 7.8	322
2000		 43.4	1,104	 20.6	762	 18.3	613	 22.5	564
2005		 20.9	2,628	 28.7	2,617	 5.3	1,657	 8.3	1,518
2010		 10.3	2,957	 10.5	2,782	 2.1	2,482	 4.4	2,356
1995	Atlántica	 42.4	243	 14.4	153	 12.1	91	 10.8	65
2000		 59.2	331	 25.1	171	 28.1	121	 28.4	102
2005		 29.7	817	 34.0	803	 6.4	452	 12.6	405
2010		 17.3	773	 6.2	662	 2.9	611	 5.3	568
1995	Bogotá	 15.0	80	 11.1	63	 7.4	54	 9.3	43
2000		 17.5	114	 17.0	106	 15.2	99	 10.0	80
2005		 4.7	127	 41.5	164	 4.2	96	 4.2	95
2010		 .8	122	 28.9	152	 .9	112	 2.8	109
1995	Central	 21.1	190	 5.1	137	 1.9	105	 10.0	100
2000		 34.0	288	 24.2	244	 15.7	178	 22.4	170
2005		 19.4	572	 28.6	566	 5.2	348	 7.8	320
2010		 6.1	575	 9.7	555	 1.6	513	 3.3	511
1995	Oriental	 21.1	128	 3.2	95	 6.7	60	 .0	52
2000		 46.5	202	 12.3	122	 18.3	120	 24.4	123
2005		 11.3	345	 32.8	381	 3.7	244	 8.2	232
2010		 6.5	397	 15.4	408	 1.5	323	 7.9	318
1995	Pacífica	 34.5	145	 3.5	86	 4.4	68	 6.5	62
2000		 42.0	169	 18.5	119	 13.7	95	 24.7	89
2005		 21.4	406	 23.2	383	 5.9	273	 7.3	247
2010		 12.1	429	 7.7	378	 2.3	349	 3.6	333
2005	Territorios Nacionales	 17.7	361	 10.6	320	 4.9	244	 4.1	219
2010	Territorios Nacionales	 8.8	661	 9.6	627	 2.3	574	 3.3	517
Scale		 100.0		 100.0		 100.0		 100.0	

















































































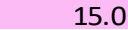
Notes for this table appear after Table SC.2c

Table SC.2b. Visit-based MOSV analysis – Colombia – DPT1-3 and MCV1

Year	Stratum	Visits with MOSV for DPT1 (%)	N	Visits with MOSV for DPT2 (%)	N	Visits with MOSV for DPT3 (%)	N	Visits with MOSV for MCV (%)	N
1995	Colombia	 8.4	536	 4.4	361	 7.5	319	 22.5	71
2000		 22.4	780	 20.3	629	 21.9	584	 22.9	516
2005		 6.7	2,137	 4.2	1,756	 8.8	1,661	 9.8	1,575
2010		 5.2	2,623	 1.8	2,482	 3.5	2,344	 7.1	2,228
1995	Atlántica	 10.9	147	 6.3	80	 16.4	67	 17.9	28
2000		 23.1	173	 26.4	121	 29.4	109	 24.0	104
2005		 8.0	624	 5.4	481	 10.1	436	 14.6	458
2010		 6.0	650	 2.2	601	 4.5	559	 7.8	540
1995	Bogotá	 13.6	66	 7.5	53	 7.0	43	 12.5	8
2000		 20.7	111	 13.3	98	 11.6	86	 14.3	70
2005		 9.2	120	 4.5	112	 3.6	110	 5.1	78
2010		 2.5	122	 .0	122	 2.6	117	 3.8	106
1995	Central	 5.1	136	 1.0	102	 5.3	94	 53.8	13
2000		 28.3	251	 21.9	192	 21.6	171	 25.3	158
2005		 4.5	448	 4.3	374	 7.8	346	 7.0	341
2010		 9.2	544	 1.4	507	 2.6	501	 6.1	490
1995	Oriental	 5.2	96	 6.7	60	 .0	52	 16.7	12
2000		 15.1	126	 16.9	118	 26.4	129	 25.5	110
2005		 4.0	300	 1.9	263	 10.5	277	 8.8	227
2010		 2.3	352	 3.3	331	 3.3	307	 4.0	301
1995	Pacífica	 8.8	91	 3.0	66	 7.9	63	 10.0	10
2000		 18.5	119	 21.0	100	 16.9	89	 20.3	74
2005		 10.9	341	 4.3	281	 8.5	258	 8.9	224
2010		 3.3	361	 1.7	354	 5.0	341	 8.3	300
2005	Territorios Nacionales	 4.3	304	 4.1	245	 8.5	234	 8.1	247
2010	Territorios Nacionales	 4.2	594	 1.4	567	 2.5	519	 9.2	491
Scale		 100.0		 100.0		 100.0		 100.0	

