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Reasons for the Low Male Involvement in Routine Child Immunization in Hoima District Uganda using the Attitude, Social Influence and Self Efficacy Model

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Abstract:

Millions of children continue to miss immunizations each year despite global increases in financing and advances in vaccine technology. Male involvement in routine child immunization activities could improve and sustain coverage but is rarely emphasized in immunization programs or research. This study identified factors associated with male involvement in routine child immunization using the attitude, social influence and self-efficacy model. A household cluster survey was conducted among 460 fathers aged 18 years or more, with children aged 10-23 months. A semi-structured interviewer-administered questionnaire was used to collect data. Prevalence Risk Ratios (PRRs) were used to measure associations with level of involvement using generalized linear models with Poisson family, log link and robust standard errors in STATA 12. Our findings show that half (51%, 236/460) of the respondents were aged 25-34 years; 36% (166/460) had completed eight or more years of formal education. Although 90% (415/460) of the respondents were willing to be involved, only 29% (133/460) were highly involved in routine child immunization. Highly involved fathers had a positive attitude towards involvement in routine child immunization (adj. PRR 2.3, 95% CI 1.18 – 4.98) and were ≥45 years [adjusted prevalence risk ratio (adj. PRR) 2.0, 95% confidence interval (CI) 1.15 - 3.76]. Traders had a lower involvement compared to those engaged in other occupations (adj. PRR 0.55, 95% CI: 0.37 - 0.82). In conclusion, few fathers were involved in routine child immunization. Strategies to improve fathers' positive attitude such as health education are needed to increase their involvement, specifically targeting younger fathers and traders.

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Introduction

Nearly 19 million infants worldwide did not complete their routine immunization schedules in 2014, more than 60% of these lived in 10 developing countries including Uganda [1]. This resulted in 1.5 million deaths due to vaccine preventable diseases (VPDs) and accounted for about a third of deaths and disabilities among children under-five years of age in these countries [1]. Previous studies indicate that individual, community and health system factors underlie failure to complete immunization schedules in developing settings [2-6]. In Uganda, the reasons for high incompletion (48%) of routine immunization schedules are not well understood particularly because 10 districts in Western Uganda, where Hoima is situated, report high access (98%) to immunization services [7].

Interventions that generate demand for immunization services in developing countries have traditionally targeted women neglecting the involvement of men mainly due to the general belief that women are typically responsible for child immunization [3, 8]. However, the lack of male involvement has been shown to reduce immunization uptake, increase dropout, and un-timely commencement and completion of routine child vaccination schedules [3, 8, 9]. Paradoxically, male involvement is particularly emphasized in maternal health care with little attention to child vaccination, one of the world's most cost-effective child survival strategies [10].

Since the launch of the Global Vaccine Action Plan for 2011 to 2020 [11], efforts are under way to strengthen routine immunization to meet vaccination coverage targets and to introduce new vaccines. The introduction of new vaccines is in addition to the pre-existing twelve doses currently provided on the routine immunization schedule in Uganda which requires several clinic visits [2]. This will increase demands on the already overburdened mothers, and without high male involvement this may be difficult to achieve [3, 9]. This study used the attitude, social influence and self-efficacy (ASE) model to identify factors associated with male involvement in routine child immunization among fathers in Hoima, Uganda so as to inform implementation of strategies for increased utilization of routine child immunization.

Materials and Methods

Study Design and Setting

We conducted a household cluster survey in Hoima district, Western Uganda, between March and May, 2013. Hoima District is located 230km West of Kampala, the Capital City of Uganda. Hoima had a total population of 549,000 people, 106,000 of whom were aged under-five and 22,000 were infants. The annual population growth rate is 4.7% [12], with an infant mortality rate of 85/1000 and under-five mortality of 88/1000 live births [7]. Hoima has 54 functional health facilities (45 public, 7 Private Not for Profit (PNFP) and 2 Private for Profit (PFP) facilities) and all provide routine child immunization (RCI) services [12].

