



# The Use of Effective Coverage in the Evaluation of Maternal and Child Health Programs

A Technical Note for the IDB's Social Protection and Health Division

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Inter-American  
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### Defining effective coverage

Effective coverage is a measure of health system performance that is intended to combine three aspects of health care service delivery into a single measure: need, use (often referred to in the literature as “utilization”, meaning availability and access), and quality.<sup>1</sup> The concept of effective coverage has only been formally defined and entered the public health discourse relatively recently. In contrast, normal or “crude” coverage has long been a standard measure of performance for interventions. While crude coverage represents simply the fraction of those who need an intervention who use it, effective coverage adjusts this fraction for the quality or efficacy of the intervention received by a population. In a technical consultation held in 2001, the WHO recommended that the measurement of effective coverage be routinely incorporated into assessments of health system performance with regard to certain interventions.<sup>1</sup> Since then, several organizations – including the Institute of Health Metrics (IHME) and the Health Observatory for Latin America and the Caribbean - have established working groups to develop the concept and apply methodologies for its measurement at national, regional and global levels.<sup>2,3</sup> Effective coverage can be thought of in several ways depending on whether it is being used at the level of the individual, the intervention or the health system and as an *ex ante* or *ex post* measure. However for the purposes of applying the framework to the evaluation of specific maternal and child health (MCH) interventions, it is perhaps simplest to conceive of effective coverage as the proportion of the population that are eligible for an intervention that receive that intervention *and then go on to benefit from it*. In other words it is the *use* of an intervention, conditional on the *need* for it and adjusted for *quality of the intervention*,<sup>4</sup> and can be formalized as follows:

$$EC_{ip} = \left( \frac{U_{ip}}{N_{ip}} \right) \times Q_{ip}$$

Where:

$EC_{ip}$  is the effective coverage of intervention  $i$  in population  $p$ .

$N_{ip}$  is the number of people in need of intervention  $i$  in population  $p$ .

$U_{ip}$  is the number of individuals in need of intervention  $i$  that receive that intervention.

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<sup>1</sup> The concept of quality as defined here has much in common with that of efficacy, however, in order to maintain consistency with the literature on effective coverage, the word quality will be used for the purpose of this note.

$Q_{ip}$  is the quality of intervention  $i$  in population  $p$ .

The part of the equation that is in red is equivalent to crude coverage and the part in green is the adjustment for quality of the intervention.

**Need:** According to this framework, an individual or group is in need of an intervention if they have the capacity to benefit from it,<sup>5</sup> that is to say, if their expected health gain from receiving it is greater than zero.<sup>6</sup> It is not always straightforward to identify those individuals that are in need of intervention, not least because a person's perceived need may differ from their actual need – they may not be aware of their potential to benefit from an intervention. However, if we take some standard MCH interventions as examples, it is possible to divide the interventions into two groups according to how need is defined:

1. **According to a norm:**<sup>5</sup> By this definition, individuals are in *need* solely in virtue of being in a certain age group or of a certain sex that makes them eligible to receive that intervention. For example:
  - Women of reproductive age are in *need* of contraceptive counseling
  - Children aged 6 to 59 months are in *need* of vitamin A supplements
  - Newborns are in *need* of the BCG vaccine
2. **In virtue of having a certain health condition:** These individuals may be identified through self-diagnosis or by performing a diagnostic or screening test, depending on the condition or on the type of assessment being carried out. For example:
  - Women with postpartum eclampsia are in *need* of magnesium sulphate and antihypertensive drugs
  - Newborns not breathing at birth are in *need* of resuscitation
  - Children with severe acute malnutrition are in *need* of clinical management

For some interventions, the distinction may be less clear - for example, are pregnant women or low birth weight newborns identified according to a norm or according to their condition? This relates to who measures the need, if it is perceived by the individual or defined by the health care provider. However, from a methodological point of view, the distinction is important because, for interventions in group 1, need can be easily determined by collecting demographic information e.g. in a households survey, whereas for group 2, for a variety of reasons, individuals in need may be harder to identify especially in societies where there are differences between the individual's perceived need and the need as defined by the provider.