Notes for this table appear after Table SC.2c

Table SC.2c. Visit-based MOSV analysis – Colombia – Any dose, MOSVs per visit & Visits between MOSVs

Year	Stratum	Visits with MOSV for any dose (%)	N	MOSVs per Visit	N	Visits between MOSVs
1995	Colombia	 18.5	1,842	 0.230	1,842	 4.3
2000		 33.1	3,301	 0.431	3,301	 2.3
2005		 18.7	9,368	 0.217	9,368	 4.6
2010		 8.5	12,391	 0.095	12,391	 10.5
1995	Atlántica	 29.1	484	 0.372	484	 2.7
2000		 45.4	764	 0.564	764	 1.8
2005		 24.9	2,627	 0.298	2,627	 3.4
2010		 9.8	3,015	 0.113	3,015	 8.8
1995	Bogotá	 14.3	230	 0.191	230	 5.2
2000		 18.0	450	 0.260	450	 3.8
2005		 17.0	546	 0.194	546	 5.2
2010		 9.2	588	 0.100	588	 10.0
1995	Central	 13.1	495	 0.160	495	 6.3
2000		 31.3	973	 0.424	973	 2.4
2005		 18.2	2,019	 0.200	2,019	 5.0
2010		 7.5	2,589	 0.083	2,589	 12.1
1995	Oriental	 11.8	321	 0.140	321	 7.1
2000		 32.0	606	 0.432	606	 2.3
2005		 16.5	1,386	 0.186	1,386	 5.4
2010		 8.8	1,713	 0.093	1,713	 10.7
1995	Pacífica	 20.5	312	 0.244	312	 4.1
2000		 32.5	508	 0.396	508	 2.5
2005		 17.8	1,433	 0.210	1,433	 4.8
2010		 8.4	1,744	 0.092	1,744	 10.8
2005	Territorios Nacionales	 11.4	1,357	 0.134	1,357	 7.5
2010		 7.7	2,742	 0.087	2,742	 11.5
Scale		 100.0		 1.000		 15.0

Notes:
Percent of visits where children were eligible for the dose and did not receive it.
This is a crude dose analysis, meaning that early doses are accepted and counted in this analysis.
The final two measures on this sheet, MOSVs per visit and Visits between MOSVs are NOT percentages.
These analyses are unweighted.
The stratum named 'Territorios Nacionales' appears only in the 2005 and 2010 surveys.
Blue columns labeled (%) are shaded such that 100% would fill the entire table cell.
The orange column labeled 'MOSVs per visit' are shaded such that 1.0 would fill the entire cell.
The pink column labeled 'Visits between MOSVs' is shaded such that 15.0 would fill the entire table cell.

Table SN.3a. Child-based MOSV analysis – Nigeria – National Results

Stratum	BCG	DPT1	DPT2	DPT3	MCV1	OPV1	OPV2	OPV3	Summary
Nigeria 1990	408 9 6	299 63 15	295 3 0	242 1 6	218 23 40	309 59 10	294 3 0	241 3 6	294 82 5 57
Nigeria 1999	184 13 7	82 55 27	115 4 6	86 2 14	96 11 14	65 76 15	122 5 2	90 1 22	75 57 38 40
Nigeria 2003	201 10 10	94 44 28	110 3 4	82 6 9	74 10 21	76 47 31	102 2 6	76 3 12	97 49 27 51
Nigeria 2008	825 176 126	624 271 50	736 37 12	684 30 15	593 91 91	486 272 79	638 36 33	554 28 26	506 422 125 188
Nigeria 2013	1256 260 66	762 490 46	1023 121 19	927 90 27	838 110 107	700 442 43	994 94 18	879 84 27	732 721 121 142
Nigeria 2018	1844 259 130	1288 159 67	1346 34 10	1301 29 16	960 75 128	1288 148 49	1317 29 19	1277 31 22	1514 439 71 242

Calculations use crude measures of MOV. Dose columns show counts: Vaccinated at First Eligible Opportunity | MOV - Later Corrected | MOV - Uncorrected.

