



Making Good Use of VCQI Supplemental Immunization Activity or Post-Campaign Coverage Survey Output

The WHO Vaccination Coverage Quality Indicators (VCQI) have been available as Stata programs since 2015 and now as an R package (**vcqiR**) since 2025. VCQI conducts standardized analyses of data from household vaccination coverage surveys. It produces tabular output, graphic figures, and row-and-column datasets that hold individual level and stratum level results. The latter can be imported into downstream tools for additional visualization, summary, or analysis.

There are numerous documents and resources on the [VCQI resources website](#). The indicators that VCQI calculates are described simply in the VCQI [Results Interpretation Quick-Reference Guide](#) and more thoroughly in the [Indicator List with Specifications](#).

VCQI has been used for both primary and secondary analysis of numerous post-supplementary immunization activity (SIA) surveys, which are often called post-campaign coverage surveys¹ (PCCSs). At this time, only the Stata version of VCQI includes PCCS indicators. VCQI documentation uses the abbreviation SIA more than PCCS.

VCQI produces a great deal of output – the goal of this document is to help an analyst: a) know what is available, b) decide what to look at first, c) understand how to interpret the output, and d) know where to look for additional information. There are several useful PCCS analytic developments that make use of VCQI data but are not yet part of VCQI. We describe those briefly here, too, and would be happy to help other analysts conduct those analyses on their data.

If you have questions that aren't answered here, you can always send a note to Dale Rhoda. (Dale.Rhoda@biostatglobal.com) Feedback on any of this material is always welcome.

¹ In the VCQI notation which was developed around 2015, a vaccination campaign is called a *supplemental immunization activity* or SIA so we see the abbreviation SIA in a lot of VCQI documentation. An SIA coverage survey is the same as a PCCS.

VCQI output overview

VCQI output produces tables and figures for immediate review. It will usually be posted in a shared folder – one folder per “VCQI run”. A single run usually involves a single survey and can calculate one or several coverage indicators. In some cases, your questions about the output or requests for additional detail may prompt additional runs which will be summarized in additional folders of output.

VCQI can summarize the demographics of respondents and their responses to multiple choice questions (e.g.,: Why didn’t your child receive the campaign dose?). But its focus is on calculating coverage indicators based on the evidence of vaccination – evidence from cards, if seen, and from caregiver recall and in the case of SIAs, evidence from a finger mark.

There is a document named the [VCQI Results Interpretation Quick-Reference Guide](#) that lists the definitions of each VCQI indicator and gives guidance for interpreting VCQI’s tables and graphs and figures. You should review that document and have it handy when interpreting VCQI output. Indicators are defined in an even more detailed manner in the [VCQI Results Interpretation Quick-Reference Guide](#).

Q. What output should I look at first?

A. Stakeholders want to know the proportion of eligible population that were reached with the campaign dose. That is summarized in both tabular and graphic output from the indicator named SIA_COVG_01. If the analyst has defined some geographic or demographic subgroups for reporting results, you will see campaign coverage summarized for the entire population and by population subgroup. You should include the 95% confidence intervals when you communicate coverage results. **Table 1** is an example of output from SIA_COVG_01.

Table 1. Percent of eligible children vaccinated during the campaign, VCQI test data from fictional District 20

	Vaccinated during SIA, by card (%)	Vaccinated during SIA, by recall (%)	Vaccinated during SIA, by fingermark (%)	Vaccinated during SIA by any source (%)	95% CI (%)	95% LCB (%)	95% UCB (%)	DEFF	ICC	N	Weighted N
Test District #20	28.1	24.8	33.3	52.9	(45.3, 60.3)	46.6	59.0	1.1	0.0244	210	210
Abbreviations: CI=Confidence Interval; LCB=Lower Confidence Bound; UCB=Upper Confidence Bound; DEFF=Design Effect; ICC=Intraclass Correlation Coefficient											
Note: This measure is a population estimate that incorporates survey weights. The CI, LCB and UCB are calculated with software that take the complex survey design into account.											

Q. What next?

A. It is helpful to look at an organ pipe plot of campaign coverage to discern a) whether there were any clusters where none of the children in the survey received the campaign dose, or b) whether there were clusters where a surprisingly small number of children in the survey received it. See **Figures 1 and 2**.

