WHO Vaccination Coverage Cluster Survey Reference Manual: What's New?

Technical Update, February 2016

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Vaccination Coverage Cluster Survey

- Working draft available on the Web: http://www.who.int/immunization/monitoring_surveillance/en/

- Pilot test(s) ongoing

- Implementation experiences will inform finalization

- Working Group
  - Tony Burton
  - Pierre Claquin
  - Felicity Cutts
  - Dale Rhoda

Immunization coverage cluster survey – Reference manual

2015

Immunization coverage cluster survey – updated Reference Manual

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Need to Assess Coverage in an Increasingly Complex Vaccination Landscape

- New and much more expensive vaccines (pneumococcal conjugate vaccine-PCV, rotavirus-RV)

- New target populations
  - 2nd dose of measles-containing vaccine (MCV2), flu, HPV

- Mix of strategies
  - Fixed site
  - Outreach, mobile teams, Child Health Days
  - Supplementary immunization activities (SIAs)

- Mixed schedules with lagging card distribution

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Role of Vaccination Coverage Surveys

- Surveys can be a helpful tool to monitor vaccination coverage, particularly trends, while efforts to improve routine reporting systems are ongoing

- They can also be used to respond to specific questions regarding factors associated with coverage

- They complement the administrative vaccination coverage data

- Household Surveys for Vaccination Coverage: DHS, MICS, EPI… LQAS

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"Old" EPI Cluster Survey

- Typically 30 clusters of 7 kids each

- Assumes DEFF = 2 or ICC ≈ 1/6

- Randomly select first dwelling using spin the bottle/pen technique

- Data collectors select households to visit – risk of selection bias

- Survey nearby dwellings (1 child per dwelling) until 7 reached

- Analysis gives equal weight to every respondent

- Includes instructions to calculate a confidence interval…but not a true probability sample

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Why a New WHO Manual

- To provide a methodology aimed at improving survey precision, accuracy, and overall quality.
  - Routine Immunization (RI)
    - Including HPV
  - Post supplementary immunization activities (SIAs)

- Old points with renewed emphasis:
  - Taking steps to ensure minimize bias and improve data quality
  - Using results for action
  - Highlighting limitations
    - To try to avoid unmet expectations or misuse of results

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Main 2015 Enhancements

1. Increase emphasis on choosing survey goals (estimation/ hypothesis testing/classification) and sizing the sample to answer key questions