Summary column shows, for each stratum, counts: No MOVs | All MOVs Corrected | Mixture Corrected/Uncorrected | All MOVs Uncorrected.

Summary column calculated using the following doses: BCG, DPT1, DPT2, DPT3, MCV1, OPV1, OPV2, OPV3

Figure SN.3. Child-based MOSV analysis – Nigeria – Subnational Detail



Crude measures of MOV shown. Figure shows suppressed output for bars where $n < 25$. Sample size is shown on each bar.

The stratum summary table shows information for the following doses: BCG, DPT1, DPT2, DPT3, MCV1, OPV1, OPV2, OPV3.

MOV Summary by Stratum. % kids with:
 NM = no MOVs; AC = all MOVs corrected;
 SC = some corrected; NC = none corrected.
 Percentages in each row sum to 100%.

Table SN.3b. Child-based MOSV analysis – Nigeria – Subnational Detail

Stratum	BCG	DPT1	DPT2	DPT3	MCV1	OPV1	OPV2	OPV3	Summary
Centr 1999	43 4 0	16 14 7	22 1 1	22 0 0	18 1 3	13 16 4	26 0 0	24 0 1	18 14 7 8
North 1990	151 6 3	110 17 10	89 1 0	67 0 3	82 11 23	118 15 5	87 3 0	66 1 3	102 29 2 33
North 1999	25 3 3	20 6 3	22 1 1	11 1 6	11 5 2	9 10 3	18 0 0	8 0 5	10 7 7 9
North 2003	104 7 5	49 25 18	47 2 2	37 3 5	29 8 15	33 24 26	39 1 3	28 1 6	40 27 18 33
North 2008	271 89 91	234 113 36	263 20 10	244 15 6	218 47 41	176 104 54	210 21 27	180 13 16	158 168 74 121
North 2013	482 116 49	307 201 30	381 47 11	321 32 19	299 54 59	261 192 28	376 35 10	296 28 18	295 267 73 91
North 2018	1022 164 101	699 118 58	709 27 8	664 17 12	444 53 91	705 106 42	697 21 18	653 18 11	784 291 50 180
South 1990	257 3 3	189 46 5	206 2 0	175 1 3	136 12 17	191 44 5	207 0 0	175 2 3	192 53 3 24
South 1999	116 6 4	46 35 17	71 2 4	53 1 8	67 5 9	43 50 8	78 5 2	58 1 16	47 36 24 23
South 2003	97 3 5	45 19 10	63 1 2	45 3 4	45 2 6	43 23 5	63 1 3	48 2 6	57 22 9 18
South 2008	554 87 35	390 158 14	473 17 2	440 15 9	375 44 50	310 168 25	428 15 6	374 15 10	348 254 51 67
South 2013	774 144 17	455 289 16	642 74 8	606 58 8	539 56 48	439 250 15	618 59 8	583 56 9	437 454 48 51
South 2018	822 95 29	589 41 9	637 7 2	637 12 4	516 22 37	583 42 7	620 8 1	624 13 11	730 148 21 62

Calculations use crude measures of MOV. Dose columns show counts: Vaccinated at First Eligible Opportunity | MOV - Later Corrected | MOV - Uncorrected.

Summary column shows, for each stratum, counts: No MOVs | All MOVs Corrected | Mixture Corrected/Uncorrected | All MOVs Uncorrected.

Summary column calculated using the following doses: BCG, DPT1, DPT2, DPT3, MCV1, OPV1, OPV2, OPV3

Table SC.3a. Child-based MOSV analysis – Colombia – National Results

Stratum	BCG	DPT1	DPT2	DPT3	MCV	OPV1	OPV2	OPV3	Summary
Colombia 1995	469 85 23	452 39 3	337 8 6	275 20 3	51 4 6	457 35 4	342 12 8	279 18 5	436 139 15 29
Colombia 2000	457 168 41	487 118 9	409 92 9	375 81 17	347 51 41	492 113 8	424 77 12	360 77 21	232 326 72 53
Colombia 2005	1788 290 50	1912 82 19	1625 57 9	1430 85 38	1340 80 58	1740 126 162	1509 60 11	1321 71 40	1398 479 92 235
Colombia 2010	2510 141 40	2427 59 22	2402 35 8	2213 50 21	1990 80 68	2415 76 62	2388 41 10	2205 47 37	2156 363 38 193

Calculations use crude measures of MOV. Dose columns show counts: Vaccinated at First Eligible Opportunity | MOV - Later Corrected | MOV - Uncorrected.