**Use:** At the population level, the 'use' of an intervention is the number or proportion of eligible individuals (those in need) who receive an intervention. This is equivalent to crude coverage and the issues surrounding how to identify those individuals that use an intervention have been widely discussed in the literature.

**Quality of the intervention:** In the limited literature on effective coverage that exists, quality is defined as the ratio of health gain delivered through an intervention relative to the maximum health gain possible given ideal efficacy or quality.<sup>5</sup> In other words it is the proportion of the maximum gain in a health outcome that an intervention is capable of producing, which is actually attained. It is therefore a value between 0 and 1 where 0 is no health gain and 1 is the maximum gain possible for that intervention. Quality of the intervention is easiest to define when the health outcome is measured by a binary indicator – for example, negative anemia status, normal birth weight or normal height for age etc. In these examples, an individual either experiences the health outcome that is stipulated as desirable or beneficial - the targeted or “valued” outcome<sup>7</sup> - or they do not (though we may wish to challenge the arbitrariness of the cutoff point by which the outcomes are defined). In such cases then, quality would signify those individuals in need of an intervention that use that intervention *and then achieve the valued outcome*. To take the example of providing iron fortified food to prevent anemia in infants - an intervention that all infants aged 6-23 months are eligible for and therefore “in need of” - the quality of the intervention might be defined as “the proportion of 6-23 month olds ( $N_{ip}$ ) that consume iron fortified food ( $U_{ip}$ ) that do not have anemia ( $Q_{ip}$ )”. Therefore, the calculation of effective coverage can be seen as a series of three adjustments, weightings or proportions applied to the total population, as illustrated in figure 1.

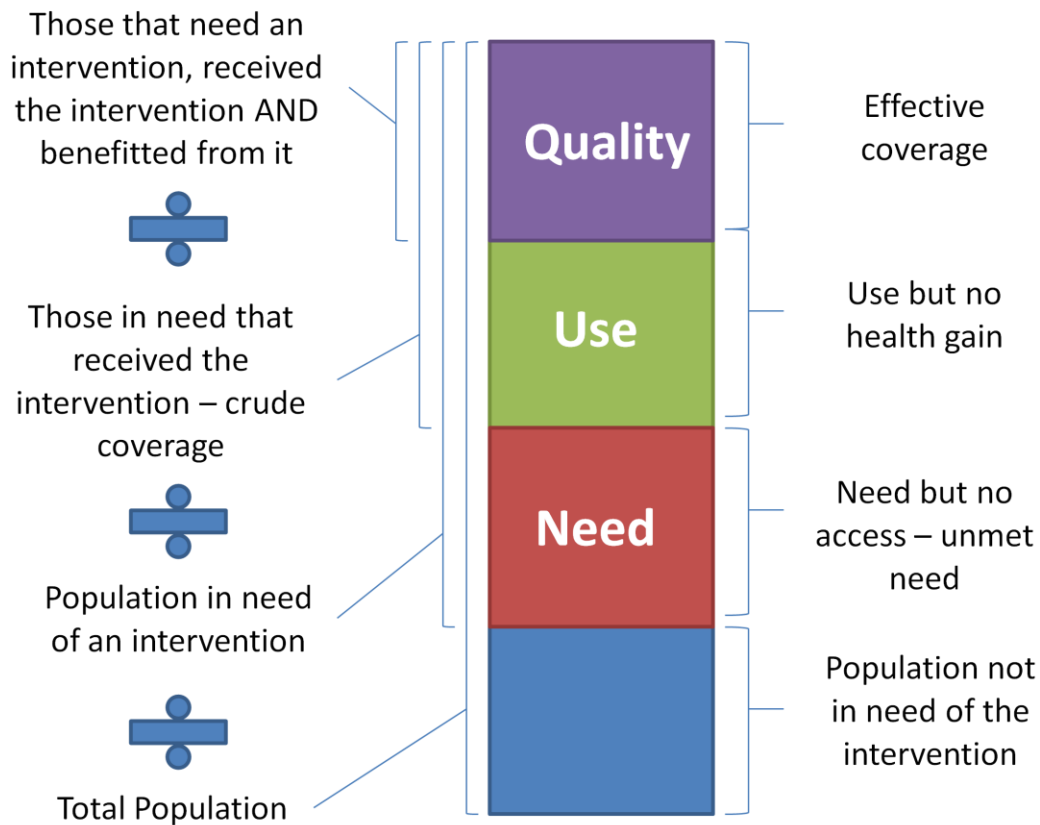


Figure 1: Illustration of the concepts of need, use and quality and how they relate to each other