2. Use probability sampling to allow strong claim of representativeness and meaningful confidence intervals

3. Pre-select households to be interviewed – limit opportunities for field data collectors to influence selection

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Main 2015 Enhancements

4. Document the outcome of visits to each household so that missing data can be accounted for properly

5. Conduct weighted statistical analyses

6. Easily include multiple age cohorts (2nd year of life, HPV)

7. More documented data on vaccination status – visit health facilities to search registers in addition to cards

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1. Sizing Survey to Meet Goals & Budget
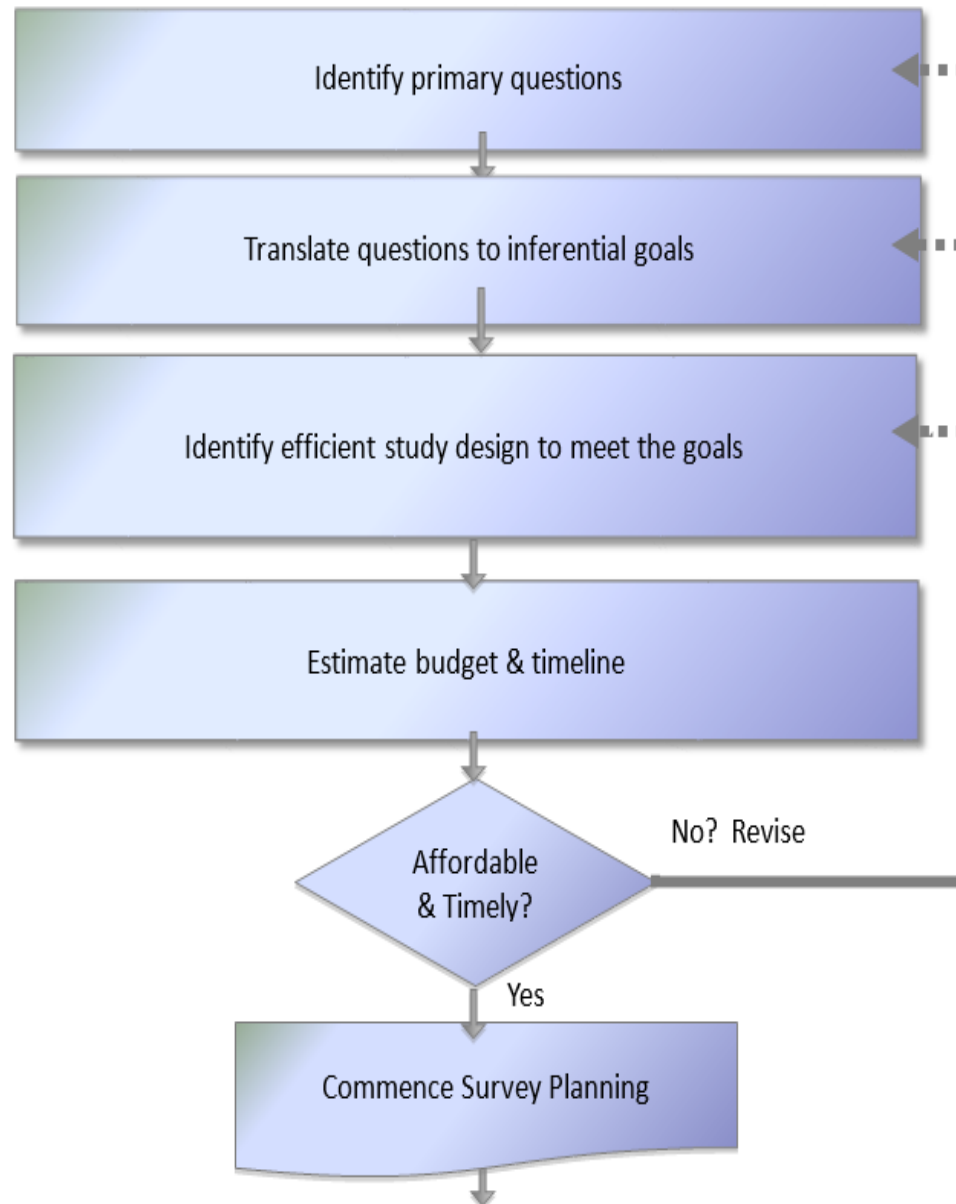
Goals Addressed

1. Estimate Precisely
   - Specify target coverage and max width of (asymmetric) 95% CI
   - Specify average respondents per cluster
   - Specify intra-cluster coefficient (ICC)

2. Classify / Estimate
   - Specify two coverage thresholds
   - Specify probability of Type I & II errors

3. Test for Difference or Change
   - Specify baseline & hypothesized change
   - Specify probability of Type I & II errors

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2. Probability Sampling for Representativeness & Meaningful Confidence Intervals

- **Using census enumeration areas (EAs) for primary sampling units**

- **Obtaining (or making) excellent maps**

  - **For RI: pre-selecting a segment of the EA & interviewing every eligible respondent**

  - **For SIA: enumerating HH & selecting random sample**

- **Revisiting those not at home at least twice**

- **Not replacing households**

Probability Sample

- Every eligible respondent has a non-zero chance of selection into survey sample

- Those probabilities are calculable for selected individuals

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3. Pre-Selecting Households to Interview

- In some places, microplanning may be possible without visiting the clusters, using excellent maps & Google Earth

- Elsewhere, an early visit will be necessary to make a good map and randomly select a segment to sample

- Same day visit can work, but household selection should be centrally or randomly accomplished – not left to data collectors

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4. Document Outcome at Each Household

- Earlier methods used a quota sample (often n=7) for completed questionnaires in each cluster

- Households with no one at home usually not recorded in any way, just substituted

- These biases have not been well accounted for

- The new methods will document the interview outcome at every household, which will allow modern adjustments for missing data

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5. Weighted Statistical Analysis

- Probability sample makes confidence intervals and bounds meaningful

- Plot coverage estimates along with 95% CI and 95% lower and upper confidence bounds

- Estimation and classification are straightforward (more on this shortly)

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6. Include Multiple Age Cohorts

- Most of the steps are the same to do field work on different age cohorts

- New guidelines give guidance to select sample size according to goals and select target number of households depending on the size of the age cohort

- Includes guidance for simultaneous work on more than one cohort

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7. More Emphasis on Documented Evidence of Vaccination

- Old: transcribe card & record recall

- New:
  - if card is not available, record recall and go to the health facility and find child's record in EPI register
  - photograph cards & registers for date verification

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Photos Present Challenges & Benefits

