


COMMENTARY



## The use and significance of vaccination cards

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### ABSTRACT

Vaccination cards are useful health records that contain information about vaccination dates and dosage. This information is helpful for parents, vaccination providers, and public health researchers. However, as they currently are structured, many vaccination cards are very difficult to read by non-experts, like parents, and even by health-care providers. Many families also lose these vaccination cards; among the top 10 countries with the most unvaccinated children, the proportion of families who were able to find their vaccination cards and give them to researchers was low, ranging from 20.7% in the Democratic Republic of the Congo to 69.2% in South Africa. Moreover, some families report that not having a vaccination card during a vaccination visit resulted in them being unable to obtain a vaccine (8% in one study in Ethiopia and 16% in one study in Bangladesh). This commentary provides recommendations about how vaccination cards should be used by parents, health-care providers, and researchers, and comments on their continued relevance in an era with increased use of electronic registries.

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Many families throughout the world possess vaccination cards, which at their base contain records of the dates their child was vaccinated with what vaccine. They often contain other information – vaccine dose lot number, information about ages for child’s vaccination schedule, and sometimes detailed information and informed consent documents for various available vaccines. The structure of vaccination cards takes many forms – from a single- or double-sided index card to a foldable leaflet to a vaccination booklet. Health-care providers often give these documents to parents when they bring their child in for the first vaccination afterbirth (birth doses of bacillus Calmette-Guérin, oral polio vaccine, hepatitis B vaccine, or other vaccines may be recorded on a separate document which parents bring to the vaccination provider later on to be re-recorded onto the vaccination card).

Many countries in the world use vaccination cards. One exception – the United States rarely uses these, although some doctors or states have cards which see little actual use. The Yellow Fever vaccination certificate is one example of specific vaccination card with global use. This certificate is required for entry into certain countries.<sup>1</sup>

### Use for parents and the vaccinee

The vaccination card can be beneficial to the parent and the vaccinated child. It indicates to authorities – day care providers, schools, doctors, immigration authorities – that a child has received certain vaccines, including ones mandatory for certain occasions. Ideally the vaccination card can also be a forecast, and provide information to the parent about when their child needs to next visit the vaccination provider

to complete a vaccine series or start another one. More complex vaccination booklets can provide some information about the disease itself.

Unfortunately, families often lose the card. Of the 10 countries with largest amount of unvaccinated children,<sup>2</sup> nine have had a national cross-sectional study under the Demographic and Health Surveys (DHS) program within the past six years (the one exception being Iraq).<sup>3</sup> These countries report low levels of diphtheria-tetanus-pertussis (DTP) dose 3 coverage, ranging from 34.5% in Angola and 35.5% in Nigeria to 71.5% in India (Table 1). When asked about their child’s vaccination card, few families were able to procure that card at the time of interview, ranging from 20.7% in the Democratic Republic of the Congo to 69.2% in South Africa. A large proportion in some countries (e.g., 30.9% in Indonesia) have a card but did not show it to the interviewer, possibly indicating that the card is lost. Regardless, a large proportion indicate that they no longer have a card (ranging from 2.1% in Nigeria to 19.0% in Angola) or never had a card (ranging from 1.4% in South Africa to 51.0% in Nigeria). In summary, these figures indicate that, within countries with large numbers of unvaccinated children, there is a corresponding difficulty in families retaining the vaccination cards. Across low- and middle-income countries (LMICs), a lack of a vaccination card has been associated with non-vaccination and under-vaccination.<sup>4</sup> Although the causal direction for this relationship is not always clear (e.g., children who have never been to a vaccination clinic would obviously not have a card), it seems reasonable to promote vaccination card retention as one mechanism to increase uptake of vaccines.

**Table 1.** Estimates of diphtheria-tetanus-pertussis (DTP) dose 3 coverage and vaccination card possession among the 10 countries with the most unvaccinated children.

	Year of survey	DTP-3	Family has card	Family has card but does not show to interviewer	Family no longer has card	Family never had card
Afghanistan	2015–16	47.8%	41.3%	21.1%	15.3%	22.3%
Angola	2015–16	34.5%	47.6%	9.0%	19.0%	24.4%
DRC	2013–14	56.6%	20.7%	36.2%	12.0%	31.1%
Ethiopia	2016	43.7%	29.5%	2.8%	8.6%	38.5%
India	2015–16	71.5%	53.5%	26.2%	11.2%	9.1%
Indonesia	2017	66.7%	57.6%	30.9%	4.1%	7.3%
Iraq	None					
Nigeria	2013	35.5%	23.3%	23.6%	2.1%	51.0%
Pakistan	2017–18	62.8%	58.7%	5.5%	17.1%	18.7%
South Africa	2016	65.4%	69.2%	11.6%	17.8%	1.4%

### Uses for vaccination providers

The vaccination provider can use a vaccination card to understand which vaccines have already been given to the child and, as a result, which ones can be administered to the child at the current visit. These cards ideally supplement records already at the clinic. Many locations around the world, particularly high-income countries, already use immunization information systems,<sup>5,6</sup> or have paper back-ups of vaccination records at the clinic. But these clinic-specific records have little utility if the child moves to a new area; even in the United States, vaccination providers are unable to automatically access vaccination records from children vaccinated previously in a separate state.<sup>7</sup>

In my own research, I have unfortunately seen examples where families have been turned away from receiving vaccines because they did not have a card. Small-scale surveys undertaken among parents of young children in Bangladesh in 2018 ( $n = 61$ ) and Ethiopia<sup>8</sup> in 2017 ( $n = 350$ ) have shown that 16% (10/61) of parents in Bangladesh and 8% in Ethiopia (29/350) were unable to receive vaccines at some point because they did not have a vaccination card with them during a vaccination visit.