If there is little difference between the levels of crude and effective coverage of an intervention within a population, it will indicate that the quality of the intervention is high. If effective coverage is significantly lower than crude coverage, it might suggest that, while the health system is able to provide access to that intervention, the expected benefits are not being achieved and the quality of the intervention is lacking. There may be numerous reasons for low quality in the delivery of an intervention relating, for example, to the competence of the provider, how much effort they go to, discrimination etc.<sup>8</sup> Of course, low quality may not be the only reason for a discrepancy between crude and effective coverage. It is possible to achieve high crude coverage and quality of intervention and yet for the valued outcome not to be achieved. For example, a program may implement breastfeeding promotion and counseling to a high standard of quality according to all norms and available evidence, and yet children may still not exclusively breastfeed due to factors not yet described in the literature that are specific to that particular context. Where low effective coverage is found, further study will be required to determine whether poor quality is the sole cause.

## Defining quality for MCH interventions

For certain intervention then, the quality component can be quite simple to define. However, for many others, there is no single, binary health outcome that the intervention aims to bring about. For example, in the case of antenatal care – which is a package of fairly diverse interventions - there is no one, specific health outcome that is directly attributable to that intervention alone. The impact of high coverage of antenatal care might be measured as declines in the incidence of low-birth weight or of neonatal tetanus, the rate of perinatal mortality or the risk of developing a severe obstetric complication during pregnancy, for example. However, many of these outcomes have multiple determinants and therefore are not specifically attributable to that particular intervention. However, in the literature on effective coverage, it is possible to differentiate a second, implicit definition of quality that relates, not to health gain or outcome, but to the main content of the intervention provided. For example, Lozano and others define the quality of antenatal care in terms of whether the woman “received a blood test and had blood pressure measured” as key components of the intervention.<sup>5</sup> Therefore, for such interventions, it will be necessary to define and measure quality in terms of the content of the care that was delivered (the items in the care package that the individual received) and use these as a proxy indicator for the multi-faceted health gain that they may bring about.

Figure 2 uses examples of two types of MCH interventions – immunization and provision of antenatal care – and gives definitions of need, use and quality for each. It also illustrates how there is a continuum running from an individual’s need for an intervention, to the valued outcome of that intervention and how evaluations of crude coverage, effective coverage and impact provide a snapshot at different stages of this process.