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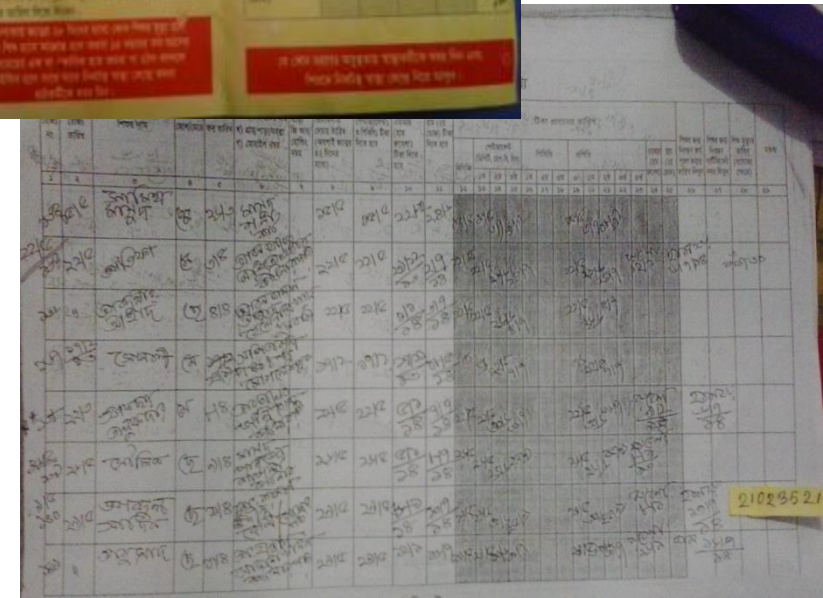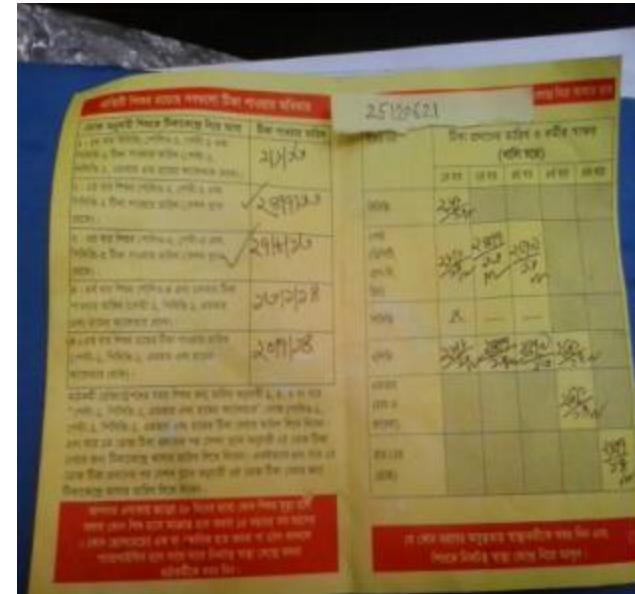
Visit Health Facilities

- **I**f no vaccination card at home, seek a copy of the child's vaccination records at the relevant health facility

- **I**t requires resources to identify, liaise, copy records enter & manage data