If none of the children in a cluster received the campaign dose, that cluster may be in a neighborhood that was entirely missed by campaign workers. It may be instructive to look at responses to the question “Why didn’t your child receive the campaign dose?”. And it may be worthwhile to coordinate with the campaign team and go back to the neighborhood and carry out qualitative interviews to understand what happened.

Figure 1. Organ pipe plots for post-measles campaign coverage survey in Jharkhand, India, 2012

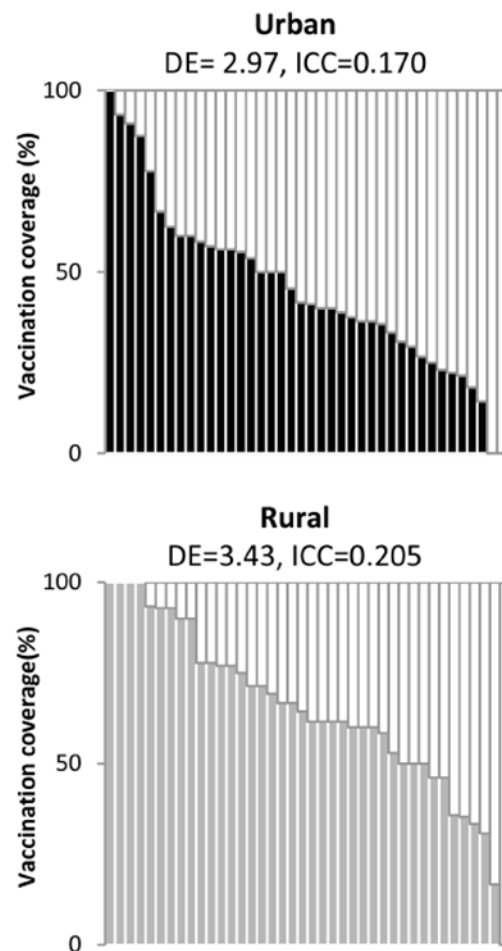


Fig 1. Cluster-level measles campaign vaccination coverage in the urban and rural surveys, Jharkhand, 2012. Organ-pipe plots of unweighted coverage by cluster were constructed for urban and rural surveys (Dale Rhoda, personal communication). Design effect (DE) and intraclass correlation coefficients (ICCs) were calculated for the respective surveys.

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What next?

A. Campaigns reach some children who had already been vaccinated, either through routine immunization services or previous campaigns. Stakeholders often want to know what portion of children in the eligible population received the dose for the first time via the recent campaign. That is summarized by indicator SIA_COVG_02. Similarly, SIA_COVG_04 reports campaign coverage stratified by the number of prior times the child had received the campaign dose.

VCQI can also make a list of clusters with surprisingly low coverage. That tabular output is from SIA_COVG_05. The VCQI analyst defines the threshold for is counted as *low coverage*.

Table 2. Proportion of children whose first measles dose came from the campaign, VCQI test data from fictional District 20

	SIA Provided Childs First Measles Dose (%)	95% CI (%)	StdErr (%)	95% LCB (%)	95% UCB (%)	DEFF	ICC	N	Weighted N
Test District #20	10.0	(6.2, 15.7)	2.3	6.8	14.6	1.2	0.0356	210	210

Abbreviations: CI=Confidence Interval; LCB=Lower Confidence Bound; UCB=Upper Confidence Bound; DEFF=Design Effect; ICC=Intracluster Correlation Coefficient

Note: This measure is a population estimate that incorporates survey weights. The CI, LCB and UCB are calculated with software that take the complex survey design into account.

Table 3. Campaign coverage reported by the number of previous measles doses the child had received, VCQI test data from fictional District 20

	Vaccinated during SIA (%)	95% CI (%)	Vaccinated during SIA (Weighted N)	Weighted N
Test District #20	52.9	(45.3, 60.3)	111	210
Zero	63.6	(45.2, 78.8)	21	33
1 Dose	46.3	(34.9, 58.1)	31	67
2+ Doses	56.8	(45.5, 67.5)	50	88
Unknown	66.7	(20.8, 93.9)	2	3
Dose Received, But Not Sure How Many	36.8	(19.1, 59.0)	7	19

Abbreviations: CI=Confidence Interval

Note: This measure is a population estimate that incorporates survey weights. The CI is calculated with software that takes the complex survey design into account.