That vaccination providers would want to check the vaccination card prior to administering a vaccine is understandable. In many locations; children may have substantially delayed vaccinations, and it may be unclear which vaccines that child should be receiving. However, the vaccination provider should broadly understand which vaccines should be administered at which ages, and, discussing past vaccination experiences with the guardian may help elucidate which vaccines were likely given (e.g., were drops administered, was vaccine administered into upper arm, thigh, etc.). A child improperly receiving a vaccine (if they had already completed a series, for example) is much more preferential to a child not receiving any doses, and returning to home without protection against deadly diseases and with their family incurring what could have been a substantial, wasted time cost.

### Uses for researchers

Vaccination cards contain a wealth of information. Many surveys, including the Demographic and Health Survey (DHS) program, use vaccination cards to list the dates

a child received a vaccine. These dates can be later used to estimate timeliness of vaccinations. What many researchers have found, though, is that a large proportion of individuals do not have vaccination cards available at the time of interview (see examples for DHS in Table 1) and individuals with and without vaccination cards can be substantially different, to the extent that estimates among only those with vaccination cards could incur bias. For example, a study of families in Karachi, Pakistan, found that families with more children and older (vs younger) children were less likely to have their vaccination cards retained.<sup>9</sup>

One way to incorporate information from those with and without vaccination cards would be to use statistics that delineate left- and right-censoring techniques. Right censoring indicates that the child has not yet been vaccinated (among those with and without vaccination cards), and left censoring indicates that the child has been vaccinated according to recall from guardians, but no vaccination card with specific dates is available. Such methods include Turnbull estimators for non-parametric estimation of cumulative vaccination coverage (analogous to a life tables approach) and accelerated failure time models for parametric regression modeling. These methods are available on a number of statistical programming packages, including PROC LIFEREG for SAS (SAS Institute, Inc., Cary, NC, USA) and the *survival* and *SurvRegCensCov* packages for R (R Foundation for Statistical Computing, Vienna, Austria).

### Continued use

As health-care providers switch more and more to electronic medical records, the utility of vaccination cards may seem to be decreasing. For instance, in many states in the United States, educational institutions are registered with the state immunization information system to check a child's vaccination records prior to matriculation.<sup>10</sup>

Nonetheless, I believe that vaccination cards are a tangible benefit to many different sources. Families crossing borders or even just attending new clinics would be well placed to show vaccination cards to a new vaccination provider, who may not yet have electronic access to their past vaccination history. As outbreaks of vaccine-preventable diseases in their community occur, families can also be re-assured of their child's protection by viewing their child's vaccination record at home. And although immunization information systems may encompass all of the world in the future, they currently are not operational in many locations, and researchers wanting to understand how to best reach individuals with low vaccination status would first need to do a cross-sectional survey using data from vaccination cards.

### Recommendations for use

As they currently are structured, many vaccination cards are very difficult to read by non-experts. Making these cards more friendly to less educated audiences could be very important. The Gates Foundation has in the past funded re-designs of vaccination cards.<sup>11</sup> However, the introduction of new vaccination cards in some circumstances has been met with

confusion on the part of health-care providers.<sup>12</sup> In a situation where bureaucracy or lack of training prevents the change of these cards, it might be more beneficial to design a coverslip instead which would convey some minimal but important information to parents: where to get vaccinated, when to show up next, and maybe a simplified diagram of what diseases their child is protected against. This coverslip could also enhance the durability of the vaccination card but would not require additional training for vaccination providers. If vaccination cards are re-designed, they should include more space for new vaccines to be added in the future because the World Health Organization's list of vaccines on the Expanded Program on Immunization has been increasing.<sup>13</sup> A global standard for a vaccination certificate – generalized from the Yellow Fever vaccine certificate – could also be implemented that includes information from other vaccines (this could be used, for example, to prove measles vaccination as individuals travel to and from areas with large outbreaks).

Vaccination providers are advised against refusing vaccination to those without a card. Increased funding for primary health care and vaccination services in many low- and middle-income countries could alleviate concerns about vaccine wastage.

If researchers are using information from vaccination cards to construct dates, they should not restrict their analysis only to those with vaccination cards, because families with and without these cards may be socioeconomically different. Instead, they should use various left- and right-censoring techniques – Turnbull estimators as a non-parametric “life tables” equivalent, and accelerated failure time models for parametric modeling – to estimate vaccination delay.<sup>14</sup>

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