- This can yield substantial increases in proportion of survey data based on documented evidence
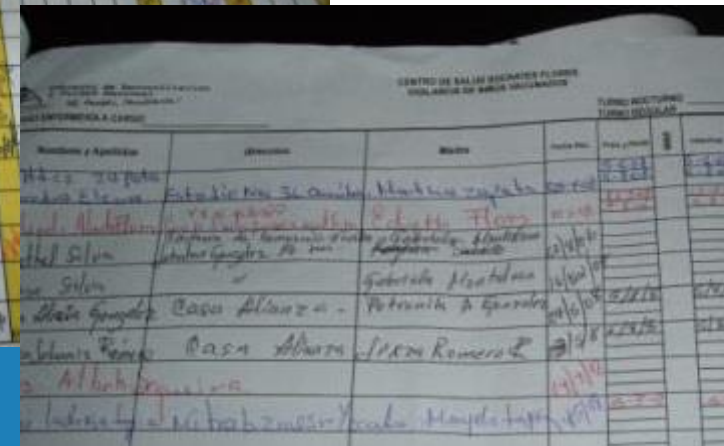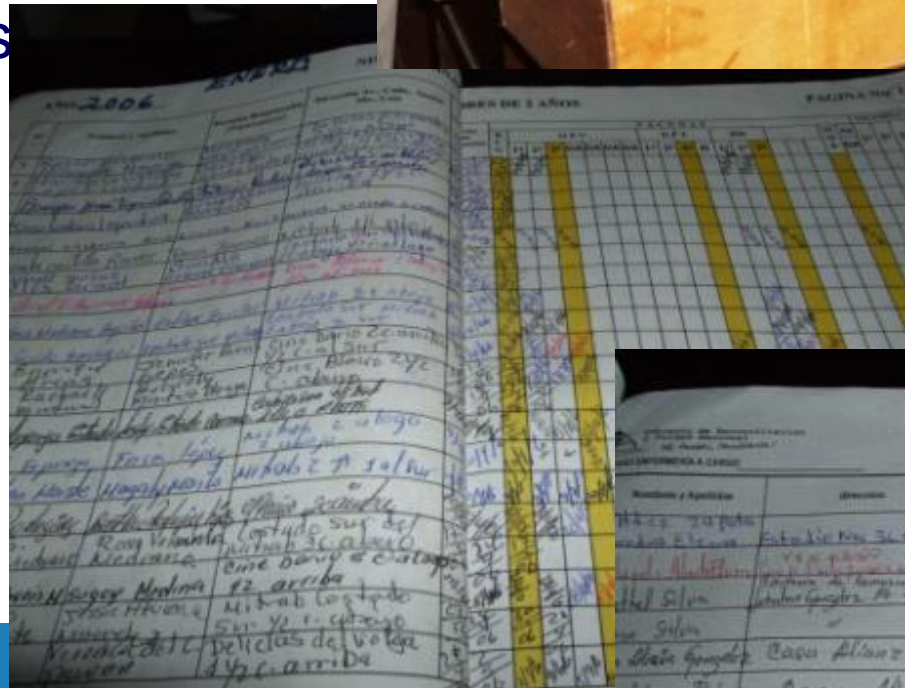
Steps to Minimize Bias and Bolster Data Quality

- Field data collectors do not select which homes are visited

- Excellent training on how to administer survey, read a variety of cards that can co-exist in the field & fill out forms

- Revisiting if no one is at home and attempting to visit at non-traditional hours

- Double-checking of data before leaving home & before leaving cluster

- Excellent supervisors available to address questions

- Independent monitors to re-interview some respondents and flag any issues

- Excellent data entry and management

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Using Results for Action

- First…the sample is sized to address the primary question(s)

- Devote substantial resources to translate results into action plans

- Look at coverage, and variation in coverage with EPI and health ministry staff

- Identify areas with high drop-out and address it

- Investigate issues in areas with missed-opportunity problems

- Re-train staff in areas with invalid doses

- Address timeliness in areas where doses are administered late

- Plot vaccinations by calendar month and investigate odd patterns

- Investigate the reasons for finding clusters with 0 children vaccinated

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Reports to Be Persuasive about Quality

- Clear and complete reporting of coverage surveys

- More substantive sections on strengths and limitations

- Authors should face a challenge to persuade the reader that the survey organizers worked hard to minimize and eliminate bias in order to produce results that are representative, understandable, and actionable

- Readers should start skeptical, and wind up with a clear opinion about the quality of the coverage survey; this would require something of a shift in practice, quality, and emphasis

| Research

Surveys of measles vaccination coverage in eastern and southern Africa: a review of quality and methods used

Reinhard Kaiser,[a] Messeret E Shibeshi,[a] Jethro M Chakauya,[a] Emelda Dzeka,[a] Balcha G Masresha,[b] Fussum Daniel[a] & Nestor Shivute[a]

Objective To assess the methods used in the evaluation of measles vaccination coverage, identify quality concerns and provide recommendations for improvement.

Methods We reviewed surveys that were conducted to evaluate supplementary measles immunization activities in eastern and southern Africa during 2012 and 2013. We investigated the organization(s) undertaking each survey, survey design, sample size, the numbers of study clusters and children per study cluster, recording of immunizations and methods of analysis. We documented sampling methods at the level of clusters, households and individual children. We also assessed the length of training for field teams at national and regional levels, the composition of teams and the supervision provided.

Findings The surveys were conducted in Comoros, Eritrea, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, Swaziland, Uganda, Zambia and Zimbabwe. Of the 13 reports we reviewed, there were weaknesses in 10 of them for ethical clearance, 9 for sample size calculation, 6 for sampling methods, 12 for training structures, 13 for supervision structures and 11 for data analysis.

