

# Immunisation-related knowledge, attitudes and practices of mothers in Kinshasa, Democratic Republic of the Congo

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## Abstract

**Background:** In the Democratic Republic of Congo, it was reported in 1995 that the routine coverage for BCG was as low as 47%, and that it was 27% for DPT3, 28% for OPV3 and 39% for measles vaccine. The trend also was declining unevenly. This study aimed to determine the reasons for such low coverage, examining the socio-demographic characteristics of mothers and health system factors such as health services barriers. It further sought to assess the knowledge, attitudes and practices of mothers associated with routine immunisation.

**Methods:** In 1999, a cross-sectional household survey applied a systematic sampling technique in a sample of eight out of the 22 health zones that then served the population of Kinshasa. These were dichotomised into low- and high-coverage health zones, based on BCG immunisation coverage. Mothers of children aged from zero to four years were the respondents to a standardised questionnaire.

**Results:** A total of 1 613 children aged zero to four years participated in the study. Awareness of immunisation and its importance in protecting a child against diseases was universal, although most mothers could not tell exactly against which diseases. Mothers had positive attitudes towards immunisation (98%). Coverage based on the immunisation card, however, was as low as 37%, indicating a discrepancy between the high level of knowledge and positive attitudes, with the observed low immunisation coverage. The father's education and the mother's experience of an EPI-targeted disease in the family emerged as significant predictors of complete immunisation of the child. The father's involvement and the mother's ability to cite signs of severity of EPI diseases were associated with the child's vaccination status in the high-coverage health zone. The mother's vaccine-related knowledge was a predictor of immunisation status only in the low-coverage zone.

**Conclusion:** Different factors determine the complete vaccination status, depending on whether the child lives in a zone with low or high routine EPI coverage. For example, the father's involvement is associated with the child's vaccination status in the high-coverage zone, but not in the low-coverage zone. Programmes and policy makers should take these factors into account when designing strategies to increase immunisation coverage.

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## Introduction

The Expanded Programme on Immunisation (EPI) was created in 1974 with the purpose of expanding immunisation services beyond smallpox to the following six preventable diseases: diphtheria, measles, pertussis, poliomyelitis, tetanus and tuberculosis.<sup>1</sup> The WHA 30.53 resolution of the World Health Assembly put forth the EPI goal of providing immunisation services for all children, with the target of 90% coverage for all antigens by the year 2000.<sup>2</sup>

When it became clear in the late 1990s that this goal would not be achieved globally, some supportive initiatives arose, including the Global Alliance for Vaccines and Immunisation (GAVI), which contributes to an impressive increase in new funding for immunisation. GAVI is a public-private partnership committed to improving access to routine vaccines and to introducing new vaccines for children in low-income countries.<sup>3,4</sup> Since resources are not indefinitely extendable, efforts to enhance immunisation coverage should be based on evidence. Moreover, even when a vaccine has been proven to be safe and protective, questions regarding feasibility, acceptability and local practices should also be addressed.<sup>5</sup> Clearly, immunising an eligible child requires that the mother is herself well mentally, physically and socially. Mothers in a depressed mood have a debilitated parenting ability. Conversely, mothers receiving support, for example marital support, exhibit greater childrearing competence.<sup>6</sup> Prislis et al.<sup>7</sup> and Flynn and Ogdan<sup>8</sup> studied the beliefs, attitudes and perceived control of parents and concluded that a mother who believes that immunisation protects is likely to have her child immunised.

The World Health Organisation rates immunisation as one of the interventions with a large potential impact on health outcomes.<sup>9</sup> However, its impact is not even throughout countries and its performance has different correlates, depending on the population studied. A community-based study conducted in urban Virginia (USA) identified, for different population groups, waiting time, difficulty in obtaining an appointment, cost and transportation problems as major barriers to immunisation, in addition to the mother being a teenager, single and African American.<sup>10</sup>

In the late 1990s, Kinshasa was experiencing a dramatic political crisis that culminated in the overthrow of president Mobutu in 1997. The crisis impacted badly on health services, so that delivery of care using the primary healthcare strategy to the then five million inhabitants (over six million in 2006) was basically borne by nongovernmental and church organisations.

The EPI policy encourages health centres to take advantage of all opportunities (growth monitoring, antenatal care, child care visits) to vaccinate a child.

