

# Access to information technology and willingness to receive text message reminders for childhood immunisation among mothers attending a tertiary facility in Lagos, Nigeria

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**Background.** Effective communication is imperative for the delivery and receipt of adequate health care services.

**Aim.** To determine access to information technology and willingness to receive short message service (SMS) text message reminders for childhood immunisation services among mothers in Lagos, Nigeria.

**Method.** In this descriptive cross-sectional study, interviews using structured questionnaires were conducted with 399 mothers of children aged <5 years who brought their children to attend the immuno-prophylaxis and child welfare clinic of Lagos University Teaching Hospital during July and August 2011.

**Results.** The age of the respondents ranged from 16 to 51 years with a mean of 31.1±4.7 years. Almost all (98%) were current owners of mobile phones, 68% had computer access, 66% were current users of the Internet though most used it occasionally and 65% had e-mail addresses. About three-quarters (77%) were willing to receive future SMS reminders about childhood immunisations although 67% preferred telephonic reminders to SMS and only 53% were willing to pay for the reminders. Respondents who were currently married and had at least a post-secondary education were more willing to receive SMS reminders.

**Conclusion.** The mothers had better access to mobile phones than the Internet and were willing to receive SMS immunisation reminders. Future intervention strategies should explore payment mechanisms for SMS reminders, as there is an unwillingness to bear the cost by the respondents.

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## Background

Effective communication is imperative for the delivery and receipt of adequate health care services. Over the past decade, new technologies and methods of communication have been introduced in Nigeria, especially the Global System Mobile communication (GSM) service which was launched 10 years ago. Since then, communication and development in the country has greatly improved. Now there are almost 90 million subscribers in Nigeria.<sup>1</sup> Access to communication is one of the important factors in the improvement of maternal and child health services.<sup>2</sup> Hence the use of mobile phones has great potential, as the number of subscribers keep increasing.

Nigeria has the second largest under-five mortality rate in the world – about 2 300 children under the age of five die daily.<sup>3</sup> About 22% of these deaths are due to vaccine-preventable diseases (VPD),

and childhood immunisation remains an important strategy in the reduction of morbidity and mortality from common VPD. According to the National Programme on Immunisation (NPI) guidelines, a child should receive a Bacille Calmette-Guérin (BCG) vaccination for tuberculosis, four doses of oral polio vaccine, three doses of diphtheria, pertussis and tetanus (DPT), three doses of hepatitis B vaccine (HBV), one dose of yellow fever vaccine and one dose of measles vaccine by the age 12 months. Yet, national coverage in Nigeria for full immunisation is one of the lowest in the world.<sup>4,5</sup>

Globally, non-attendance for immunisation appointments remains a challenge to healthcare managers, and providers and previous studies have shown that reminders are effective in improving clinic attendance and increasing childhood immunisation rates.<sup>6-9</sup> It is important to know the preparedness of mothers in low-income countries such as

Nigeria to embrace similar intervention strategies to improve child health should they arise. There is a dearth of published research work on willingness to receive short message service (SMS) text message reminders for health-related services in Africa. This study therefore aims to determine access to information technology and willingness to receive SMS reminders for childhood immunisation services among Nigerian mothers.

## Methods

This descriptive, cross-sectional study was carried out at the immunoprophylaxis and child welfare clinic of the Lagos University Teaching Hospital (LUTH), one of the major tertiary hospitals in Lagos State, Nigeria. The clinic offers the full spectrum of vaccines advocated by NPI and monitors the growth and development of children from birth to 5 years of age. It receives an average of 350 clients every month.

A minimum sample size of 384 was calculated using the formula for descriptive studies ( $n = z^2pq/d^2$ ) and assuming a proportion ( $p$ ) of 0.5 of mothers willing to receive SMS reminders. The sample size was increased to 400 to make up for non-responses. All consecutive mothers coming into the clinic were enrolled until the sample size was attained over a period of 5 weeks during the months of July and August 2011. Four trained research assistants collected verbal information from selected mothers by means of a structured questionnaire. Each interview was completed within 20 minutes.

Ethical approval was obtained from the LUTH research and ethics committee. The concept of the study was explained to the mothers and their verbal consent was obtained.

Data were entered using Epi-info software (version 3.4.1) and analysed using SPSS 16.0 software. Chi-square tests were performed to assess the factors associated with a willingness to receive SMS reminders. To assess the relative contribution of each of these predictor variables on the willingness to receive SMS reminders, a logistic regression analysis was carried out. Variables with a  $p < 0.05$  on bivariate analyses were included in the multivariate logistic model and categorical variables were recoded into a binary form. These variables were entered into the model using a block entry approach. Odds ratios (OR) and 95% confidence intervals (CI) were produced for each predictor variable. There was no co-linearity among the variables included in the final model.  $P$ -values  $< 0.05$  were considered statistically significant.

## Results

A total of 399 out of 400 administered questionnaires were valid for analysis. The age of the respondents ranged from 16 to 51 years with a mean of  $31.1 \pm 4.7$  years. Almost all (96%) were currently married and 95% had at least a secondary school education.