Conclusion We recommend improvements in the documentation of routine and supplementary immunization, via home-based vaccination cards or other records. For surveys conducted after supplementary immunization, a standard protocol is required. Finally, we recommend that standards be developed for report templates and for the technical review of protocols and reports. This would ensure that the results of vaccination coverage surveys are accurate, comparable, reliable and valuable for programme improvement.

Abstracts in عربي, 中文, Français, Русский and Español at the end of each article.

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Organ Pipe Plots

- Clusters with highest coverage at left; lowest at right

- Easily detect clusters with alarmingly low sample coverage

- If the width of bar = cluster weight, then shaded area = coverage estimate

- Intuitive visual representation of coverage heterogeneity

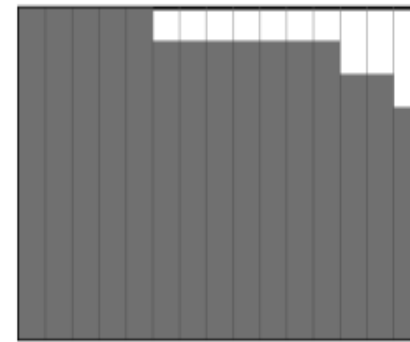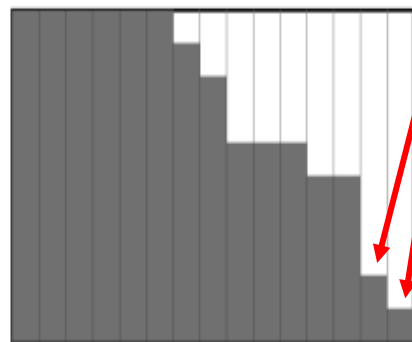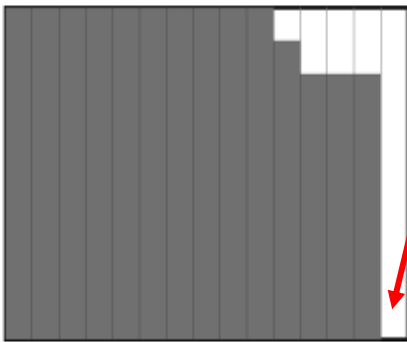- Relates to intracluster correlation coefficient (ICC), which drives design effect
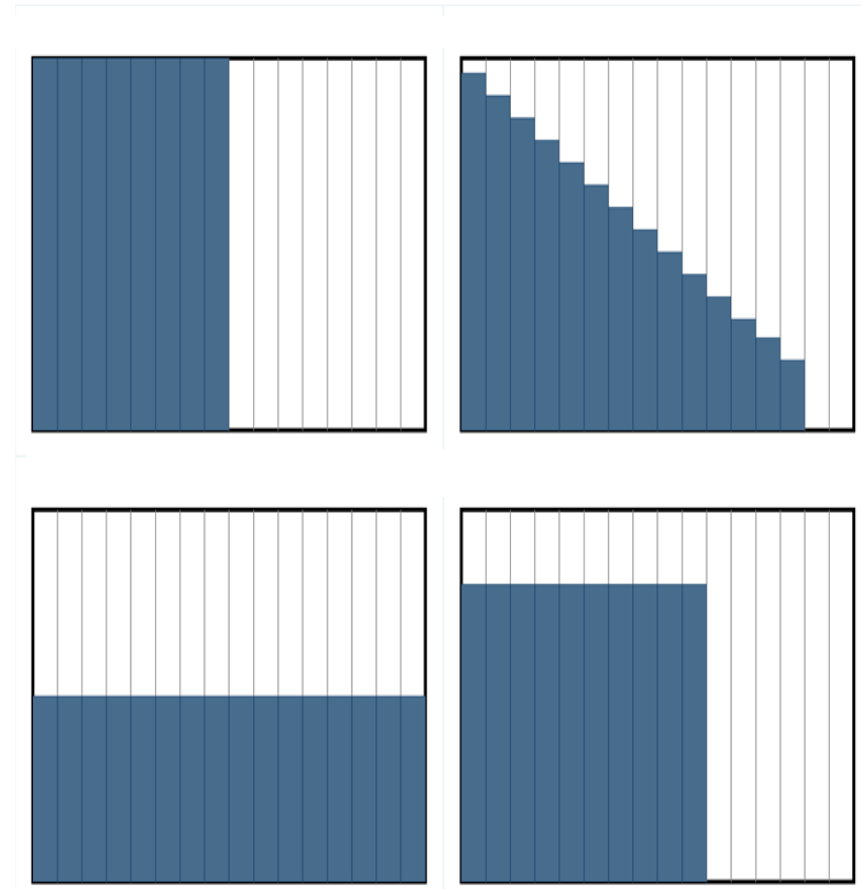
"Covered strata are all alike; every poorly covered stratum is poorly covered in its own way." – Neo Tolstoy

