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Review

Caregiver recall in childhood vaccination surveys: Systematic review of recall quality and use in low- and middle-income settings

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ABSTRACT

Introduction: High population coverage is key to the impact of vaccines. However, vaccine coverage estimates in low- and middle-income countries (LMICs) have repeatedly been shown to be of poor quality. LMICs often rely on 'caregiver recall' of vaccination, the validity and collection method of which remains uncertain. We aimed to critique the quality of caregiver recall and make recommendations for its collection and use.

Methods: We performed a systematic review for methods assessing childhood vaccination coverage in LMICs. We searched Medline using variations of the key terms: (child) AND (vaccinat*) AND (survey OR recall OR coverage) AND (reliab* OR valid*). We selected articles assessing the quality of recall in LMICs and extracted reported validity, reliability and completeness. We synthesised recommendations on collecting, analysing and presenting caregiver recall for varying resource availabilities.

Results: Of 1268 articles, 134 full texts were screened and eight were included for review. There was heterogeneity in study designs, ways of incorporating recall data and outcomes measured. Sensitivity of recall was 41–98%; specificity was 12–80%. There was a dearth of reliability measures and no consistent method for dealing with data incompleteness.

Conclusion: There are quality concerns with caregiver recall and difficulty in assessing it given the lack of a 'gold standard' for vaccine status. To improve coverage estimates and the impact of vaccines, caregiver recall should be used. Other recommendations include: recall is included for those presenting vaccine records; missing data is imputed; recall and record quality are assessed in a sub-sample; and sensitivity analyses are performed.

Contents

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1. Introduction

Childhood vaccines have been one of the most successful and cost-effective interventions in the history of public health for reducing mortality and morbidity [1,2]. Maximising the success of vaccination programmes and inducing herd-protection for unvaccinated persons by disrupting transmission [3,4] requires high population coverage [5].

Vaccine coverage is a key indicator of health system performance, is used as a proxy for the availability and quality of primary healthcare services and is an important predictor of infant mortality rate [6]. It can also help inform when to introduce a new vaccine [7], how close a population is to achieving herd-protection [8,9], and in modelling lives saved and cost-benefits [10–12].

Coverage levels are universally reported by governments and international organisations, and are particularly important in high mortality regions facing implementation challenges [13,14]. Data need to be of high quality, geographically-precise, inexpensive and timely, which may be challenging in LMICs where there are resource and infrastructure constraints.

However, estimates have repeatedly been shown to be of low reliability and validity [15–17]. Several methods are used for collecting information on vaccine coverage, including national electronic registers, reporting of health-facility records and population surveys. In countries that lack established national reporting systems or accurate facility records, vaccine coverage data often come from surveys. Subject-held cards can be used to record receipt and date of vaccines but they are not always available or accurate for use in surveys [18–20]. Therefore asking the mother or caregiver questions about the child's vaccination status is commonly used to supplement card data. Due to the increasing complexity of immunisation schedules [21], recall may become less accurate and the direction of arising biases is unknown.

Therefore understanding if and how caregiver recall should be used is important [18-20,22,23]. We assessed the validity, reliability and completeness of caregiver recall of childhood vaccine status to estimate coverage in LMICs. We also developed recommendations to improve the collection, analysis, presentation and interpretation of recall data for investigators and policy makers.

2. Material and methods

In January 2017 we conducted a systematic literature review of methods for estimating childhood vaccination coverage in LMICs, including specific search terms for caregiver recall.

2.1. Search strategy

We searched OvidSP MEDLINE using the following key terms (see supplementary material 1 for full search strategy): "(infant OR child) AND (vaccinat* OR immunisation) AND (data collection OR survey OR recall OR coverage) AND (evaluat* OR reliab* OR valid*)". Reference lists of included articles were screened for additional papers.

2.2. Inclusion and exclusion criteria

We added filters to the search to include observational studies, interventional studies, reviews and articles published in English after 1980 (when many survey techniques and statistics were developed). Arising titles and abstracts were screened and only those that measured childhood vaccine coverage in LMICs were included. All relevant articles were read in full and those that assessed the quality of caregiver recall with regards to validity, reliability or completeness were included in this review.

2.3. Data extraction

The final publications were critiqued with respect to three important components of data quality: validity, reliability and completeness [24]. For data extraction, the definitions from the independent Healthcare Quality Improvement Partnership guidance on data quality were used [25]:

Validity: "Data meaningfully represent exactly what they are intended to represent" [25]. We extracted measures that compared coverage to a gold standard including but not limited to sensitivity, specificity, positive predictive value and negative predictive value.

Reliability: "Data are the same no matter who collects the data or when a person collects the data" [25]. We extracted measures of coverage that were performed on the same population by different investigators, or the same investigators at different times that should reasonably be expected to give the same coverage values.

Completeness: "All the elements of information needed are present in the designated data source and no elements of needed information are missing" [25]. We extracted methods on dealing with missing data where this was explicitly stated, including their evaluations of these methods.

We also extracted author, year, country, vaccine, age of subjects, recall interval, study design and the authors' recommendations. RM performed data extraction; TC, CK and NBZ advised on data extraction categories and checked the results of the extraction.

We then synthesised recommendations for the collection, analysis, presentation and interpretation of caregiver recall in childhood vaccine surveys. The systematic review was reported according to PRISMA standards.

3. Results

Our search returned 1268 papers, of which 77 were included in our systematic review of measuring vaccine coverage, and of these 9 met inclusion criteria for this review of caregiver recall (Fig. 1). We did not find any reviews on the quality or use of caregiver recall. A summary of the papers is presented in Table 1. As key

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