The EPI in the Democratic Republic of the Congo (DRC) enjoys GAVI support. It had set the goal of achieving 80% coverage for all antigens by 1995. However, a national household survey carried out in 1995 noted that the EPI was far from reaching its target, as the routine coverage was as low as 47% for BCG, 27% for DPT3, 28% for OPV3 and 39% for the measles vaccine.<sup>11</sup> Then again, this low coverage was uneven, which meant that, for instance, the 22 health zones that then served the population of Kinshasa could be dichotomised into low- and high-coverage health zones.

This study aimed at determining the reasons for such low coverage, examining the socio-demographic characteristics of mothers

and health system factors such as health services barriers. More specifically, the study sought to assess the knowledge, attitudes and practices of mothers associated with routine immunisation in Kinshasa.

## Methodology

A cross-sectional household survey was carried out in Kinshasa in June 1999 among mothers of children aged zero to four years. In the absence of the mother, any responsible caretaker was interviewed. Prior to the survey, authorisation was sought from the relevant authorities.

The study was conducted in eight randomly selected health zones out of 22, regrouped into two strata, one with low and the other with high BCG coverage, using 80% coverage as the cut-off point. A list of health catchment areas was subsequently established in each selected health zone, out of which one-third of the catchment areas were selected randomly. In each catchment area, streets were numbered, and half of these streets were selected randomly. On each street, households were selected using a systematic sampling technique. In each compound, one household was sampled in which one mother of an eligible child was retained by random selection, after seeking verbal consent.

The sample size calculated for the cross-sectional survey was 400 mothers per stratum, which was raised to 500 to account for an estimated 25% non-response, thus giving a total of 1 000 mothers.

## Measures

The following variables were measured to assess the socio-demographic characteristics of the mother and the father: age, marital status, parity, occupation, education and family size. The mother's age was categorised into below 20, 20 to 39, 40 to 49 and older than 49. Years of schooling were categorised into no education, primary education, secondary education and university (or equivalent) education. In relation to knowledge, mothers were asked what they knew about the six antigens and the purpose, the place and the schedule of immunisation. With regard to attitudes, mothers were asked their opinion about immunisation services and the reasons for or the barriers to remaining in the programme, and also their values and social norms, and the influential agents in their decision making. Their immunisation-seeking behaviour and their children's immunisation status were also assessed. A question measured whether the mother had ever experienced an EPI disease in her family. Another question measured knowledge of the consequences (death, handicap) of contracting it. To assess full immunisation status, children below 12 months were excluded.

## Data analysis

A stepwise logistic regression method was used to identify correlates of full immunisation of the child by card for the two strata.

## Results

### Socio-demographic characteristics of mothers

There were 1 024 mothers for a total of 1 613 children aged zero to four years, with 49.4% of mothers in the low-coverage zone (LCZ) and 50.6% in the high-coverage zone (HCZ) for BCG. The socio-demographic characteristics in both strata are shown in Table I.

The mean age of the mothers was the same across the strata (29±6 years). Marital status differed by stratum ( $p = 0.002$ ). The HCZ tended to contain more married women (90.3%) than the LCZ (82.2%). While

**Table I:** Socio-demographic characteristics of the sample (Kinshasa, 1999)

Socio-demographic characteristics	LCZ	HCZ	Total sample
Mothers sampled	506	518	1 024
Mother's mean age	29.3±6.2	29.5±6.5	29.4±6.3
Mother's marital status (%)			
▪ Married	82.2	90.3	86.2
▪ Single	11.1	6.2	8.6
▪ Divorced	4.7	2.1	3.4
▪ Widow	2.0	1.4	1.7
Mother's schooling (%)			
▪ No education	2.2	2.1	2.1
▪ Primary school	14.2	18.2	16.2
▪ Secondary/high school	67.4	68.3	67.7
▪ Beyond high school	4.6	3.7	4.1
▪ Vocational	11.7	7.7	9.9
Mother's occupation (%)			
▪ Housekeeper	25.6	28.9	26.8
▪ Petty vendor	53.2	41.2	46.8
▪ Civil servant	3.0	2.1	2.0
▪ Tailor	7.6	5.0	6.3
▪ No job	5.6	8.5	7.0
▪ Petty jobs	1.8	10.9	6.3
▪ Nurse	0.8	0.6	0.7
▪ Farm worker	2.2	2.7	2.4
▪ Other	0.2	0.1	1.7
Father's schooling (%)			
▪ No education	16.8	14.7	15.5
▪ Primary school	3.2	3.4	3.3
▪ Secondary/high school	45.0	44.4	44.5
▪ Beyond high school	21.8	25.1	23.9
▪ Vocational	13.2	12.4	12.8