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Examples of Measles Campaign Organ Pipe Plots
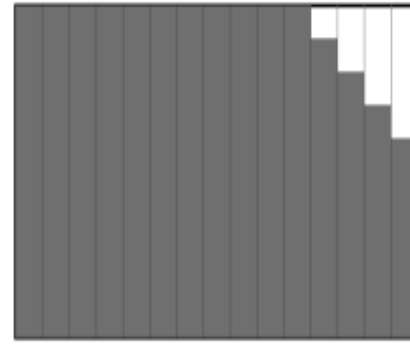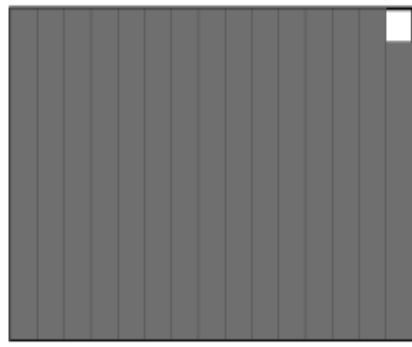
These three clusters have <u>alarmingly low coverage</u> in the survey sample.

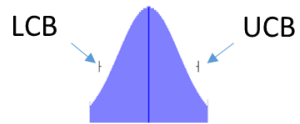**Definition of "<u>alarmingly low</u>" could vary from one context to another.**

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Inchworm Plots

- **Three Useful Confidence Intervals**

1. Show the point estimate and 95% CI in color
2. Show the 95% LCB & UCB with subtle tick marks
3. List the point estimate and all three intervals

LCB   UCB

50.0 [40.2,59.8] (0.0,58.3] [41.7,100)

Estimated Coverage %

50.0 [40.2,59.8] (0.0,58.3] [41.7,100)

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Estimated Coverage %

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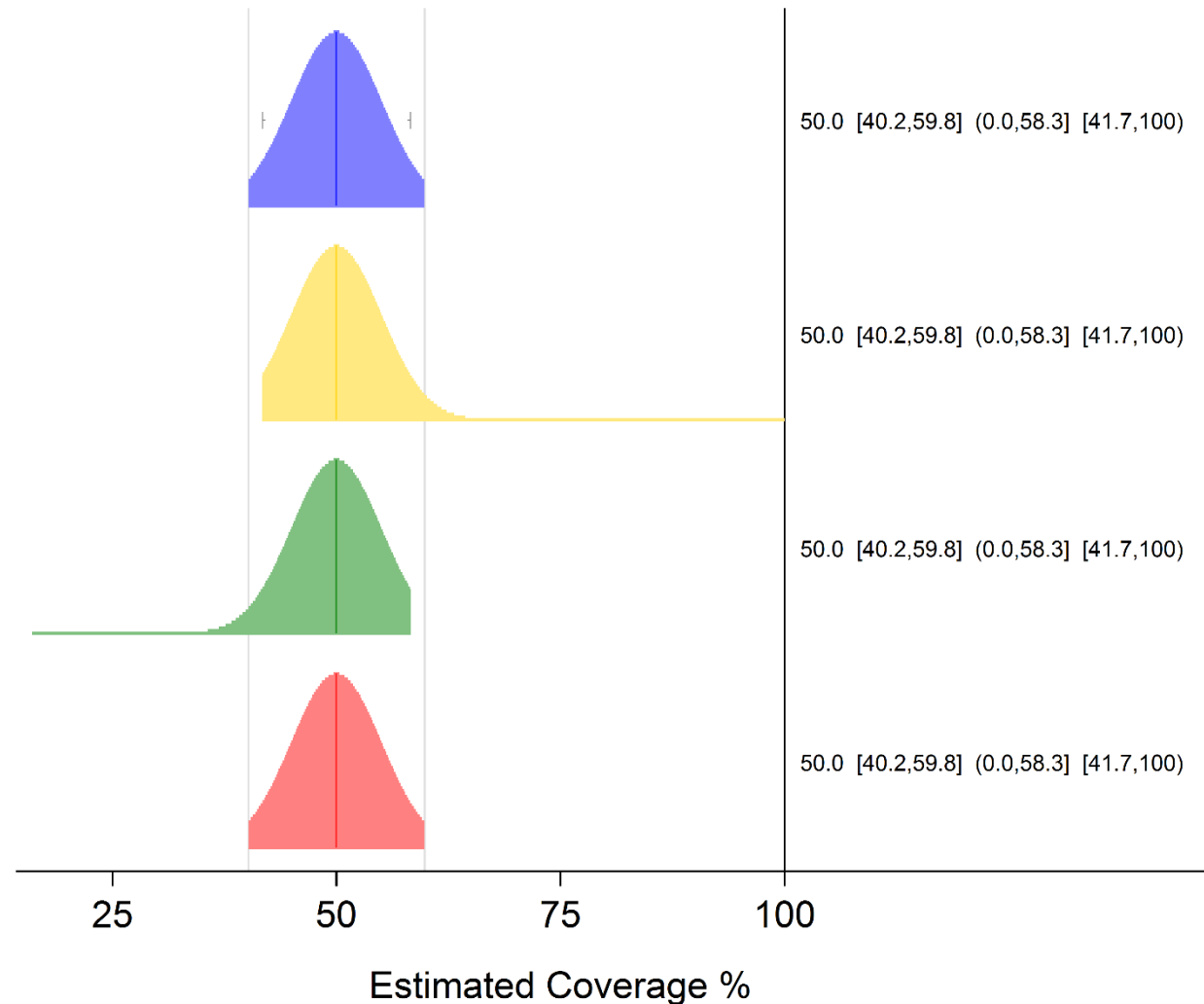
Example of inchworms