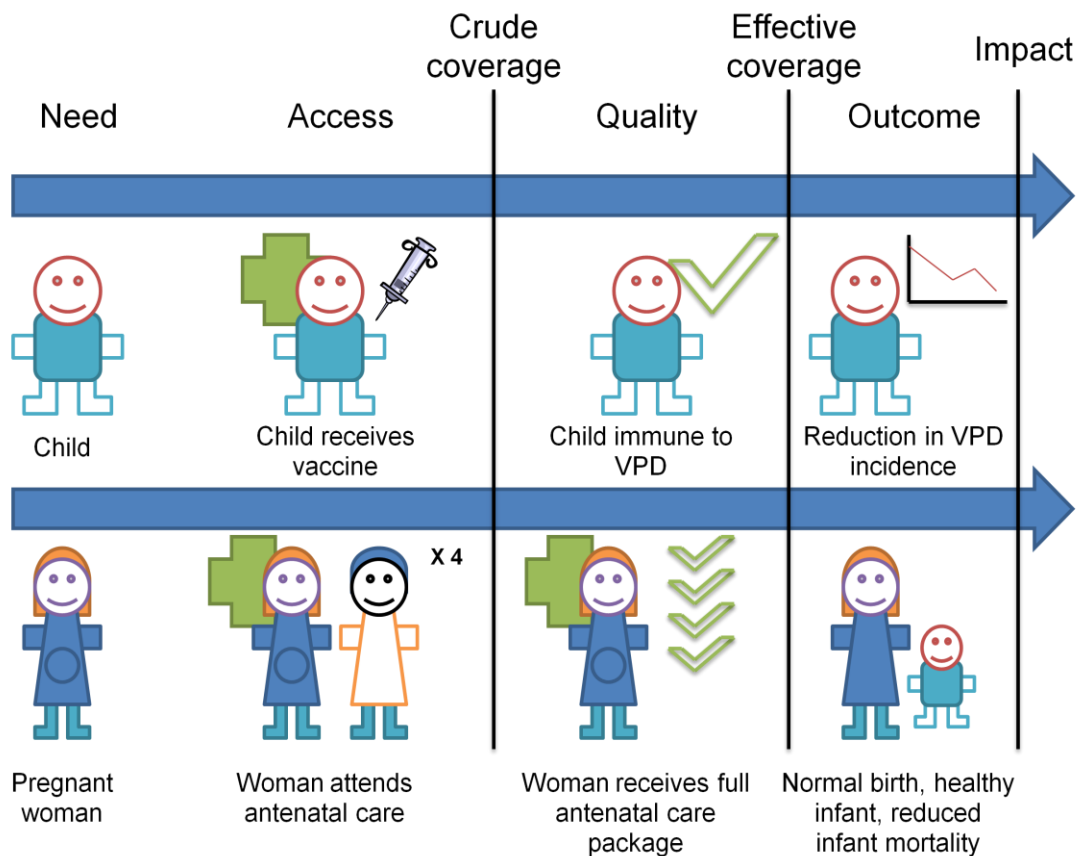


Figure 2: Illustration of the relationship between crude coverage, effective coverage and impact evaluation for vaccination and antenatal care (VPD = vaccine preventable disease)

Another observation that is worth considering is that definitions of quality (as well as need and use) depend greatly on how one defines the interventions, but usually include the contribution of the individual and the community towards achieving the expected outcomes. Take breastfeeding as an example. In a regional report on effective coverage of various health interventions in the Latin America and Caribbean (LAC) region, the components for calculating effective coverage are defined as follows:<sup>4</sup>

- Intervention – Breastfeeding
- Population in need - Children aged under 6 months
- Use - Mothers report exclusive breastfeeding up to 6 months
- Quality - Mothers report no incidence of respiratory infections or acute diarrheal episodes in the last 2 weeks

Breastfeeding in and of itself is something that mothers provide so, at the level of the individual, it would make sense to define quality as the health gain obtained through breastfeeding. However, a health system does not provide breastfeeding to an infant directly, but rather can only provide the *promotion* of breastfeeding (to both pregnant women and mothers of



newborns) with the aim of encouraging certain subsequent behaviors among women. If the intervention is defined in this way, then the definition of need, use and quality changes, and the components might instead be specified as follows:

- Intervention – Promotion of breastfeeding
- Population in need – Pregnant women and mothers of newborns
- Use – Women report receiving breastfeeding counseling as part of antenatal care, upon giving birth and as part of post-natal care
- Quality – Women report adopting appropriate breastfeeding practices (puts the child to the breast within one hour of birth; exclusively breastfeeds the child until age 6 months; child still received breast milk at age 12 months etc.); Mothers report no incidence of respiratory infections or acute diarrheal episodes in the last 2 weeks

In the case of this intervention then, quality is defined not as a health outcome, but as a behavioral outcome that is known to be so closely associated with positive health outcomes as to be a reliable proxy indicator. This is in contrast to interventions like vaccinations where the role of the health service is to deliver a procedure directly to the individual that benefits and the valued outcome is very much defined in terms of health status (immunity to a particular VPD). Other interventions lie somewhere between the two. For example, with family planning the role of the health service is both to promote the use of contraception (act on the demand side), and to supply the contraceptive methods. With facility births, the health service both encourages women to deliver in a health facility (a behavioral outcome) and supplies the facilities and personnel to ensure that the delivery is as free from complications as possible. All of these factors will determine how quality – and therefore effective coverage - is to be defined for a given intervention.