Eligibility and Sampling

Fathers who were at least 18 years old with children aged 10 to 23 months, and had lived in Hoima for at least a year prior to the survey were included in the study. The required sample size was 460 men using the formula by Bennett for sampling in cluster surveys, with the following assumptions; a two-sided test with a precision of 0.03, 80% power, 10 households per cluster, intra-cluster correlation of 0.1, and a design effect of 1.9 and 50% level of male involvement in routine child immunization [13].

Multistage cluster sampling method was used to select study participants. In the first stage, five of 13 sub-counties in Hoima district were randomly selected using computer generated random numbers. In the second stage, two parishes from each of the five selected sub-counties were randomly selected (ten

parishes in total). In the third stage, a list of all villages from each of the ten parishes was generated. A total of 46 out of 116 villages were then selected proportionate to the number of villages in each parish. Villages (lowest administrative units) were considered as clusters in this study. At the last stage, households were consecutively searched for eligible fathers. Ten fathers were interviewed in each village, selecting one respondent per household.

In each of the selected villages, a random starting point preferably a main junction in the village was identified. Then beginning with the house on the eastern side, data collectors moved from house to house looking for eligible respondents until the desired sample for the village was obtained.

In case a household did not have an eligible respondent, the respondent declined to participate, or was not at home at the time the house was approached for study inclusion, the next household was considered. In a household with an eligible man with more than one child aged 10-23 months or a polygamous man with partners each having a child in the 10-23 months age group; the male partner would be interviewed in reference to the youngest child in the age group. This last criterion was chosen to reduce recall bias for the study outcome.

The Attitude, Social Influence and Self-Efficacy (ASE) Model

The ASE model was originally developed for smoking cessation by de Vries et al [14], and has been widely applied in explaining health behavior [3, 15, 16]. We used the ASE model in this study because it not only considers social influence and self-efficacy as predictors of behavior but it is also better suited to explaining current behavior; unlike the health belief and the trans-theoretical models that do not consider social influence as a predictor of behavior, and trans-theoretical model that is much more focused on promoting change in behavior [17].

As shown in figure 1, behavior related to male involvement in RCI is a result of behavior intention. This is in turn is influenced by three main factors; attitude, social influence and self-efficacy. Attitude is an individual's evaluation of merits and demerits of involvement in routine child immunization services. Social influence results from social norms in regard to male involvement in routine child immunization. It's