the mother's education varied little by stratum, the occupation did ( $p = 0.000$ ). Hence, mothers in the LCZ were more likely to be involved in small trade (53.2%) (which prevented them from attending health services) than mothers in the HCZ (41.2%).

In most cases (70%), the father was a waged worker or a civil servant or involved in petty jobs. Nearly half of the parents had at least completed high school (44.5%), while the pattern differed considerably beyond high school for mothers (4.1%) compared to fathers (23.9%) ( $p = 0.001$ ).

#### Mothers' vaccination-related knowledge

Virtually all the mothers had heard of immunisation (99.8%). There was, however, confusion in their minds as to which diseases were targeted by the EPI. Some mothers cited diarrhoea (3.9%) and malaria (3%) among the EPI-targeted diseases. Thus, many mothers attended immunisation sessions without knowing exactly for which vaccines they were there.

Barely half of the mothers knew the schedule for BCG (52.3%) and measles (45.5%), and a third (32.3%) did not know the schedule for polio, implying that half of the mothers, should they had missed the BCG or measles vaccines, very likely would not had claimed for the child to receive these vaccines (see Table II).

Diphtheria is the least-known antigen. As for the tetanus, pertussis and diphtheria antigens, the mothers did not know that they were to be administered three times during the first four months of life. Less than 5% stated that the polio vaccine is to be given three times, and less than 1% said so for the pertussis and tetanus vaccines (0.3%). The majority (74.5%) thought that the polio vaccine was given only once.

The mothers relied mostly on the immunisation card (47.8%) and on the health personnel (28.5%) to decide whether the child had completed the immunisation schedule (see Table III).

**Table II:** Proportion of mothers citing correctly the immunisation schedule (%) (Kinshasa, 1999)

Antigens	Age at immunisation	LCZ	HCZ	Total
Poliomyelitis	Birth	15.7	13.9	14.5
	1–3 months	34.6	31.4	32.3
Measles	6–12 months	51.7	40.7	45.5
BCG	Birth	55.0	50.2	52.3
Tetanus	1–3 months	23.3	31.7	27.0
Pertussis	1–3 months	32.9	37.7	34.4
Diphtheria	1–3 months	0.0	0.0	0.0

**Table III:** Criteria used by mothers to decide the child's completion of the immunisation schedule (Kinshasa, 1999)

Criteria for deciding on completion of immunisation schedule	LCZ (%)	HCZ (%)	Total (%)	P
I refer to immunisation card	40.7	55.2	47.8	0.000
I follow nurse's instructions	30.0	26.9	28.5	0.005
I refer to child's age	12.3	7.2	9.9	0.061
After measles vaccine	9.5	4.6	7.1	0.003
If child looks healthy	3.0	1.1	2.1	0.03
If I exhaust all coupons	1.2	2.5	1.9	0.123
I do not know how to decide	2.8	1.6	1.1	0.904
Child is not immunised	0.2	0.8	0.5	0.858
Total	100.0	100.0	100.0	

Mothers in the HCZ (55.2%) used the immunisation card more readily as a decision making tool regarding completion of the immunisation schedule than those in the LCZ (40.7%) ( $p = 0.000$ ), while significantly more LCZ mothers than HCZ mothers relied on health workers ( $p = 0.005$ ), on the completion of the measles shot ( $p = 0.03$ ) and on the absence of diseases ( $p = 0.03$ ).

#### Attitude of mothers

Most of the mothers (98%) declared that immunisation was an important intervention because it protected a child against diseases (96%) and because they learnt new things during the immunisation sessions (2%). In both the HCZ (94.7%) and LCZ (97.9%), the protection of the child against diseases was the main reason for remaining in the immunisation programme. Overall, the mothers rated immunisation highly, despite the experience of fever (96.3%) after a vaccine shot. One mother out of ten believed that vaccination was optional, since there were alternatives for protecting a child (13.3% in the LCZ; 6.8% in the HCZ;  $p = 0.021$ ), such as dressing a child around the waist with a string holding a small key (5%) or praying (4.7%).