### Why evaluate effective coverage?

The IDB's SPH division supports a considerable number of projects in the areas of MCH, not least those to be carried out under the Salud Mesoamerica 2015 Initiative (SM2015). This provides a unique opportunity to incorporate the innovative and relatively new concept of effective coverage into the monitoring and evaluation activities for such programs. The evaluations will benefit from this for the following reasons:

1. **The interventions meet many of the criteria proposed by the WHO:** Of the criteria proposed by the 2001 technical consultation for selecting interventions for effective coverage assessment, nutrition, immunization and maternal and neonatal interventions meet the following:
  - They have the ability to produce a significant health gain in a relatively short time.
  - They are a response to a significant health problem at national and regional level.
  - They therefore correspond to the priorities and objective needs of the countries' of LAC.
  - There is ample evidence for their effectiveness.

- There is relatively little additional cost to obtaining the data for calculating these indicators. No extra data is necessary for calculating effective coverage for MCH interventions over and above that which will be collected anyway for the performance and impact evaluations.
2. **Quality of interventions can be defined *ex ante*:** Previous studies into effective coverage in Latin America have encountered serious limitations due to the fact that the analysis was restricted to routinely collected data that was already available (from health and nutrition surveys etc.).<sup>4,5</sup> In these studies, quality had to be defined *ex post* either based on the data available, which may be inadequate indicators of health gain, or left out of the analysis. For example, both Lozano and others and the Observatorio de Salud were unable to find data on the quality of immunization and therefore could only report the crude coverage of these interventions.<sup>4,5</sup> Because the monitoring and evaluation of SPH projects in MCH tends to involve the collection of new data, there is the opportunity to define the indicators of quality beforehand and improve on previous studies by collecting data that is adequate for the analysis of effective coverage, thereby contributing new knowledge, data and methodologies to the field of health system assessment.
  3. **The LAC context and the focus on quality:** Many parts of LAC, including the countries of the Central America, are notable for having achieved fairly high coverage in of MCH interventions at national level, while at the same time exhibiting pockets of negative health outcomes among the poorer sections of the population. It has been observed that increases in availability and use of health care among poor populations do not always correspond to improvements in quality of care.<sup>8</sup> As the capacity of a health system improves – as has certainly been the case in most countries of LAC over the past decades – the focus of the assessment of its performance should shift from coverage (availability, access or use) to effective coverage.<sup>8</sup>
  4. **Benchmarking:** The effective coverage of a set of interventions can be aggregated into a single measure of the effective coverage of the health system. This can reveal how well investments in those areas of the health system are contributing to the health of the population and make comparisons between countries, states or health systems (provided that the package of interventions is the same or comparable).<sup>5</sup> In the case of SM2015, this might be done for each country for the full set of interventions supported by the initiative. The effective coverage of each country's health system can then be entered into the 'dashboard' by which their performance is to be monitored and benchmarked against each other. This will be important for further fostering accountability, incentivizing success and identifying determinants of failure.<sup>5</sup>

Furthermore, it would be informative and desirable, to have these indicators of quality collected routinely by the health information systems of the countries. Insisting that they are measured as part of the evaluation of IDB health projects, can be seen as a capacity-building exercise that might lead to measurement of quality being permanently incorporated into health system monitoring. Finally, the use of effective coverage in the evaluation of public health programs

need not be confined to MCH interventions. Recently, IHME have published studies that use survey data to carry out multi country assessments of effective coverage both of diabetes care<sup>9</sup> and cholesterol-lowering medication.<sup>2</sup> The concept may therefore be widely applicable to other areas of activity for SPH such as the control of chronic disease.