Additional analyses

At Biostat Global Consulting we run several additional analyses that use datasets produced by VCQI, but these analyses have not been incorporated into VCQI yet. We describe them briefly here and would be happy to share example code for others to use or adapt.

1. Coverage before and after the campaign
2. Three-colored organ pipe plots
3. BeSD or attitude question responses disaggregated by cluster coverage
4. Maps showing locations of clusters, possibly indicating cluster level coverage
5. Maps of campaign coverage
6. Attitude response tile charts

Coverage before and after the campaign

The team that compiles WHO UNICEF coverage estimates finds it helpful for PCCS teams to summarize campaign dose coverage before and after a campaign, by age cohort. If the PCCS asked whether the child had received the campaign dose prior to the campaign, those responses can be used to estimate coverage before the campaign. And then data from prior can be combined with data from the campaign to estimate coverage after, meaning prior to and during the campaign. When we produce this table, it looks something like [Table 4](#).

Table 4. Measles coverage before, during, and after the campaign, stratified by child age, Burkina Faso 2024

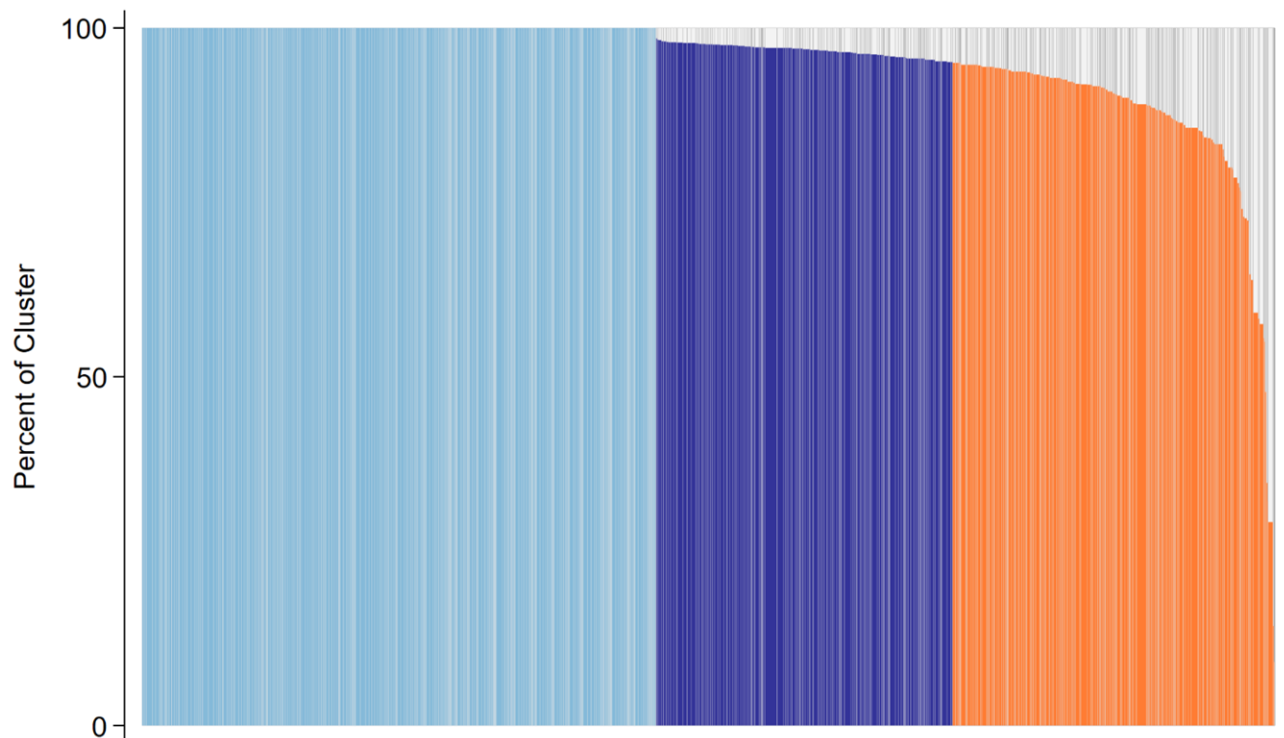
Age (years)	Had received 1+ doses before the campaign (%)	Had received 2+ doses before the campaign (%)	Campaign coverage	Received 1+ doses before and/or during the campaign (%)	Received 2+ doses before and during the campaign (%)
	% 95% CI	% 95% CI	% 95% CI	% 95% CI	% 95% CI
<2	63.9 (57.2-70.0)	36.1 (30.4-42.2)	82.6 (77.4-86.8)	93.7 (90.2-96.0)	56.2 (49.4-62.8)
2	77.4 (70.9-82.8)	48.4 (42.2-54.7)	89.7 (86.1-92.4)	97.6 (95.9-98.7)	73.7 (67.2-79.3)
3	74.8 (67.7-80.7)	43.4 (37.2-49.8)	86.7 (81.6-90.6)	97.6 (95.0-98.9)	71.4 (64.3-77.5)
4	69.2 (63.0-74.8)	33.9 (28.9-39.3)	87.1 (83.2-90.2)	97.9 (95.3-99.0)	63.0 (56.8-68.8)
All	70.9 (66.6-74.9)	39.7 (35.7-43.8)	86.6 (83.9-88.9)	96.8 (95.4-97.8)	65.6 (61.1-69.8)