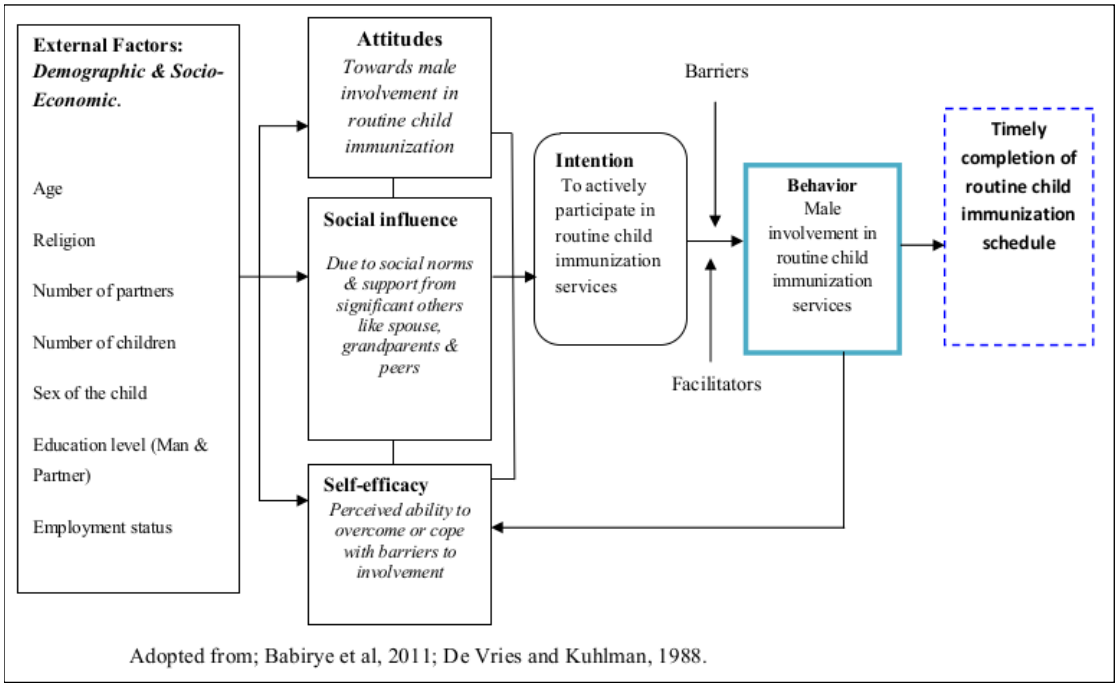

Fig. 1 Attitude-Social Influence-Self-efficacy Model.

influenced by gender roles, and support, or discouragement from significant others such as one's parents and spouse [18, 19]. Self-efficacy is the perceived ability to perform a behavior, and to cope with barriers to perform a behavior. It influences both behavior intention and behavior itself. Self-efficacy may be influenced by a man's perceived benefits of their involvement in routine child immunization. Barriers and abilities could influence male partner involvement in RCI. Previous behavior or trying to perform the behavior has a feedback mechanism that in turn influences the attitude, social influence and self-efficacy. Demographic characteristics on the other hand are unchangeable but useful in identifying men less supportive of their partners in routinely immunizing their children so they can be targeted [3].

Data Collection and Measurements

The measurements used in this study were based on the ASE model described above. Data were collected through face-to-face interviews using a pre-tested structured questionnaire that was translated into Runyoro (local dialect) and back translated into English for consistence in meaning. We describe below the measurements used for this study; male involvement in routine child immunization, attitude, social influence and self-efficacy.

Male Involvement in Routine Child Immunization

This was estimated based on an involvement index developed from five indicators: 1) if the male partner had taken their child for routine immunization, 2) had accompanied the partner for routine child immunization, 3) provided financial support for a child's routine immunization visits, 4) discussed with the partner about the child's immunization schedule, and 5) had participated in making a decision with partner to have a child immunized. Each indicator had an equal weight score of one. The involvement score of each respondent ranged from 0=no involvement to 5=involved in all five areas at least once. A total score of at least 4 was considered as high male involvement and ≤3 as low male involvement [20].

Attitude:

A male partners' attitude was defined as his evaluation of merits and demerits of his involvement in routine child immunization (RCI) [3, 15]. The man's attitude towards involvement in RCI was measured on an ordinal scale using a four- point likert item (3=Strongly agree, 2=Agree 1=Disagree, 0=Strongly disagree) using the following four statements: 1) routine child immunization care is equally a man's role, 2) male involvement in routine child immunization is beneficial, 3) I am willing to be involved in routine child immunization, and 4) I can encourage another man to be involved in a child's routine immunization. A binary variable (agree/disagree) was then created from the likert scale for each statement and a score of one was assigned to each statement agreed to. If a respondent scored a maximum of ≥3 points then they would be categorized as having a positive attitude and those who scored ≤2 points were regarded as having a negative attitude towards male involvement in RCI.

Social Influence:

Social influence was described as resulting from social norms in regard to male involvement in routine child immunization [3, 15]. In this study, social influence was assessed using three key questions: 1) who is mainly responsible for ensuring that a child is immunized in this community? 2) have you ever been encouraged by significant others like your spouse or parent to be involved in RCI? 3) Have you ever been discouraged by significant others like your spouse or parents from being involved in RCI? [21]

Self-Efficacy:

Self-efficacy was defined as a father's perceived ability to cope with barriers to their involvement in RCI [2, 3, 15]. Fathers were asked if they felt they were able to cope with or overcome the following major barriers to participate in routine child immunization: competing work demands, gender role rigidities, peer disapproval,

financial constraints; long distance to, and long waiting time at the health facility. Again, a 4-point likert scale was used here (4=most likely, 3=likely, 2=less likely, 1=not likely). Respondents who responded "most likely" or "likely" to overcome to four of the challenges were categorized as having high self-efficacy and those who responded similarly to ≤3 of the challenges were classified as having low self-efficacy.