Summary column shows, for each stratum, counts: No MOVs | All MOVs Corrected | Mixture Corrected/Uncorrected | All MOVs Uncorrected.

Summary column calculated using the following doses: BCG, DPT1, DPT2, DPT3, MCV, OPV1, OPV2, OPV3

Figure SC.3. Child-based MOSV analysis – Colombia - Subnational Detail



Table SC.3b. Child-based MOSV analysis – Colombia - Subnational Detail

Stratum	BCG	DPT1	DPT2	DPT3	MCV	OPV1	OPV2	OPV3	Summary
Atlántica 1995	109 31 12	118 13 1	73 2 2	48 8 2	22 1 1	113 18 2	77 3 5	53 5 2	103 45 8 13
Atlántica 2000	73 62 15	107 26 3	66 23 2	62 15 7	70 9 8	99 29 2	69 18 4	56 17 8	37 79 20 19
Atlántica 2005	471 103 29	543 31 4	440 15 5	370 22 16	362 29 29	476 54 58	406 17 3	332 22 23	340 155 46 85
Atlántica 2010	593 46 23	596 15 9	577 11 2	523 11 7	475 23 17	602 19 7	580 13 3	526 12 11	520 101 12 48
Bogotá 1995	64 4 2	50 7 1	48 1 3	37 3 0	7 0 1	50 6 0	47 3 1	36 3 1	51 18 1 5
Bogotá 2000	86 8 2	70 18 1	75 10 2	69 7 2	57 3 5	72 16 0	72 12 2	65 7 1	52 34 6 5
Bogotá 2005	119 2 1	103 6 1	103 4 1	103 3 1	70 4 0	93 3 19	88 4 0	88 3 1	87 15 4 19
Bogotá 2010	120 1 0	116 3 0	122 0 0	113 1 1	100 2 1	107 1 12	110 1 0	104 2 1	103 8 1 12
Central 1995	132 18 3	122 7 0	100 1 0	84 5 0	5 1 3	124 6 1	102 1 1	82 8 1	127 30 4 3
Central 2000	153 37 14	138 42 5	121 29 2	109 25 6	99 19 15	146 39 4	130 20 3	109 23 5	64 99 27 16
Central 2005	404 57 10	418 10 5	344 14 1	301 18 5	305 12 8	390 14 38	318 12 2	280 15 6	319 91 15 54
Central 2010	517 23 2	486 8 10	494 6 1	478 10 3	441 19 8	490 11 12	498 7 1	484 10 4	450 68 4 33
Oriental 1995	91 10 4	87 4 1	53 3 0	52 0 0	9 1 1	90 2 1	53 3 0	52 0 0	87 16 0 5
Oriental 2000	76 32 5	91 16 0	82 16 1	72 23 2	66 16 4	94 13 0	82 16 1	74 19 4	43 60 9 5
Oriental 2005	281 25 2	278 10 1	253 5 0	231 17 5	195 12 5	240 16 28	229 6 2	202 11 4	215 61 6 35
Oriental 2010	356 15 2	337 7 0	314 6 3	289 8 1	282 7 5	330 15 14	314 4 1	280 13 7	296 54 5 25
Pacífica 1995	73 22 2	75 8 0	63 1 1	54 4 1	8 1 0	80 3 0	63 2 1	56 2 1	68 30 2 3
Pacífica 2000	69 29 5	81 16 0	65 14 2	63 11 0	55 4 9	81 16 2	71 11 2	56 11 3	36 54 10 8
Pacífica 2005	271 48 8	292 12 8	260 9 2	225 11 8	197 7 12	275 19 16	247 10 4	216 13 4	215 75 15 37
Pacífica 2010	349 28 6	341 8 1	343 5 1	315 9 7	262 13 12	342 7 6	335 6 2	317 4 6	301 58 4 31
Territorios Nacionales 2005	242 55 0	278 13 0	225 10 0	200 14 3	211 16 4	266 20 3	221 11 0	203 7 2	222 82 6 5
Territorios Nacionales 2010	575 28 7	551 18 2	552 7 1	495 11 2	430 16 25	544 23 11	551 10 3	494 6 8	486 74 12 44

Calculations use crude measures of MOV. Dose columns show counts: Vaccinated at First Eligible Opportunity | MOV - Later Corrected | MOV - Uncorrected.

