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Collecting and using reliable vaccination coverage survey estimates: Summary and recommendations from the "Meeting to share lessons learnt from the roll-out of the updated WHO Vaccination Coverage Cluster Survey Reference Manual and to set an operational research agenda around vaccination coverage surveys", Geneva, 18–21 April 2017

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ABSTRACT

Household surveys are frequently used as means of vaccination coverage measurement, but obtaining accurate survey estimates present several challenges. In 2015, the World Health Organization (WHO) released a working draft of its updated Vaccination Coverage Survey Reference Manual that moved well beyond the traditional Expanded Program on Immunization (EPI) survey design. In April 2017, WHO convened a four-day meeting, to review lessons learned using the updated manual and to define an agenda for operational research about vaccination coverage surveys. About 70 stakeholders, including EPI managers and participants from 10 countries that have used the updated Survey Manual, survey experts, statisticians, partners, representatives from WHO regional offices and headquarters, and providers of technical assistance discussed methodological issues from sampling to accurately ascertaining a person's vaccination status, optimizing data collection and data management and conducting appropriate analyses. Participants also discussed data sharing and how to best survey data for immunization decision-making. The lessons learned from the use of the updated WHO Survey Manual related mainly to operational issues to implement better quality vaccination coverage surveys. It resulted in a list of 23 recommendations for WHO, donors and partners, immunization programs, and household surveys that collect immunization data. Similarly, 14 research topics, categorized in six themes (overall survey conduction, sampling, vaccination ascertainment, data collection, data analysis and use, and inclusion of questions on knowledge, attitudes and practices) were prioritized. Top areas of further work included improving our understanding of the accuracy of caregiver recall when documented evidence of vaccination is not available, improving engagement and coordination between immunization programs and entities conducting multi-purpose household surveys such as Demographic and Health Survey and Multiple Cluster Indicator Survey, improving mechanisms for sharing vaccination survey datasets and documentation, and making better use of survey results to translate data into knowledge for decision-making. This manuscript summarizes the meeting proceedings and provides an update of actions taken by WHO since this meeting.

1. Background

Vaccination coverage is an important indicator to track and guide immunization programs at the global, national and sub-national levels [1]. While coverage is ideally continuously monitored through routine administrative systems and registries, data

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can be incomplete or inaccurate, particularly in low and middle-income countries (LMICs) [2,3]. Therefore, household surveys are frequently used as a supplement to administrative data or, in some cases as the primary means of vaccination coverage measurement [4]. Nevertheless, obtaining quality vaccination survey coverage estimates also presents challenges. Methodological issues include accurately ascertaining a person's vaccination status, the potential for selection bias given difficulties in conducting probability sampling, optimizing data collection and data management techniques and conducting appropriate analyses [5]. There are also strategic and organizational challenges including engaging appropriate stakeholders and ensuring decision-makers understand the results, including their limitations, and use the data to their full potential.

Since the 1980s, the World Health Organization (WHO) has provided guidance on designing, conducting, and utilizing vaccination coverage surveys [6,7]. In 2015, WHO released a working-draft of its Vaccination Coverage Survey Reference Manual that moved beyond the well-known "30x7" Expanded Program on Immunization (EPI) survey design [8]. The update was motivated by growing complexities of EPI in the 21st century [9]; a need for more accuracy and precision with increasing coverage levels [10]; global emphasis on accountability and transparency [11]; and increasingly sophisticated statistical and computational capacities in LMICs. Table 1 presents the main differences between the updated manual and previous WHO guidance on vaccination coverage surveys.

In April 2017, WHO convened a four-day meeting to review lessons learned using the updated manual and to define an operational research agenda about vaccination coverage surveys; in practice, the meeting ended-up covering a broader set of survey issues. About 70 stakeholders, including EPI managers and participants from 10 LMIC countries that recently used the updated Survey Manual, survey experts, statisticians, partners, representatives from WHO regional offices and headquarters, and providers of technical assistance, shared experience through presentations, panels, and break-out sessions, each followed by plenary discussion. Following the meeting, a questionnaire was sent to all attendees to help prioritize 14 potential research topics and potential WHO actions proposed during the meeting. Questionnaire results are shown in Table 2 and Fig. 1. The draft manual was updated after the meeting, mostly with editorial changes, and a final version released in 2018 [12].

This paper describes the main discussion points, recommendations, and conclusions from the meeting and subsequent poll.

2. Collaboration among survey implementers and national immunization programs

Vaccination coverage is estimated in surveys commissioned by national immunization programs, Demographic and Health Surveys (DHS), UNICEF-supported Multiple Indicator Cluster Surveys (MICS), national health surveys [4,5], among others. Between 2000 and 2015, there were 61 instances where a country conducted a vaccination coverage survey within one year before or after a DHS or MICS (*unpublished results presented in the meeting*). While the two surveys sometimes had similar results, the findings often diverged substantially, leaving decision-makers unsure what to believe or do and providing an opportunity to discount results that reflect poorly on their program.

Participants agreed that countries, WHO, partners, and donors should standardize and harmonize methods as much as possible and avoid expending unnecessary resources on parallel surveys. First, it was recommended improving communication and coordination between DHS and MICS with WHO and within countries between National Statistical Offices (NSOs) and Ministries of Health, so that immunization programs account for these surveys in their annual and multi-year plans. Second, every national EPI could designate a focal point to closely advise DHS/MICS or similar multipurpose surveys, on current vaccination schedules, recent vaccine introductions, different home-based records (HBR) or vaccination cards in use, formulating vaccination survey questions, training supervisors and interviewers, and designing questionnaires and fieldwork protocols. This would improve the credibility of vaccination results, increase EPI's confidence in DHS/MICS and

Table 1
Main changes in the updated WHO Vaccination Coverage Cluster Survey: Reference Manual compared to previous guidance on vaccination surveys.[a]

Topic	Previous WHO guidance on vaccination surveys	Updated WHO Vaccination Coverage Cluster Survey: Reference Manual
Sampling	Non-probabilistic sampling, analysis gave equal weight to every respondent (non-interpretable CIs)	Probabilistic sampling, weighted analysis and meaningful confidence intervals (CIs)
	Data collectors selected households to visit and randomly selected first dwelling, usually 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)
	Quota sampling. Usually 30 clusters of 7 *children* each	Sample size to be 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 (DEFF) of 2 (intra-cluster correlation of 1/6)	Recommends DEFF depending on number of eligible people per cluster
	No attempts at revisits recommended	Recommends at least two revisits to obtain interviews in pre-selected HH; document outcomes of each visit
Eligibility	Proposed the inclusion only of persons who had resided in the area for at least six months	Removes the length of residence as an inclusion criteria, and instead, it proposes adding a question to the questionnaire on how long the individual has been living at the present residence.
Vaccination ascertainment	Relied on home-based records (cards) and/or maternal/caregiver recall	Relies on home-based records (cards) and/or maternal/caregiver recall, but encourages visits to health care facilities to document vaccination from facility records Recommends photographing cards, when possible
Data collection	Only paper-assisted personal interviewing (PAPI)	Includes section on computer-assisted personal interviewing (CAPI) (using mobile devices for data collection)
Report writing	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 reduce bias and improve overall survey quality

[a] Adapted from "2018 WHO Vaccination Coverage Cluster Survey: Reference Manual", section 1.4 [12].