- Show the distributions, and the UCB and LCB

- Describe your classification rule clearly and portray the classification outcomes along with the graphic distributions
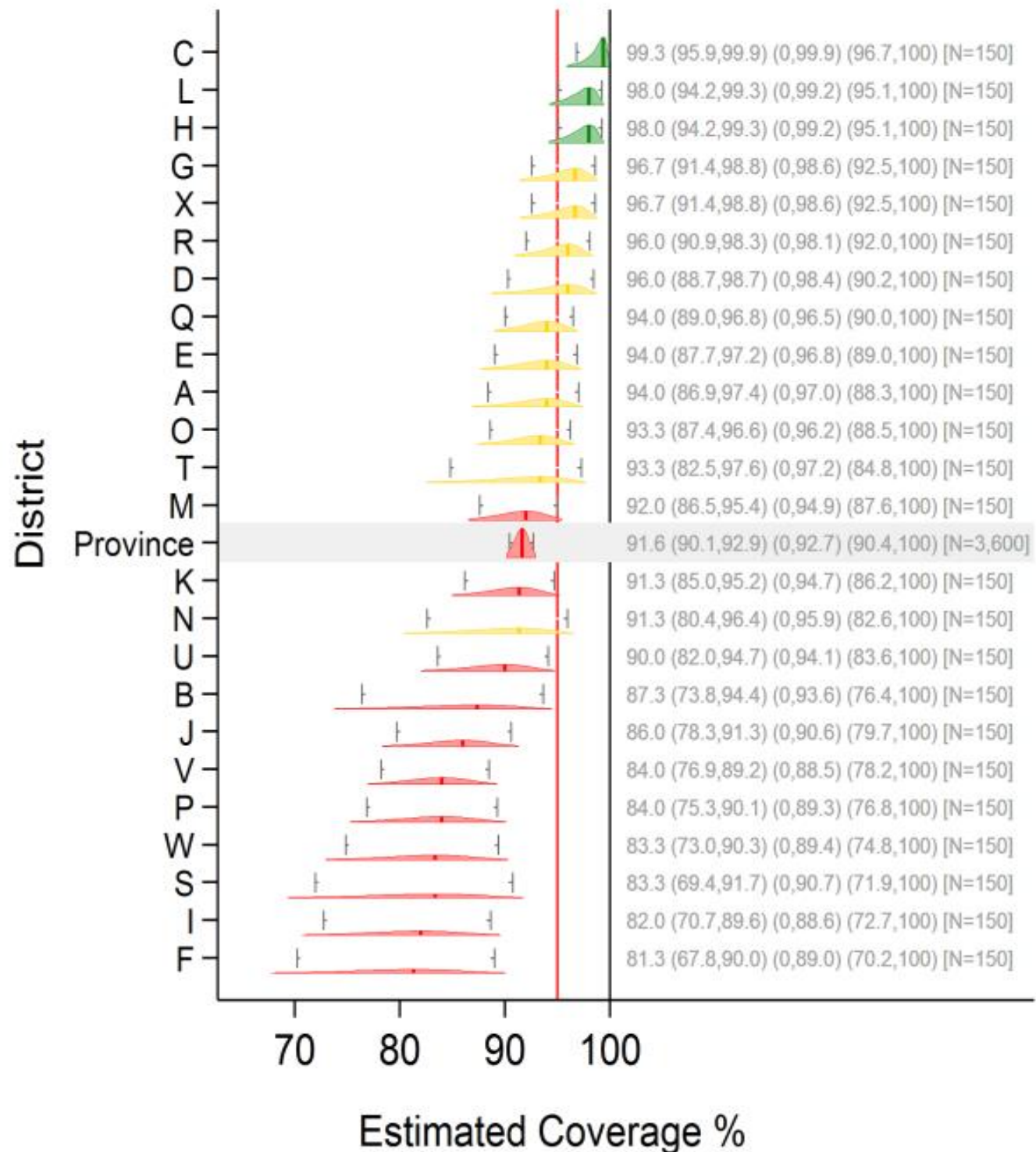
Challenges: Investments and Technical Assistance