Summary column shows, for each stratum, counts: No MOVs | All MOVs Corrected | Mixture Corrected/Uncorrected | All MOVs Uncorrected.

Summary column calculated using the following doses: BCG, DPT1, DPT2, DPT3, MCV, OPV1, OPV2, OPV3

Table SN.4. MOSV Consequences – Nigeria – Potential Coverage Increase – National Results

	Card Seen (%)		Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)		Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)		Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)		Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)	
			BCG					OPV1					OPV2						OPV3			
1990	<div><div></div></div> 36	<div><div></div></div> 61	1	<div><div></div></div> 34	2	<div><div></div></div> 64	1	<div><div></div></div> 33	2	<div><div></div></div> 48	0	<div><div></div></div> 22	1	<div><div></div></div> 35	0	<div><div></div></div> 13	3					
1999	<div><div></div></div> 21	<div><div></div></div> 57	1	<div><div></div></div> 19	1	<div><div></div></div> 59	1	<div><div></div></div> 17	3	<div><div></div></div> 48	2	<div><div></div></div> 13	5	<div><div></div></div> 28	4	<div><div></div></div> 7	8					
2003	<div><div></div></div> 22	<div><div></div></div> 49	1	<div><div></div></div> 20	1	<div><div></div></div> 67	3	<div><div></div></div> 16	4	<div><div></div></div> 54	3	<div><div></div></div> 10	5	<div><div></div></div> 31	2	<div><div></div></div> 5	6					
2008	<div><div></div></div> 26	<div><div></div></div> 50	2	<div><div></div></div> 21	5	<div><div></div></div> 68	2	<div><div></div></div> 21	4	<div><div></div></div> 58	2	<div><div></div></div> 16	5	<div><div></div></div> 39	2	<div><div></div></div> 9	8					
2013	<div><div></div></div> 28	<div><div></div></div> 51	1	<div><div></div></div> 24	3	<div><div></div></div> 77	1	<div><div></div></div> 24	2	<div><div></div></div> 70	1	<div><div></div></div> 20	4	<div><div></div></div> 54	1	<div><div></div></div> 11	10					
2018	<div><div></div></div> 40	<div><div></div></div> 67	2	<div><div></div></div> 35	3	<div><div></div></div> 74	1	<div><div></div></div> 34	2	<div><div></div></div> 67	1	<div><div></div></div> 29	3	<div><div></div></div> 48	1	<div><div></div></div> 17	11					
	Card Seen (%)		Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)		Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)		Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)						
			DPT1					DPT2					DPT3					MCV1				
1990	<div><div></div></div> 36	<div><div></div></div> 63	1	<div><div></div></div> 32	2	<div><div></div></div> 48	0	<div><div></div></div> 22	1	<div><div></div></div> 34	0	<div><div></div></div> 13	4	<div><div></div></div> 45	4	<div><div></div></div> 19	5					
1999	<div><div></div></div> 21	<div><div></div></div> 50	3	<div><div></div></div> 16	3	<div><div></div></div> 42	3	<div><div></div></div> 12	6	<div><div></div></div> 29	4	<div><div></div></div> 7	8	<div><div></div></div> 43	1	<div><div></div></div> 10	2					
2003	<div><div></div></div> 22	<div><div></div></div> 43	3	<div><div></div></div> 17	3	<div><div></div></div> 33	2	<div><div></div></div> 11	4	<div><div></div></div> 23	2	<div><div></div></div> 5	6	<div><div></div></div> 37	2	<div><div></div></div> 9	2					
2008	<div><div></div></div> 26	<div><div></div></div> 52	1	<div><div></div></div> 23	2	<div><div></div></div> 45	1	<div><div></div></div> 18	3	<div><div></div></div> 36	1	<div><div></div></div> 11	6	<div><div></div></div> 41	2	<div><div></div></div> 14	2					
2013	<div><div></div></div> 28	<div><div></div></div> 51	1	<div><div></div></div> 25	2	<div><div></div></div> 46	1	<div><div></div></div> 21	3	<div><div></div></div> 39	1	<div><div></div></div> 12	8	<div><div></div></div> 42	2	<div><div></div></div> 15	3					
2018	<div><div></div></div> 40	<div><div></div></div> 65	1	<div><div></div></div> 34	2	<div><div></div></div> 58	1	<div><div></div></div> 30	3	<div><div></div></div> 51	1	<div><div></div></div> 17	10	<div><div></div></div> 54	2	<div><div></div></div> 18	3					
Gold columns labeled 'Up (%)' show increase in crude or valid coverage if respondents with cards had received every eligible dose at every documented vaccination visit.																						
Color bars are scaled so that 100% would fill the entire table cell.																						
All outcomes are weighted.																						

