

## VALIDATING MEASURES OF IMMUNIZATION COVERAGE: LESSONS FROM INTERNATIONAL EXPERIENCE

Accurate measurement of immunization is critical for assessing immunization coverage which in turn is important for planning and funding childhood immunization programs.

Immunization coverage is recorded in vaccinator/ facility records during routine immunization and is then validated during surveys by viewing vaccination cards or asking mothers to recall vaccination of their children<sup>1</sup>.

While mother's recall is the most widely used source of information in most developing countries and is considered highly reliable<sup>2,3,4</sup>, some studies show parental recall to be inferior to health facility records<sup>5</sup>. There is also some debate in literature on the validity of mother's recall for measuring coverage. These authors suggest that vaccination cards may be preferred over mothers' recall while acknowledging that only a minority of households are able to show vaccination cards at coverage surveys.

Validity of these measures is profoundly important since misreporting of data can misguide immunization programs. While underreporting results in greater costs of immunization through repeated immunization campaigns, over reporting means that some children will be missed during immunization activities. In this brief we evaluate the accuracy of both recall and record measures as measured in previous studies.

### Global Issues in Measuring Coverage

Nearly half of immunization coverage surveys in North Africa, Middle East, South and South East Asia use mother's recall. Recall measures are higher in Southeast Asia than in any other region<sup>6</sup>. In many developing countries including Pakistan and India, only a small minority of women present vaccination cards at surveys<sup>7</sup>. In these situations, parental recall is a more

<sup>1</sup> Brown et al. 2002

<sup>2</sup> Joseph Valadez J, Leisa Weld H. Maternal recall error of child vaccination status in a developing nation. *Am J Public Health* 1992; 82: 120- 122

<sup>3</sup> Brown, J., Monasch, R., Bicego, G., Burton, A., and Boerma J. T., (2002). An Assessment of the Quality of National Child Immunization Coverage Estimates in Population-based Surveys. *Measure Evaluation*, WP-02-53.

<sup>4</sup> Murray, C.J., Shengelia B., Gupta, N., Moussavi, S., Tandon, A. and Thieren, M. (2003). Validity of reported vaccination coverage in 45 countries, *Lancet* 362: 1022–27.

<sup>5</sup> Bolton, P., Holt, E., Ross, A., Hughart, N., and Guyer, B., 1998. Association of Schools of Public Health. *Public Health Reports* (1974-), Vol. 113, No. 6 (Nov. - Dec.), pp. 521-52.

<sup>6</sup> Brown, J., Monasch, R., Bicego, G., Burton, A., and Boerma J. T., (2002). An Assessment of the Quality of National Child Immunization Coverage Estimates in Population-based Surveys. *Measure Evaluation*, WP-02-53.

<sup>7</sup> Babu, G.R., Olsen, J., Jana, S., Nandy, S., Farid, M.N., & . Sadhana, A.M. (2011) Evaluation Of Immunization Cards And Parental Recall Against Gold Standard For Evaluating

### SALIENT POINTS AND RECOMMENDATIONS

- Accurate records of vaccinations at facilities is a key measure and yet only 30% of these are maintained. This must be improved with better oversight and consideration of use of electronic record entering and processing methods
- Mothers' Recall of Vaccination of their children is the best measure for routine surveys as few households in Pakistan or elsewhere maintain vaccination cards
- The marked variation between PSLM and other surveys such as PDHS and EPI likely stem from including the recall of other family members in lieu of mothers in the PSLM survey
- The question of mothers' recall should only be asked from mothers in all surveys in an effort to improve the quality of surveys and to standardize the answers from these surveys

reliable indicator of BCG vaccination, as verified against a gold standard such as a BCG scar.

On average, the coverage rates are expected to be 20% higher based on mother's recall than in the vaccination cards<sup>8</sup> and mother's recall also varies based on antigens. Although, not well studied, the commonest factors that affect accuracy of mother's recall are economic status, literacy, mother's age, occupation and type of residence (rural/urban). Accuracy of recall (as measured against health facility recall) increases with economic status, literacy and mother's age as seen in Bangladesh<sup>9</sup>. Literacy levels can increase probability of a mother having a vaccination card as seen in Mozambique<sup>10</sup>. Parents having a vaccination card were more likely to be better educated and have health insurance<sup>11</sup>. Other

Immunization Coverage. *The Internet Journal of Epidemiology*, Vol. 9, No. 2.

<sup>8</sup> Murray, C.J., Shengelia B., Gupta, N., Moussavi, S., Tandon, A. and Thieren, M. (2003). Validity of reported vaccination coverage in 45 countries, *Lancet* 362: 1022–27.