Almost all (99%) of the respondents had ever owned a mobile phone, while 98% were current owners. The number of phones owned ranged from one to four, with a median of 1. Forty-three per cent had ever received a health-related SMS from their GSM provider while 52% had ever received one from an individual/organisation providing medical services. A total of 269 respondents (68%) had computer access. Of these, 67% had a personal computer, 16% had access at a cybercafé/business centre, 11% at work, and 4% from a friend; 263 respondents (66%) currently used the Internet and their access was occasional (48%), 24 hours (22%), daytime (18%) and nighttime (13%); 65% had an email address.

Seventy-four respondents (19%) admitted to having ever missed a previous clinic appointment and the median number of missed appointments was 1. The reasons for missing clinic appointments were because they forgot (23%), either mother or child was ill (22%), travelled (20%), were too busy (16%) or mixed up dates (5%).

Table 1 shows the attitude of the mothers towards reminders for immunisations. About three-quarters (77%) were willing to receive future SMS reminders about childhood immunisations. The preferred language for the reminders was English. Sixty seven per cent preferred telephonic reminders to SMS, 69% perceived reminders to be very beneficial and 53% were willing to pay for them.

A bivariate analysis showed that there were statistically significant associations between age, level of education, marital status, religion, ethnicity, ownership of a personal computer and willingness to receive SMS reminders (Table 2).

Table 3 shows the predictors of willingness to receive SMS reminders. Respondents with a post-secondary education were 2.5 times more likely to be willing to receive SMS reminders (OR 2.50, CI 1.41 - 4.42). Those who were currently married were 7 times (OR 6.81, CI 1.91 - 24.21) while the Christians were 2 times

**Table 1. Respondents' attitudes towards reminders for childhood immunisation appointments**

Variable	Freq (%)
<b>Willing to receive SMS reminders about child's immunisation</b>	
Yes	308 (77)
No	91 (23)
<b>Preferred language for reminder SMS (n=308)</b>	
English	288 (94)
My native language	14 (5)
Pidgin	6 (2)
<b>Preferred time of SMS reminder (n=308)</b>	
On the day of the appointment	8 (3)
A day before appointment	183 (60)
A week before appointment	99 (32)
Other	18 (6)
<b>Prefers e-mail reminders to SMS (n=308)</b>	108 (35)
<b>Prefers telephonic reminders to SMS (n=308)</b>	206 (67)
<b>Perception of benefit expected to be received via SMS/telephonic/e-mail reminder (n=399)</b>	
Very beneficial	274 (69)
Somewhat beneficial	31 (8)
Not beneficial	4 (1)
Indifferent	7 (2)
Non response	83 (21)
<b>Willing to pay for SMS/telephonic reminder</b>	213 (53)
<b>Median amount for SMS reminder</b>	N10.00 (6 cents)
<b>Median amount for telephonic reminder</b>	N20.00 (12 cents)

**Table 2. Factors associated with willingness to receive SMS reminders about child immunisations**

Variables	Total N=399 Freq (%)	Willing n=308 Freq (%)	Not willing n=91 Freq (%)	<i>p</i> -value
<b>Age (years)</b>				
15 - 24	24 (100)	10 (40)	14 (60)	<0.001
25 - 34	282 (100)	226 (80)	56 (20)	
35 and above	93 (100)	72 (78)	21 (22)	
<b>Highest level of education</b>				
No formal	7 (100)	0 (0)	7 (100)	<0.001
Primary	14 (100)	9 (64)	5 (36)	
Secondary	127 (100)	87 (69)	40 (31)	
Post-secondary	251(100)	212 (84)	39 (16)	
<b>Marital status</b>				
Never married	8 (100)	2 (25)	6 (75)	<0.001
Currently married	384 (100)	304 (79)	80 (21)	
Separated/divorced/ widowed	7 (100)	2 (29)	5 (71)	
<b>Ethnicity</b>				
Yoruba	213 (100)	158 (74)	55 (26)	<0.001
Igbo	138 (100)	119 (86)	19 (14)	
Hausa	18 (100)	7 (39)	11 (61)	
Others	30 (100)	24 (80)	6 (20)	
<b>Religion</b>				
Christianity	307 (100)	249 (81)	58 (19)	<0.001
Islam	90 (100)	59 (66)	31 (34)	
Other	2 (100)	0 (0)	2 (100)	
<b>Owns a mobile phone</b>				
Yes	389 (100)	301(77)	88(23)	0.583
No	10 (100)	7(70)	3 (30)	
<b>Has a personal computer</b>				
Yes	179 (100)	147 (82)	32 (18)	0.034
No	220 (100)	161 (73)	59 (27)	
<b>Currently uses the Internet</b>				
Yes	263 (100)	210 (80)	53 (20)	0.079
No	136 (100)	98 (72)	38 (28)	
<b>Has e-mail address</b>				
Yes	258 (100)	207 (80)	51 (20)	0.050
No	141 (100)	101 (72)	40 (28)	
<b>Ever received SMS reminder</b>				
Yes	207 (100)	158 (76)	49 (24)	0.669
No	192 (100)	150 (78)	42 (22)	
<b>Ever missed clinic appointment</b>				
Yes	74 (100)	62 (84)	12 (16)	0.134
No	325 (100)	246 (76)	79 (24)	

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(OR 1.99, CI 1.14 - 3.47) more likely to be willing to receive SMS reminders for their child's immunisation appointments.