Table SC.4. MOSV Consequences – Colombia – Potential Coverage Increase – National Results

	Card Seen (%)	Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)	Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)	Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)	Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)
		BCG				OPV1				OPV2				OPV3			
1995	<div><div></div></div> 62	<div><div></div></div> 94	2	<div><div></div></div> 54	7	<div><div></div></div> 97	0	<div><div></div></div> 59	1	<div><div></div></div> 91	1	<div><div></div></div> 56	3	<div><div></div></div> 77	1	<div><div></div></div> 40	11
2000	<div><div></div></div> 75	<div><div></div></div> 95	3	<div><div></div></div> 69	6	<div><div></div></div> 97	1	<div><div></div></div> 73	2	<div><div></div></div> 89	2	<div><div></div></div> 67	4	<div><div></div></div> 72	5	<div><div></div></div> 54	13
2005	<div><div></div></div> 78	<div><div></div></div> 97	2	<div><div></div></div> 74	4	<div><div></div></div> 89	7	<div><div></div></div> 71	7	<div><div></div></div> 83	7	<div><div></div></div> 68	8	<div><div></div></div> 70	8	<div><div></div></div> 56	15
2010	<div><div></div></div> 83	<div><div></div></div> 97	1	<div><div></div></div> 75	3	<div><div></div></div> 94	3	<div><div></div></div> 75	3	<div><div></div></div> 91	3	<div><div></div></div> 74	4	<div><div></div></div> 83	4	<div><div></div></div> 65	9
	Card Seen (%)	Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)	Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)	Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)	Crude Cvg (%)	Up (%)	Valid Cvg (%)	Up (%)
		DPT1				DPT2				DPT3				MCV1			
1995	<div><div></div></div> 62	<div><div></div></div> 96	0	<div><div></div></div> 59	1	<div><div></div></div> 88	1	<div><div></div></div> 55	3	<div><div></div></div> 78	1	<div><div></div></div> 40	10	<div><div></div></div> 84	1	<div><div></div></div> 5	3
2000	<div><div></div></div> 75	<div><div></div></div> 95	1	<div><div></div></div> 72	2	<div><div></div></div> 89	2	<div><div></div></div> 67	4	<div><div></div></div> 77	4	<div><div></div></div> 54	13	<div><div></div></div> 71	4	<div><div></div></div> 44	7
2005	<div><div></div></div> 78	<div><div></div></div> 97	1	<div><div></div></div> 77	1	<div><div></div></div> 89	1	<div><div></div></div> 74	2	<div><div></div></div> 82	2	<div><div></div></div> 61	10	<div><div></div></div> 82	2	<div><div></div></div> 50	7
2010	<div><div></div></div> 83	<div><div></div></div> 97	1	<div><div></div></div> 77	1	<div><div></div></div> 94	1	<div><div></div></div> 75	2	<div><div></div></div> 90	2	<div><div></div></div> 65	9	<div><div></div></div> 81	1	<div><div></div></div> 59	3
Gold columns labeled 'Up (%)' show increase in crude or valid coverage if respondents with cards had received every eligible dose at every documented vaccination visit.																	
Color bars are scaled so that 100% would fill the entire table cell.																	
All outcomes are weighted.																	