The following tables present proposed definitions of need, use and quality, as measured by survey, for the evaluation of MCH interventions in SPH projects:

**Nutrition**

Intervention	Population in need	Coverage (Use/access)	Effective coverage (Quality)
Breastfeeding promotion	Women that have given birth in the last 2 years	Received breastfeeding counseling at all of the following stages: a. As part of antenatal care b. Upon giving birth c. As part of postnatal care	<ol style="list-style-type: none"> <li>1. Mother put the child to the breast within one hour of birth</li> <li>2. At six months of age the child had been exclusively breastfed since birth (mothers of children aged &gt;6 months)</li> <li>3. At twelve months of age, the child was still being breastfed (though not necessarily exclusively – mothers of children aged &gt;12 months)</li> <li>4. Mother reports no incidence of respiratory infections or acute diarrheal episodes in the last 2 weeks</li> </ol>
Promotion of complementary feeding practices	Mothers of children aged 6-23 months	Received counseling on complementary feeding practices	<ol style="list-style-type: none"> <li>1. At 8 months of age, the child was receiving solid, semi-solid or soft food</li> <li>2. The child currently receives an iron-rich food or iron-fortified food that is specially designed for infants and young children, or that is fortified in the home</li> <li>3. The child has normal height/length for age</li> </ol>
Provision of iron supplementation for pregnant women	Women that have given birth in the last 2 years	Received or bought iron supplements during the last pregnancy	<ol style="list-style-type: none"> <li>1. Woman reports taking supplements regularly during last pregnancy</li> <li>2. Woman reports not suffering from anemia during the last pregnancy</li> <li>3. At birth the child weighed over 2,500g</li> </ol>

Provision of vitamin supplementation for children	Children aged 6-23 months	Child was administered a vitamin A supplement in the last 6 months	Child tests negative for vitamin A deficiency
Provision of preventive chemotherapy for STH	Children aged under 5 years	Child was administered an antihelminthic drug in the last year	Child tests negative for heavy intensity STH infection

Maternal and neonatal health

Intervention	Population in need	Coverage (Use/access)	Effective coverage (Quality)
Counseling on family planning from community health workers	Women who: <ol style="list-style-type: none"> <li>1. Are at risk of pregnancy</li> <li>2. Are not currently trying to become pregnant</li> </ol>	Have been visited in the past 12 months by a community health worker who talked to them about family planning.	Woman reports that she or her partner are currently using a modern contraceptive method
Counseling on family planning from health facility staff	Women who: <ol style="list-style-type: none"> <li>1. Are at risk of pregnancy</li> <li>2. Are not currently trying to become pregnant</li> <li>3. Have visited a health facility in the past 12 months</li> </ol>	Spoke to a staff member about family planning methods during any visit to a health facility in the past 12 months	Woman reports that she or her partner are currently using a modern contraceptive method

Antenatal care for pregnant women	Women that have given birth in the past 2 years	<ol style="list-style-type: none"> <li>1. Were attended four times during their most recent pregnancy by any provider</li> <li>2. Were attended at least once by a skilled professional</li> </ol>	<ol style="list-style-type: none"> <li>1. While being attended for antenatal care, received the following: <ol style="list-style-type: none"> <li>a. Weighing</li> <li>b. Prenatal counseling</li> <li>c. Counseling on preparation for immediate and exclusive breastfeeding (see nutrition)</li> <li>d. Testing for preeclampsia, syphilis, urinary tract infection, anemia and HIV (had blood and urine samples taken)</li> <li>e. Counseling about the signs of pregnancy complications and what to do if they experienced any such signs</li> <li>f. A tetanus toxoid immunization</li> </ol> </li> <li>2. Were given the following while being attended for antenatal care and later went on to take them: <ol style="list-style-type: none"> <li>a. Iron supplementation (see nutrition)</li> <li>b. Folate supplementation</li> <li>c. An antihelminthic drug</li> </ol> </li> <li>3. Women reports not suffering from anemia during the last pregnancy</li> <li>4. Woman tests negative for heavy intensity STH infection</li> <li>5. At birth the child weighed over 2,500g</li> </ol>
Utilization of health facilities for births	Women that have given birth in the past 2 years	Birth took place in a health facility	Not measurable by survey
Birth attendance by skilled health personnel	Women that have given birth in the past 2 years	Birth was attended by skilled health personnel	Not measurable by survey