<sup>9</sup> Selimuzzaman, A. B. M., Ullah, M.A. and Haque, M. J., (2008), Accuracy of Mothers' Reports Regarding Vaccination Status of Their Children in Urban Bangladesh. *The Journal of Teachers Association*, Vol. 21 No. 1.

<sup>10</sup> Jani, V. J; Jani, I. V., Barreto, J. and Sahay, S. (2007). The role of recorded and verbal information in health information systems: A case study of the Expanded Program on Immunization in Mozambique. *Ethiopian Journal of Health Development*, Vol. 21, No. 2.

<sup>11</sup> Suarez, L.; Simpson, D.M.; and Smith, D. R., 1997. Errors and Correlates in Parental Recall of Child Immunizations:

studies have shown no effect of literacy levels on accuracy of mother's recall<sup>12</sup>.

Coverage using recall by mothers is higher in Southeast Asia than elsewhere. While health cards and recall are important sources of data to estimate immunization coverage, maternal recall is consistent with records in most developing countries<sup>13,14</sup>. Thus mother's recall is a valid indicator to use for coverage surveys.

### Evidence from Egypt

One study in rural Egypt compared mother's recall responses against health cards<sup>15</sup>. Using a three round confirmation process, where women were asked to produce vaccination cards for their children, they found record plus history estimates were actually underestimated. Fewer women misreported a child being vaccinated than those who misreported child not vaccinated. The consistency of coverage estimates for BCG was 98% and 97% for Measles.

### Validity of Mother's recall in Pakistan

There are 3 surveys that are used to discuss immunization coverage in Pakistan. Of these the EPI Coverage Survey 2006 (EPI) and the Pakistan Demographic and Health Survey 2007 (PDHS) were onetime events, whereas the Pakistan Social and Living Measurements Survey (PSLM) is conducted annually or biennially. Each asks for mothers' recall and looks at vaccination cards using a sampling frame that is provided by the Federal Bureau of Statistics.

Coverage as measured on the EPI and PDHS was considerably lower than that measured during the PSLM. In all surveys mothers' recall was higher than vaccination cards, which were available in fewer than 20% of the households while coverage by mothers' recall varied from 46% to 78% for fully immunized children nationwide.

This discrepancy between surveys has confounded program managers. It appears that the difference likely lies in how the surveys are conducted. In the EPI and PDHS the interviewers insisted on interviewing only the mothers of children. In the PSLM, which is much larger, interviewers don't necessarily ask only mothers and interview any available household member. This later approach likely results in higher coverage as other relatives guess about when the immunization occurred. Another issue that has been highlighted recently is that even mothers' recall may not be as accurate as

previously thought, particularly for less publicised vaccines<sup>16</sup>.

A recent study from Pakistan also highlighted these findings in addition to the fact that vaccinators recorded only around 30% vaccines they provided.

### Conclusions and Recommendations

Underestimation of vaccine efficacy leads to expensive "catch up" campaigns that now accounts for almost half of all immunization spending in Pakistan. Overestimation for coverage may lead to missed children. While a BCG scar has high reliability for BCG immunization, finding 'Gold standards' for other vaccines remains a challenge.

Under the circumstances, mothers' recall is reasonably adequate for surveys but it is essential that the question be asked from the mother and not just any member of household. While viewing a vaccination card is desirable, such few households have them that it is difficult to ascertain much importance to them.

On the other hand it is essential that means be found to have vaccinators record the immunizations that they perform. Currently they record around 30% of these. Means to improve such record can include electronic data entry and more direct involvement of the district health teams in overseeing the work of the vaccinators in crucial.

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Effects on Vaccination Coverage Estimates. Pediatrics, Vol. 99 No. 5.

<sup>12</sup> Valadez, J., Weld, L.H., (1992). Maternal recall error of child vaccination status in a developing nation. Am J Public Health 1992; 82: 120- 122.

<sup>13</sup> Brown, J., Monasch, R., Bicego, G., Burton, A., and Boerma J. T., (2002). An Assessment of the Quality of National Child Immunization Coverage Estimates in Population-based Surveys. Measure Evaluation, WP-02-53.

<sup>14</sup> Murray, C.J., Shengelia B., Gupta, N., Moussavi, S., Tandon, A. and Thieren, M. (2003). Validity of reported vaccination coverage in 45 countries, Lancet 362: 1022-27.

<sup>15</sup> Langsten, R. and Hill, K. (1998). The Accuracy of mother's reports of child vaccination: Evidence from rural Egypt. Social Science Medicine. Vol. 46, No. 9, pp. 1205 ± 1212

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<sup>16</sup> Shaikh S et al. Measles susceptibility in children in Karachi, Pakistan. Vaccine 29 (2011) 3419-3423