Table SN.5a. MOSV Consequences – Nigeria – Time to Correction – National Results

levelname	BCG	DPT1	DPT2	DPT3	MCV1	OPV1	OPV2	OPV3
Nigeria 1990	4 27 30 133	28 35 52 109	30 31 82 113	1 1 1 1	32 61 118 138	28 35 50 78	24 29 149 221	4 6 16 22
Nigeria 1999	27 38 169 300	28 35 55 108	3 4 5 6	11 12 14 14	39 91 140 188	28 35 56 78	3 20 87 163	182 182 182 182
Nigeria 2003	6 58 148 192	28 42 70 165	6 8 18 24	23 40 52 209	30 50 158 203	28 36 62 102	11 19 27 32	54 61 213 304
Nigeria 2008	15 45 110 190	28 35 62 109	14 31 87 150	28 41 94 140	34 68 120 194	28 40 68 118	28 40 95 129	28 32 75 167
Nigeria 2013	10 28 63 154	27 35 67 133	20 36 66 133	26 44 90 155	28 40 92 163	28 35 59 111	21 35 66 131	28 34 83 158
Nigeria 2018	7 21 48 119	27 34 55 91	3 8 28 38	7 20 126 238	32 71 116 187	27 34 50 86	4 10 28 34	6 14 60 190

Table shows 25th, 50th, 75th, and 90th percentiles for days between first MOV and receiving dose, by level and dose.

Table SN.5b. MOSV Consequences – Nigeria – Time to Correction – Subnational Detail

levelname	BCG	DPT1	DPT2	DPT3	MCV1	OPV1	OPV2	OPV3
Centr 1999	30 104 187 220	31 37 49 61	2 2 2 2	NA NA NA NA	259 259 259 259	32 42 58 84	NA NA NA NA	NA NA NA NA
North 1990	6 22 81 186	31 46 59 119	31 31 31 31	NA NA NA NA	38 63 113 129	30 42 52 63	24 29 149 221	6 6 6 6
North 1999	16 31 61 79	18 30 33 44	3 3 3 3	15 15 15 15	91 138 142 170	22 44 67 78	NA NA NA NA	NA NA NA NA
North 2003	7 32 148 164	28 42 77 198	13 18 23 26	24 32 42 49	30 50 105 193	26 42 62 113	3 3 3 3	61 61 61 61
North 2008	28 63 135 229	28 42 76 161	26 36 88 147	28 35 64 124	34 63 110 157	28 42 76 159	28 35 92 133	31 46 118 198
North 2013	17 42 77 176	25 33 68 147	28 43 82 143	28 42 68 159	25 40 102 181	28 35 65 132	19 42 87 135	27 28 60 153
North 2018	7 28 58 128	28 35 56 90	4 12 28 35	8 14 154 365	30 63 115 188	28 35 56 88	4 10 27 44	6 10 42 254
South 1990	15 27 28 28	28 35 48 91	56 82 108 124	1 1 1 1	30 60 117 139	28 35 50 99	NA NA NA NA	7 14 20 24
South 1999	29 46 250 428	28 35 56 143	5 6 6 6	10 10 10 10	21 22 56 79	28 35 55 77	3 20 87 163	182 182 182 182
South 2003	44 84 163 210	28 35 62 154	5 5 5 5	34 47 206 301	72 115 158 185	28 35 62 81	35 35 35 35	126 206 286 333
South 2008	12 32 80 142	28 34 55 83	7 28 84 142	28 65 118 183	36 71 135 195	28 36 64 97	28 49 96 117	28 28 34 77
South 2013	7 21 48 137	28 35 63 118	15 34 62 76	24 47 92 149	29 39 90 155	28 34 56 93	23 35 62 126	28 39 91 168
South 2018	7 14 28 62	14 28 42 105	2 3 12 48	6 47 94 129	40 86 117 181	16 28 42 63	6 24 28 30	7 35 60 118

Table shows 25th, 50th, 75th, and 90th percentiles for days between first MOV and receiving dose, by level and dose.

Table SC.5a. MOSV Consequences – Colombia – Potential Coverage Increase – National Results

levelname	BCG	DPT1	DPT2	DPT3	MCV	OPV1	OPV2	OPV3
Colombia 1995	20 63 152 253	14 30 42 167	34 53 83 155	14 28 71 128	24 38 58 71	29 33 63 146	9 21 36 59	16 29 77 128
Colombia 2000	10 36 103 181	10 35 70 132	16 40 80 163	20 47 86 181	60 98 170 187	13 41 70 130	12 30 63 141	22 40 98 168
Colombia 2005	6 21 70 146	9 31 59 81	6 22 59 99	6 28 62 181	9 30 65 155	15 40 67 114	5 22 58 117	6 30 63 195
Colombia 2010	4 26 61 103	8 32 61 96	3 7 31 55	6 30 66 178	22 39 100 191	10 33 61 86	1 5 27 39	10 30 64 178

Table shows 25th, 50th, 75th, and 90th percentiles for days between first MOV and receiving dose, by level and dose.