Nonetheless, the mothers generally had a positive attitude and found the schedule appropriate (93.8%), the personnel friendly (93.5%) and the waiting time acceptable (78.2%).

The main source of information on immunisation for the mothers was the health centre (82.2%). This source was cited more in the LCZ (86.9%) than in the HCZ (78.8%) ( $p = 0.001$ ).

Moreover, 54.3% of the mothers listened to the radio and 53% watched television on a regular basis; more so in the HCZ (58.6% and 57.1% respectively) than in the LCZ (49.8% and 48.8% respectively). Social groups such as church or women's associations constituted a poor source of information (14%). Written messages represented an unusual source of information (10%). It is worth noting that health topics were not often discussed over the radio (4.7%). Mothers also reported that immunisation was rarely on the agenda when they attended social group meetings (1%).

*Practices of mothers*

Out of 1 613 children aged from zero to four years, 86.1% were fully immunised, based on the mothers' reports (see Table IV). However, only the mothers of 75.7% of the children declared that they possessed an immunisation card. The interviewers could only observe cards for 57.4% of the children – more in the HCZ (70.9%) than in the LCZ (46.9%) ( $p = 0.000$ ), implying that the mothers in the HCZ looked after the card much better. The card was not available because it was lost (46%) or kept at the health centre (16.4%). The interviewers noted that when a mother could produce the vaccination card, it was likely that the child was fully immunised. This was the case in both the LCZs (96.2%) and the HCZs (94.1%). Based on the card, the immunisation coverage was nearly the same in both strata, namely around 37%.

**Table IV:** Immunisation status of children aged zero to four years as stated by mothers or evidenced by the card (Kinshasa, 1999).

Immunisation status	LCZ (%)	HCZ (%)	Total (%)	P (LCZ vs. HCZ)
Proportion of fully immunised children, according to mother	88.1 (N = 753)	83.0 (N = 860)	86.1 (N = 1 613)	0.098
Proportion of children with card, according to mother	92.9 (N = 663)	66.24 (N = 726)	75.7 (N = 1 389)	0.000
Proportion of cards seen by interviewer	46.9 (N = 616)	70.9 (N = 481)	57.4 (N = 630)	0.000
Proportion of seen cards with expected number of visits	96.2 (N = 289)	94.1 (N = 341)	95.1 (N = 630)	0.430
Proportion of children with expected number of visits over total sample	36.9 (N = 753)	37.3 (N = 860)	37.1 (N = 1613)	0.891

The mothers considered the father's involvement to be essential for the immunisation of a child. A father was involved, for instance, by asking questions on the services offered to the child during immunisation (86.4%) or by checking the immunisation card (69.4%). Criteria for assessing the father's involvement weighed differently by stratum and by the child's immunisation status (see Table V). Thus, the father's involvement seemed to be more critical in the LCZ than in the HCZ. Whether the father checked the vaccination card was significantly more important to the mothers of fully immunised children in the LCZ (80.4%) than to those in the HCZ (73.3%). Similarly, whether the father reminded the mother on the due day for vaccination was significantly more vital to the mothers of fully immunised children in the LCZ (74.2%) than to those in the HCZ (68%). The contrary was true when the father's involvement consisted of accompanying the mother to the health centre, which seemed to be a more critical factor in the HCZ (17.3%) than in the LCZ (11.1%).

The set of predictors of full immunisation status operating in the LCZ is not a mere mirror image of the one not operating in the HCZ, such that a predictor present in LCZ would therefore be absent in HCZ (see Table VI).

The age of the mother does not matter. Whether she is young or old does not influence the immunisation status of the child.