Data Analysis

Data were coded, entered, cleaned and analyzed using STATA version 12.0. We computed prevalence risk ratios (PRR) as a measure of association between the outcome and independent factors (attitudinal, social influence and self-efficacy factors) using generalized linear model (GLM) with Poisson family and a log link with robust standard errors [22]. Univariable then multivariable analysis were conducted. All factors with p <0.15 at univariable analysis and factors plausibly associated with the primary outcome were entered in multivariable GLM models to obtain adjusted prevalence risk ratios (adj.PRR). Two multivariable models were used in this study; in the first multivariable GLM, background characteristics and the specific variables that were used to create overall attitude, social influence and overall self-efficacy were run. In the second GLM model, the background characteristics, overall attitude, overall social influence and overall self-efficacy were run. A stepwise backward elimination approach in each of the two models was used to ascertain the best fitting model with a log likelihood tending towards zero.

Ethical Considerations

Ethics approval was obtained from Makerere University School of Public Health Higher Degrees Research and Ethics Committee. Interviews were conducted only when written informed consent had been obtained from the study participants.

Results

A total of 460 eligible respondents were approached for study inclusion and all were interviewed, representing 100% response rate. Respondents were aged between 18-72 years with a mean age of 32.3 years (SD=8.7). Half (51%, 236/460) of them were aged 25-34 years and only 36% (166/460) had completed 8 or more years of formal education. Most (77%, 353/460) respondents had four or less children, were in monogamous relationships (83%, 380/460); 41% (190/460) were peasant farmers, and 29% (135/460) were traders, table 1.

Level of Male Involvement:

Overall, 29% (132/460) of all respondents were highly involved in routine child immunization (RCI). The level of involvement varied by activity; for instance, most (76.1%, 350/460) respondents reported provision of financial support for the child's routine immunization session(s), followed by accompanying the partner (61.5%, 283/460), discussing a child's routine vaccination schedule with partner (57.8%, 266/460), and least involvement (18%, 84/460) was in taking their children for routine immunization, table 2.

Attitude:

Overall, 87% (399/460) of respondents had a positive attitude towards involvement in RCI (Cronbach's alpha correlation coefficient (α) = 0.8). The majority (87%, 401/460) agreed that male involvement in RCI was beneficial in terms of: sharing parental responsibility (60%, 275/460), showing love to partner (40%, 186/460), opportunity to receive child care education as a couple at immunization clinic (15%, 69/460), and help both parents plan and be better prepared for the next visit (9%, 42/460), and improve timely completion of routine child immunization schedule (12%, 55/460). Nearly all (90%, 415/460) respondents were willing to be involved in RCI and to encourage other men to be involved in RCI (88%, 405/460).

Social Influence:

Most (73%, 334/460) respondents reported that it is mainly a woman's responsibility to have a child immunized and only 3% (14/460) said it was mainly a man's role. In terms of the key roles fathers thought

Table 1: Respondent and child characteristics

Variable	Frequency (n=460)	Percentage (%)
Age of the respondent		
18-24	74	16.1
25-34	236	51.3
35-44	98	21.3
≥45 years	52	11.3
Formal educational Level		
≤7 years	236	51.3
>7 years	224	48.7
Marital Status		
Living with partner	299	65
Married	142	31
Separated	19	4
Type of marriage		
Monogamous	380	83
Polygamous	78	17
Household size		
≤5 People	308	67
>5 People	152	33
Occupation		
Peasant farmer	190	41.3
Casual laborer	83	18
Trader	135	29.4
Formally employed	52	11.3
Religion		
Anglican	184	40
Catholic	155	33.7
Muslim	59	12.8
Other	62	13.5
Number of children		
≤4	353	76.7
>4	107	23.3
Age of child in months		
<12	69	15
12-17	232	50
18-23	159	35
Sex of the child		
Male	222	48
Female	238	52