## Discussion

This study is innovative because it assesses willingness to receive SMS reminders for immunisation services in an African setting and the findings would be of interest to programme managers and researchers working on interventions on child survival. Most of the mothers surveyed had access to information technology. Almost all of them owned a mobile phone and 67% owned a personal computer, possibly because of their high literacy level; most (95%) of the respondents had at least a secondary school education, which is higher than the proportion of urban women with at least a secondary school education (66.7%) from the 2008 National Demographic and Health Survey.<sup>10</sup> This implies that the GSM phones could be a valuable tool for reminding mothers about childhood immunisation appointments and delivering other health messages. The ease with which large numbers of messages can be customised and sent by SMS text messaging, along with its availability and comparatively low cost, suggest it may be a suitable means of improving maternal and child health services.

Access to Internet services in Nigeria has increased over time, placing Nigeria, with 44 million users, among the top ten countries with Internet access in Africa.<sup>11</sup> It is encouraging to observe that most of the respondents in this study had access to the Internet and an e-mail address, which enhances the possibility of using the Internet as a channel of communication between mothers and healthcare providers in the near future.

This study found that the majority of the respondents were willing to receive SMS immunisation reminders and this was consistent with findings in quantitative and qualitative studies in the USA.<sup>12,13</sup> This finding is important, especially as the most common reason given for missing clinic appointments was because the mothers forgot the appointments, and it suggests that African mothers would accept a technique with proven effectiveness in improving immunisation rates.<sup>8</sup> The mothers' preference for English language could be attributed to their high literacy level. Future programmatic interventions should explore the use of SMS reminders as a tool to improve immunisation coverage if end-users are willing to adopt it. The mothers in this study had a positive attitude towards reminders and appreciated the benefit it would have to them and their children. This could be because they are regularly exposed to health talks and other forms of health education that address the benefits of immunisation.

Most of the mothers preferred to have a telephonic reminder to a text message. This is similar to findings from a recent study in the USA, where the preferred mode of immunisation reminder was a phone call to the home telephone.<sup>14</sup> Qualitative studies are needed to further explore mothers' preference for immunisation reminders in the African context, as these will further guide programme managers.

It is surprising that almost half of the respondents were not willing to pay for appointment reminders even though the benefit was clearly appreciated. An explanation for this could be that immunisations in the NPI schedule are provided free of charge by the Nigerian government and

**Table 3. Predictors of willingness to receive SMS reminders**

Factor	Odds ratio	95% CI	Coefficient	SE	p-value
Increasing age in years	1.05	0.99 - 1.10	0.04	0.02	0.096
Post-secondary v. <post-secondary education	2.50	1.41 - 4.42	0.92	0.28	<0.001
Currently married v. not currently married	6.81	1.91 - 24.21	1.92	0.65	<0.001
Christianity v. Islam	1.99	1.14 - 3.47	0.69	0.29	0.018
Yoruba ethnic group v. non-Yoruba ethnic group	0.68	0.39 - 1.16	-0.38	0.27	0.146
Has personal computer v. does not have a personal computer	0.97	0.54 - 1.73	-0.03	0.29	0.927

thus mothers might not want to take up any new costs. This finding has important implications for programme managers and researchers, as they may need to devise alternative payment mechanisms for reminders in future intervention strategies.

The findings from this study suggest that being married and having a higher education makes a mother more likely to be willing to receive SMS reminders. This brings to light the influence of maternal education and marital status on child survival, as confirmed by previous studies.<sup>15-19</sup> It also implies that before immunisation appointment reminders can be widely adopted, apart from considering access to information technology, barriers that are related to the socio-economic conditions of end-users (especially marital and educational status) need to be fully explored and addressed.

There are some limitations to this study. To avoid a high rate of non-response and incompletely filled questionnaires a client-completed questionnaire was not used to collect data from the educated respondents because of the busy nature of the clinic. In addition, the findings are applicable only to urban caregivers attending a tertiary facility while a significant proportion of mothers receive the services in primary health care centres. Further research needs to be done in the rural area where literacy and immunisation coverage rates are lower.<sup>5,10</sup>

## Conclusion

The mothers had better access to mobile phones than the Internet and the majority were willing to receive SMS reminders for their child's immunisation clinic appointment. Marriage and a post-secondary education make a mother more likely to be willing to receive SMS reminders. Future intervention strategies should explore payment mechanisms for SMS reminders as almost half of the respondents were unwilling to bear the cost.

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