- Larger sample sizes often appropriate, revisits
  - May require 2+ trips per cluster
  - Revisit non-respondents in evening/morning or during weekends, may require overnight stay in clusters

- Costly technology for data capture

- Technical assistance
  - General implementation
  - Statistical (throughout)
  - Possibly with digital maps
  - Possibly for data management & record linking

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Challenges: Microplanning

- **Excellent maps**
  - Without them, household selection is likely to exclude outlying households
  - Some countries will not have digital coordinates of census EAs and some will not have recent high-quality satellite photos; sometimes tree or cloud cover will render such maps useless or deceptive

- **Cluster visits**
  - The best plans probably result from visits
  - The feasibility and workload of microplanning without a visit will vary substantially

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Challenges: Expectations, Interpretation of Results, Understanding of Limitations

- Most EPI manager may expect district-level representativeness

- Countries with poor administrative [coverage] data quality likely to have low card retention, poor records in health facilities

- Beyond coverage point estimates…

- All the investment in a survey…what for?

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Conclusion

- The WHO Vaccination Coverage Cluster Survey recommendations have been substantially revised

- Results from the new surveys should meet the increasingly high standards of RI programs, ministries of health, and results-based financers

- Surveys conducted with the new guidelines will be more rigorous, more complicated, and, in most cases, more costly than under earlier guidelines
  - These sobering aspects should drive productive conversations about what info is truly needed next and how good is good enough
  - More need for qualified Technical Assistance (TA)

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Next Steps

- **Complete a full pilot testing**
  - Burkina Faso
  - Kenya

- **Writing-up partial experiences**
  - Lao PDR, Bangladesh

- **Publication of article on "when to do coverage surveys"**

- **More trainings and eLearning in 2016 and beyond**

- **Documenting experiences and revising manual**

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THANK YOU

http://www.who.int/immunization/monitoring_surveillance/en/

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EXTRA SLIDES

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	"Old" EPI Cluster Survey	"New" Vaccination Coverage Cluster Survey
Sampling	Non-probabilistic sampling, analysis gives equal weight to every respondent (non-interpretable CIs)	Probabilistic sampling, weighted analysis and meaningful confidence intervals (CIs)
	Data collectors select households to visit and randomly select first dwelling using spin the pen/bottle technique	Households (HHs) to be interviewed are pre-selected (*requires good maps and usually field visits prior to interviewers field work*)
	Usually 30 clusters of 7 *children* each (quota sampling)	Sample size defined according to survey objectives (estimation, hypothesis testing or classification). Pre-defined number of *HHs* to find an *approximate* number of children in each cluster
	Assumed design effect (DEEF) of 2 (intra-cluster correlation of 1/6)	Recommends DEEF depending on number of eligible people per cluster

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	"Old" EPI Cluster Survey	"New" Vaccination Coverage Cluster Survey
Sampling (cont.)	No attempts at revisits recommended	Recommends at least two revisits to obtain interviews in pre-selected HH; document outcomes of each visit
Vaccination Status	Relies on home-based records (cards) and/or maternal recall	Relies on home-based records (cards) and/or maternal recall, but encourages visits to health care facilities to document vaccination using registries
		Recommends photographing cards
Data entry	Only paper forms included	Includes section of mobile data collection (using mobile devices)
Survey report	Not clear guidance on report writing	Encourages using the results for action Encourages detailed report writing to clearly understand limitations
Overall quality		Renewed emphasis on taking steps to ensure minimize bias and improve data quality

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