Table 2: Level of male involvement in routine child immunization

Involvement indices	Yes	No
	no. (%)	no. (%)
1. Did you ever take the child yourself for routine immunization?	84 (18.3)	376 (81.7)
2. Did you ever accompany your partner for routine child immunization?	283 (61.5)	177 (38.5)
3. Did you ever provide financial support for a child's routine immunization?	350 (76.1)	110 (23.9)
4. Did you ever discuss with your partner the child's routine immunization schedule?	266 (57.8)	194 (42.2)
5. Did you ever make a decision with partner to have the child routinely immunized?	195 (42.4)	265 (57.6)
29% (132/460) of fathers were highly involved in RCI (participated in 4-5 indices)		

other community members expected of them in RCI, 21% (95/460) reported taking the child for immunization, 34% (155/460) reminding partner of next visit and 45% (209/460) reported providing financial support.

Most men (68%, 313/460) reported encouragement for involvement in RCI mainly from their spouses (28%, 129/460). Respondents reported that other community members considered the act of male involvement in RCI as an expression of love for the wife and child (23%, 107/406), and as a way of a father showing a sense of responsibility for his family (50%, 230/460).

On the other hand; 23% (106/460) of respondents reported discouragement from involvement in RCI mainly from their peers (22%, 101/460). Their involvement was viewed by other community members as a sign of "weakness" for a man (34%, 157/460) and as having time to waste (4%, 19/460).

Self-Efficacy:

Overall, most (72%, 333/460) respondents had a high self-efficacy towards involvement in RCI (Cronbach's alpha correlation coefficient (α) = 0.83). Key barriers to male involvement in routine child immunization (RCI) were: competing work demands (88.7%, 408/460), long waiting time at immunization clinics (43.3%, 199/460), considering routine child immunization as a woman's responsibility (38.9%, 179/460), financial constraints (24.4%, 112/460), long distance to immunization facility (17.6%, 81/460), and perceived ridicule from peers (5.7%, 26/460). Nearly all fathers (90%, 395/460) expressed ability to cope with or overcome financial constraints; 79% (362/460) with long distance to immunization clinic; 76% (348/460) with ridicule from peers; 70% (321/460) with traditional gender roles, 67% (306/460) with competing work demands; and 56% (258/460) with long waiting time at immunization clinic.

Independent Predictors

Both univariable and multivariable level analyses are shown in table 3. At multivariable analysis high male involvement in RCI was significantly associated with; men who were 45 years or older (adj. PRR 2.0, 95% CI 1.15 - 3.76), and men who had a positive attitude towards involvement in RCI (adj. PRR 2.3, 95% CI 1.18 – 4.98). Low Male involvement in RCI was observed among men whose main occupation was trading (adj. PRR 0.55, 95% CI 0.37 - 0.82). Male education level, perceived self-efficacy, and social influence towards involvement in RCI were not significantly associated with male involvement in RCI, table 3.

Discussion

This study identified factors associated with male involvement in routine child immunization (RCI). We found that, although 90% of men were willing to participate in RCI, only 29% were highly involved. High male involvement in RCI was more often among respondents that were 45 years or older and among