**Table V:** Criteria used by mothers to assess the father's interest in the child's immunisation (Kinshasa, 1999)

Criteria	LCZ (%)		HCZ (%)		P*
	Fully	Not fully	Fully	Not fully	
Father asks questions upon return from growth monitoring	89.8	82.4	86.2	84.4	0.630
Father pays bus/taxi fare	86.7	77.6	85.4	74.1	0.079
Father checks the vaccination card	80.4	70.3	73.3	66.4	0.000
Father reminds mother on the day due for vaccination	74.2	65.8	68.0	62.2	0.009
Father goes with mother to health centre	11.1	12.2	17.3	21.4	0.02

\* P value contrasts fully immunised children in the HCZ with those in the LCZ

**Table VI:** Logistic regression models for predicting full immunisation coverage per stratum (LCZ, HCZ) (Kinshasa, 1999)

Logistic model for HCZ stratum			
Variables in the model		OR	(CI <sub>95</sub> )
Age of mother (years)			
▪ Below 20		1	
▪ 20 to 39		15.72	(0.00–1.5E+08)
▪ 40 to 49		13.87	(0.00–1.4E+08)
▪ ≥50		14.07	(0.00–1.4E+08)
Father provides transport fare:		No	1
		Yes	1.86 (1.10–3.12)
Father goes along with mother for vaccination:		No	1
		Yes	1.68 (1.05–1.97)
Father's education			
▪ No education		1	
▪ Primary education		0.73	(0.39–1.38)
▪ Secondary education		0.29	(0.08–1.20)
▪ University education		0.56	(0.35–0.89)
Mother cites signs of severity:		No	1
		Yes	1.61 (1.08–2.16)
Mother has experience of EPI diseases:		No	1
		Yes	2.05 (1.27–3.32)
Logistic model for LCZ stratum			
Variables in the model		OR	(CI <sub>95</sub> )
Father's education			
▪ No education		1	
▪ Primary education		0.26	(0.16–0.55)
▪ Secondary education		0.90	(0.28–2.90)
▪ University education		0.60	(0.36–0.97)
Mother's knowledge:		No	1
		Yes	0.41 (0.26–0.67)
Mother has experience of EPI diseases:		No	1
		Yes	1.67 (1.06–2.62)

In the HCZ, the predictors of full immunisation are that the father provides the transport fare (OR = 1.86; CI<sub>95</sub> = 1.10–3.12), the father goes along with the mother for vaccination (OR = 1.68; CI<sub>95</sub> = 1.05–1.97), the mother cites the consequences of non-immunisation (disease, death, handicap) (OR = 1.61; CI<sub>95</sub> = 1.08–2.16), the mother has experience of EPI-targeted diseases (OR = 2.05; CI<sub>95</sub> = 1.27–3.32), while the fathers' university education correlates inversely with full immunisation (OR = .056; CI<sub>95</sub> = 0.35–0.89). In the LCZ, full

immunisation seems to be determined by the mother's experience of an EPI-targeted disease (OR = .167; CI<sub>95</sub> = 1.06-2.62) whereas her knowledge of the vaccination schedule affects it negatively (OR = 0.41; CI<sub>95</sub> = 0.26-0.67). If the father has a primary (OR = 0.26; CI<sub>95</sub> = 0.16-0.55) or a university education (OR = 0.60; CI<sub>95</sub> = 0.36-0.97), there is a chance that the child will not be fully immunised.

## Discussion

### Social support

Children born to mothers enjoying social support had a better chance of being fully immunised. This is reflected by more mothers who are likely to be married in the HCZ. The impact of marital status on the child's vaccination status has been reported elsewhere.<sup>12,13</sup> Although marital status per se was not a predictor of immunisation status in our study, the husband's involvement showed a significant impact. Thus, programmes gain in involving the father.

### Knowledge of mothers

The awareness of immunisation was universal. This implies that interventions intended to increase parental awareness may have a modest impact.<sup>12</sup>

Mothers in the LCZ exhibited more confusion but only about the tetanus and pertussis vaccination schedule. Nevertheless, vaccination-related knowledge is a significant determinant of vaccination status, as also observed by Kim et al.<sup>13</sup> Whereas it has been observed that confusion about the vaccination scheme characterises incomplete immunisation,<sup>14,15,16</sup> our data suggest that, after adjusting for the father's and mother's characteristics, this may be true only in the LCZ, surprisingly with full immunization, meaning that heightening the knowledge of mothers about vaccination alone would not be beneficial in the LCZ.