<p>Postpartum care</p>	<ol style="list-style-type: none"> <li>1. Women that have given birth in the past 2 years</li> <li>2. Children born in the past 2 years</li> </ol>	<p>Woman and child received postpartum care during the neonatal period</p>	<p>Woman received the following:</p> <ol style="list-style-type: none"> <li>1. Counseling on vaccinations</li> <li>2. Counseling on family planning (including birth spacing)</li> <li>3. Counseling on immediate and exclusive breastfeeding (see nutrition)</li> <li>4. Information and counseling for home care and emergency preparedness</li> <li>5. Postpartum vitamin A supplements</li> </ol> <p>Child received the following:</p> <ol style="list-style-type: none"> <li>1. Early initiation of breastfeeding (first put to the breast within one hour following birth - see nutrition)</li> <li>2. Warmth provision and avoidance of bathing during the first 24 hours following birth</li> <li>3. Eye antimicrobial to prevent perinatal infections</li> <li>4. Vitamin K supplementation</li> </ol>
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**Immunization**

Intervention	Population in need	Coverage (Use/access)	Effective coverage (Quality)
Full vaccination for age	Children under the age of 5	Child has received at least one vaccination	<ol style="list-style-type: none"> <li>1. Child has completed the full national vaccination schedule appropriate to their age</li> <li>2. Child's immunity validated by serological analysis</li> </ol>
Provision of vaccination card	Children under the age of 5	Child's mother has been issued a vaccination card for each child under the age of 5	<ol style="list-style-type: none"> <li>1. For each child under the age of 5 the woman can provide a vaccination card upon request</li> <li>2. Each vaccination card produced gives a complete record of that child's vaccination history</li> </ol>

## Bibliography

1. World Health Organization. Draft report of technical consultation on effective coverage in health systems. 2001. Available at: [http://www.who.int/health-systems-performance/technical\\_consultations/effcov\\_report.pdf](http://www.who.int/health-systems-performance/technical_consultations/effcov_report.pdf).
2. Anon. Effective Intervention Coverage | Institute for Health Metrics and Evaluation. Available at: <http://www.healthmetricsandevaluation.org/research/team/effective-intervention-coverage>. Accessed March 14, 2011.
3. Anon. Observatorio de la Salud - Cobertura Efectiva. Available at: [http://www.observatoriodelasalud.net/index.php?option=com\\_content&task=blogcategory&id=118&Itemid=227](http://www.observatoriodelasalud.net/index.php?option=com_content&task=blogcategory&id=118&Itemid=227). Accessed March 14, 2011.
4. Observatorio de la Salud America Latina y el Caribe. Informe Regional de Cobertura Efectiva en América Latina y el Caribe. 2010. Available at: [http://www.tomateloapecho.org.mx/fusionmaps/data/Informe\\_Regional\\_de\\_Cobertura\\_Efectiva\\_final\\_300910.pdf](http://www.tomateloapecho.org.mx/fusionmaps/data/Informe_Regional_de_Cobertura_Efectiva_final_300910.pdf).
5. Lozano R, Soliz P, Gakidou E, et al. Benchmarking of performance of Mexican states with effective coverage. *Lancet*. 2006;368(9548):1729-1741.
6. Shengelia B, Tandon A, Adams OB, Murray CJL. Access, utilization, quality, and effective coverage: an integrated conceptual framework and measurement strategy. *Soc Sci Med*. 2005;61(1):97-109.
7. Campbell OMR, Graham WJ. Strategies for reducing maternal mortality: getting on with what works. *Lancet*. 2006;368(9543):1284-1299.
8. Das J, Gertler PJ. Variations In Practice Quality In Five Low-Income Countries: A Conceptual Overview. *Health Affairs*. 2007;26(3):w296 -w309.
9. Gakidou E, Mallinger L, Abbott-Klafter J, et al. Management of diabetes and associated cardiovascular risk factors in seven countries: a comparison of data from national health examination surveys. *Bull. World Health Organ*. 2011;89(3):172-183.

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