Multi-colored organ pipe plots

It may be helpful to shade organ pipe plot bars using several colors to define two or three coverage groups.

[Figure 2](#) is an example of three categories where 95% or fewer of respondents in the orange clusters received the campaign dose. The analyst may use any thresholds to define the groups. It is a good idea to discuss the topic with stakeholders to define that they mean by *surprisingly low coverage*. In our work we sometimes define the orange category as clusters where 50% or fewer of survey respondents received the campaign dose.

Figure 2. Organ pipe plot for post-measles-rubella vaccination campaign, Kenya 2016. Light blue columns are clusters where 100% of survey respondents received the campaign dose. Dark blue clusters are those where more than 95% and fewer than 100% of respondents received it. The small number of orange clusters are places where 95% or fewer of survey respondents report having received the campaign dose.



Source: Data from the survey described in <https://doi.org/10.1371/journal.pone.0199786>.

Note: This is not a VCQI output, but is easily constructed in post-processing with a dataset that VCQI produces and one of the VCQI commands.

BeSD or attitude question responses disaggregated by cluster coverage

VCQI will summarize responses to multiple choice questions like whether the caregiver had heard of the campaign, sources of campaign information, reasons the child did not receive the campaign dose, and caregiver knowledge and attitude or behavioral and social drivers of vaccination (BeSD). These summaries are tabular. Figures may be constructed from those tables in a downstream step.

It may be helpful to summarize responses to BeSD questions by cluster coverage group to see if attitudes appear to differ between clusters where all the respondents got the campaign dose and clusters where fewer or very few received the campaign dose. The differences can be assessed formally using a survey-adjusted Rao-Scott chi-square test. We have examples of this output in our Burkina Faso, Laos, and Cambodia PCCS reports. **<I am working to obtain permission to make copies of those accessible by hyperlink. When approved for sharing, insert an example here.>**

Maps showing locations of clusters, possibly indicating cluster level coverage

When the microdata include geocoordinates of the survey clusters, it is possible to make a map that shows the location of clusters with high and medium and low proportions of respondents who received the campaign dose.