### Attitude of mothers

Mothers have positive attitudes towards immunisation, which the majority regarded as an important intervention (98%). In our data, no attitudinal variable was a strong predictor of child immunisation, as also observed by some other researchers.<sup>17,18</sup> However, these researchers worked in private clinics in the United States. Furthermore, as Zelaya et al. have warned, a positive attitude is not a guarantee for full immunisation.<sup>19</sup> Mothers may sometimes not complete the vaccination schedule despite their positive attitude because of their poor understanding of the concept of vaccination, which health personnel do not take time to explain to them clearly.<sup>19</sup>

Yawn et al., studying an affluent community in the USA, identified fear of side effects as an important factor for under-immunisation.<sup>20</sup> Taylor et al.,<sup>21</sup> however, could not find the association, which, possibly as in our study, was confounded by unmeasured socio-cultural factors. Moreover, as observed in Malawi, Ethiopia, Bangladesh, the Philippines and India, mothers might understate side effects. Some mothers view them as a normal occurrence, some expect them to disappear anyway and some see in them a sign that the vaccine is working.<sup>22</sup>

Most mothers, and more so the mothers in the LCZ, acknowledged that their major source of information was the health personnel. This finding suggests a unique opportunity, but also should instil a sense of responsibility in health personnel, as mothers trust them as the most important source of information on immunisation. The health personnel should be mindful because mothers comply with what they tell them, even as regards stopping vaccination.

### Practices of mothers

Although determinants of child vaccination status differ by site, complete immunisation coverage according to the immunisation cards is low and roughly the same in both strata. A survey conducted in 2001 only reported the children's full immunisation status according to the mothers, which it estimated at 45.7%,<sup>23</sup> suggesting that the actual coverage in 2001 remained very low. Therefore, high coverage regarding BCG, which is administered at birth, is not a guarantee for completing the vaccination schedule. Thus all sites, whether of low or high coverage, need to improve their complete vaccination coverage.

In addition to the mother's knowledge and the father's involvement, three other factors are significant determinants of the complete vaccination of the child:

### Other correlates

The father's education is the only socio-demographic predictor. In both strata, a university education was negatively associated with complete vaccination of the child. Higher education being associated with a negative outcome was not expected. In Colombia, years of schooling were reported to have a positive effect on the use of vaccination services.<sup>24</sup> Luzolela and Herdt, however, have described the rather positive deviant behaviour of less educated people resembling that of more educated ones in accessing welfare services.<sup>25</sup>

Mothers with a family member who had suffered from any EPI-preventable disease were likely to have their children completely immunised. This finding is a true application of Salisbury's personal communication, quoted by Gellin et al.: "If parents have fear of disease but no fear of vaccines, the argument in favour of vaccination is clear-cut. When they have no fear of disease, but have fear of vaccines, parents are likely to refuse immunisation".<sup>26</sup> Thus, taking advantage of the increased safety of vaccines, health personnel should emphasise educating parents on the benefits of vaccination.

Linking vaccination practice to the knowledge of the consequences of not being vaccinated, which only appears in the HCZ, is another application of Salisbury's communication.<sup>26</sup> When a mother was unable to cite the consequences of EPI diseases, her child was likely to be immunised incompletely. Experience of disease is a real event and this link is evident in both the HCZ and the LCZ, whereas citing the consequences of no vaccination is just an exercise of the mind, which turns out to be a significant predictor of complete immunisation only in the HCZ.

Other factors, such as service-utilisation factors, were not mentioned by the mothers. Yet a paper analysing the reasons of non-utilisation of growth-monitoring services (within which vaccination is usually administered) in Kinshasa depicted transport problems as an important factor, while staff rudeness and cost seemed to be minor ones.<sup>27</sup>

## Conclusions

Different factors determine a child's complete vaccination status, depending on whether the child lives in an area with a low or high routine EPI coverage.

The father's education and the mother's experience of an EPI disease in the family are significant predictors of a child's complete immunisation across the strata. The mother's vaccine-related knowledge is a predictor of complete immunisation only in the LCZ.

The mother's ability to cite signs of the severity of EPI-targeted diseases and the father's involvement are associated with the child's vaccination status only in the HCZ.

Programmes and policy makers should take these factors into account when designing strategies for enhancing the utilisation of immunisation services. 

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