Table SC.5b. MOSV Consequences – Colombia – Potential Coverage Increase – Subnational Detail

levelname	BCG	DPT1	DPT2	DPT3	MCV	OPV1	OPV2	OPV3
Atlántica 1995	26 72 150 195	20 30 61 206	72 93 114 127	8 29 62 146	24 24 24 24	28 33 59 151	10 15 68 100	27 38 102 143
Atlántica 2000	7 30 134 213	9 29 59 81	3 19 43 61	6 17 58 74	64 74 174 176	9 42 78 104	6 18 70 161	7 20 59 107
Atlántica 2005	7 30 82 164	15 30 54 81	12 30 72 117	6 28 62 153	7 30 65 158	22 45 66 101	4 22 70 136	6 24 93 228
Atlántica 2010	7 26 50 102	6 35 56 62	8 20 34 82	18 34 119 153	19 34 69 141	6 31 56 62	3 4 28 36	16 32 90 185
Bogotá 1995	18 26 94 208	8 32 33 37	27 27 27 27	10 16 17 18	NA NA NA NA	32 38 70 90	6 6 16 23	10 16 17 18
Bogotá 2000	10 22 29 124	31 57 69 136	37 80 116 205	36 40 54 67	104 142 206 244	32 65 72 148	30 58 92 192	40 55 72 119
Bogotá 2005	6 8 9 10	8 29 31 58	4 6 17 36	19 30 46 56	25 92 160 173	15 28 30 30	4 6 14 28	4 8 19 26
Bogotá 2010	1 1 1 1	33 63 66 69	NA NA NA NA	245 245 245 245	133 158 182 197	63 63 63 63	1 1 1 1	10 10 10 10
Central 1995	26 76 128 246	24 42 144 215	55 55 55 55	28 30 65 79	24 24 24 24	24 38 110 164	28 28 28 28	16 29 50 130
Central 2000	13 37 88 219	10 33 103 154	21 38 64 128	32 56 129 164	86 134 181 187	10 36 66 137	18 33 62 119	34 63 126 178
Central 2005	7 19 63 151	3 20 56 59	12 39 68 95	3 8 35 69	21 32 61 68	35 60 86 198	4 15 60 94	6 28 36 63
Central 2010	6 40 68 167	25 61 90 262	2 4 6 8	8 30 42 144	28 69 110 182	25 32 61 64	2 6 14 26	4 9 40 175
Oriental 1995	7 16 99 177	2 8 24 43	25 36 120 170	NA NA NA NA	51 51 51 51	24 35 46 52	12 14 25 32	NA NA NA NA
Oriental 2000	13 40 103 160	9 38 56 82	15 29 80 156	24 47 85 173	50 96 134 176	10 36 66 90	13 26 62 132	15 31 116 145
Oriental 2005	5 25 70 134	11 33 60 94	1 12 15 23	10 30 179 231	28 46 99 175	8 30 40 92	18 28 95 117	28 35 80 184
Oriental 2010	1 4 55 135	20 30 49 84	6 22 58 215	1 6 53 138	4 31 120 160	30 58 62 62	2 6 14 22	4 48 61 160
Pacífica 1995	36 52 176 252	25 30 32 67	66 66 66 66	20 68 114 122	80 80 80 80	30 31 88 122	42 48 55 58	53 72 91 102
Pacífica 2000	17 58 85 128	20 43 80 122	30 76 152 197	57 92 184 272	35 68 114 156	32 55 78 150	12 19 38 60	32 84 136 180
Pacífica 2005	5 28 80 148	25 40 63 116	5 22 59 111	10 30 49 89	6 26 34 50	34 62 70 122	14 38 53 67	9 30 69 174
Pacífica 2010	4 22 58 111	12 38 59 71	7 10 28 35	2 9 10 49	22 31 53 115	6 15 38 63	5 18 37 42	20 36 51 57
Territorios Nacionales 2005	4 11 33 76	5 31 48 62	10 20 30 113	6 43 86 117	6 16 64 94	6 30 60 93	3 15 38 88	6 9 51 107
Territorios Nacionales 2010	8 30 63 84	7 30 61 89	1 1 4 16	11 58 113 174	31 58 198 230	4 32 76 111	1 2 10 161	39 79 120 150

Table shows 25th, 50th, 75th, and 90th percentiles for days between first MOV and receiving dose, by level and dose.