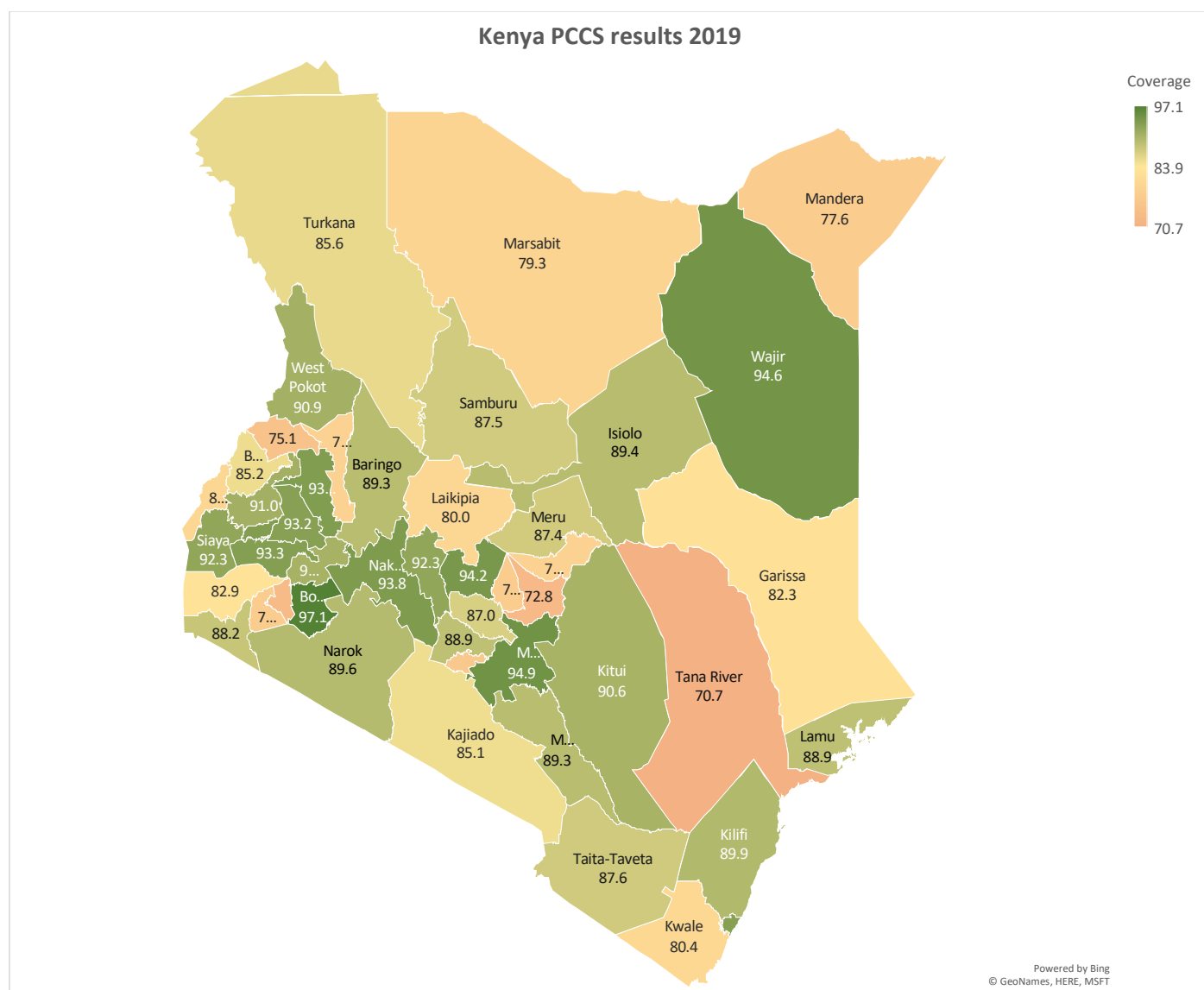
<Again, insert an example from Gavi PCCS reports, when permission is obtained.>

VCQI does not make maps, but its SIA augmented dataset can serve as an input for a downstream program to make such a map.

Maps of campaign coverage

If the survey includes subnational reporting domains then it may be useful to summarize coverage results using a choropleth map like **Figure 3**.

Figure 3. Map of campaign coverage results, Kenya 2019, from John Wagai, personal communication



Attitude tile charts

We are developing the capability to show all responses to BeSD or vaccine attitude questions in a structured manner that reveals patterns that may not be obvious from usual tabular output. We call these attitude tile charts. It is possible to compare and contrast the responses from caregivers whose children received the campaign dose with those whose children did not. Contact Dale Rhoda for details and for access to the program to generate the charts from your data. [<Pointer to a slide deck and explainer video to come soon.>](#)

VCQI output folder contents

A brief orientation to what contents are saved where in the VCQI output folder:

Plots_IW_UW – holds bar charts of indicator outcomes for all respondents, and by subnational stratum. The plots are listed by the name of the indicator – see the VCQI Results Interpretation Guide for a list of which indicator summarizes what. The indicators that use survey weights show bars with 95% confidence intervals. Indicators that do not use survey weights simply show bars with no confidence intervals.

Plots_OP – holds organ pipe plots that show how coverage is distributed across the clusters in each stratum. This is an indication of whether the outcome is spatially uniform or whether it is spatially *spotty* or *heterogeneous*. If the vaccination program is doing well in some areas and poorly in others, that might be a clue worth following up.

Run_XX_TO.xlsx (where XX is a number like 01) holds the tabular output for all the indicators that were run.

Run_XX.do is the VCQI control program that made all of the output.

Overview of VCQI barcharts

In the folder named **Plots_IW_UW**, it may be instructive to look at the plots with the following names

SIA_COVG_01*.png – documents campaign coverage

SIA_COVG_02*.png – documents proportion of children for whom the campaign dose was their first

SIA_QUAL_01*.png – documents the proportion of vaccinated children who received campaign cards

Which Outcomes to Feature for Stakeholders

The [VCQI Interpretation and Quick Reference Guide](#) includes guidance on how to interpret and describe VCQI indicator outcomes. The following steps are meant to give a framework for teams to evaluate what else to describe in the survey report and dissemination workshops:

1. What % of eligible respondents received the campaign dose (SIA_COVG_01)?
If high, **report the good news.**
If low or medium, then **examine carefully the tabulated reasons for non-vaccination (DESC_03) and consider liaising with the campaign team to try to learn what they learned during rapid convenience monitoring (RCM) if applicable or what they heard about challenges from the campaign workers.**
2. What was the dose coverage before the campaign, and after the campaign?
If coverage improved notably, **report the good news.**
If it did not, then **examine closely the tabulated reasons for non-vaccination (DESC_03) especially among caregivers of children with zero prior doses.**
3. If campaign coverage was lower than the target, examine an organ pipe plot (SIA_COVG_01).
Were there clusters where none of or only a small number of survey respondents received the campaign dose?
If yes, **ask campaign staff what happened in those areas.** You can make a list of clusters with surprisingly few vaccinated respondents using the indicator (SIA_COVG_05). **Examine closely the reasons that caregivers there gave for their child not receiving the campaign dose (DESC_03).**
4. What % of children received their first dose of the vaccine in the campaign (SIA_COVG_02)?
If high, **report the good news.**
If low, **take a careful look at campaign coverage stratified by number of prior doses (SIA_COVG_04).**
5. Look at campaign coverage stratified by number of prior doses? (SIA_COVG_04)
Did children with zero previous doses have high coverage? If yes, **report the good news.**
If low, **look carefully at the reasons for not receiving a campaign dose, especially from caregivers of children with zero prior doses.**
6. What % of vaccinated children showed a card? (SIA_QUAL_01)
If high, **report the good news.**
If low or medium, do not despair, handing out cards is still likely to have improved the quality of recall data in the survey.
7. Report the outcomes from Behavioral and Social Drivers of Vaccination (BeSD) questions, or other attitude questions if they were asked.
If results are encouraging, **report the good news.**
If not then **summarize the results in detail.**
If there were a notable number of clusters where surprisingly few respondents received the campaign dose, consider presenting a stratified tabulation of BeSD and attitude responses, in two or three groups:
 - i. Attitudes among caregivers from clusters where all respondents got the campaign dose.
 - ii. Among caregivers from clusters where most but not all respondents got the campaign dose.
 - iii. Among caregivers from clusters where half or fewer of respondents got the campaign dose.

For each of the indicators mentioned here, you can use both geographic sub-regions and demographic sub-groups to investigate whether performance is uniformly good/poor or whether it varies by region or by sub-group.

Contact Dale if you want some help to explore your VCQI output. (Dale.Rhoda@biostatglobal.com)

Again, your feedback on any of this material is always welcome!