Table 3: Factors associated with male involvement in routine child immunization

Variable	Total n=460	High involvement no. (%). n=132	Low involvement no. (%). n=328	Unadjusted PRR (95% CI)	Adjusted PRR[c] (95% CI)
Age					
18-24	74	13 (17.6)	61 (82.4)	1	1
25-34	236	72 (30.5)	164 (69.5)	1.74 (1.02 - 2.95)	1.59 (0.53 - 2.72)
35-44	98	29 (29.6)	69 (70.4)	1.68 (0.94 - 3.01)	1.58 (0.88 - 2.84)
≥45 years	52	18 (34.6)	34 (65.4)	1.97 (1.06 - 3.66)	**2.00 (1.15 - 3.76)***
Formal educational level					
≤7 years in school	236	60 (25.4)	174 (74.6)	1	1
≥8 years in school	224	72 (32.1)	152 (67.9)	1.26 (0.95 - 1.69)	1.33 (0.98 – 1.81)
Occupation					
Farmer	190	63 (33.2)	127 (66.8)	1	1
Casual laborer	83	22 (26.5)	61 (73.5)	0.80 (0.53 - 1.21)	0.86 (0.57 - 1.30)
Trader	135	25 (18.5)	110 (81.5)	0.56 (0.37 - 0.84)	**0.55 (0.37- 0.82)****
Formally employed	52	22 (43.2)	30 (57.8)	1.28 (0.88 - 1.86)	1.00 (0.66 - 1.50)
Number of children					
≤4	353	29 (8.2)	250 (70.8)	1	
>4	107	103 (96.3)	78 (72.9)	0.93 (0.65 -1.32)	
Sex of the child					
Male	222	60(27.0)	162 (73.0)	**1**	
Female	238	72 (30.3)	166 (69.7)	1.12 (0.84 - 1.49)	
Attitude[a]					
Male involvement in RCI is beneficial to the child					
Yes	401	122 (30.4)	279 (69.6)	1.79 (1.00 - 3.22)	1.08 (0.60 - 1.95)
No	59	10 (16.9)	49 (83.1)	1	1
RCI is equally a man's role					
Yes	310	103 (33.2)	207 (66.8)	1.72 (1.19 - 2.47)	1.19 (0.77 - 1.84)
No	150	29 (19.3)	121 (80.7)	1	1
I am willing to be involved in RCI					
Yes	415	128 (30.8)	287 (69.2)	3.47 (1.35- 8.95)	**3.17 (1.27- 7.92)**
No	45	4(8.9)	41 (91.1)	1	1
I can recommend another man to be involved in RCI care					
Yes	405	124 (30.6)	281 (69.4)	2.10 (1.09 - 4.06)	1.16 (0.46 - 2.93)
No	55	8 (14.5)	47 (85.5)	1	1
Overall attitude					
Positive (yes to 3-4 indices)	399	125 (31.3)	274 (68.7)	2.73 (1.34 - 5.57)	**2.31 (1.18 - 4.98)***
Negative (yes to ≤2 indices)	61	7 (11.5)	54 (88.5)	1	1
Social influence					
Perceived gender roles in RCI					
Joint parental role	112	44 (33.3)	68 (20.7)	1	1
Man's role	14	3 (2.3)	11 (3.4)	0.55 (0.19 - 1.53)	0.72 (0.29 - 1.95)
Mother's role	334	85 (64.4)	249 (75.9)	0.65 (0.48 -0.87)	1.39 (0.96 - 1.75)

those with a positive attitude towards involvement. Men engaged in trade as the main occupation were less involved.

Table 3 Continued...

Variable	Total n=460	High involvement no. (%). n=132	Low involvement no. (%). n=328	Unadjusted PRR (95% CI)	Adjusted PRR[c] (95% CI)
Ever encouraged to be involved in RCI					
Yes	325	101 (31.1)	224 (68.9)	1.35 (0.95 - 1.92)	1.18 (0.86 – 1.64)
No	135	31 (23.0)	104 (77)	1	1
Ever discouraged to be involved in RCI					
Yes	106	32 (30.2)	74 (69.8)	1.07 (0.76 - 1.49)	1.14 (0.80 – 1.62)
No	353	100 (28.3)	253 (71.7)	1	1
Self efficacy[b]					
I do not mind long waiting times at the immunization clinic					
Yes	258	85 (32.9)	173 (67.1)	1.42 (1.04 - 1.92)	1.21 (0.90 - 1.63)
No	202	47 (23.3)	155 (76.7)	1	1
I can ignore ridicule from peers to be involved in RCI					
Yes	348	107 (30.7)	241 (69.3)	1.38 (0.94 - 2.01)	1.10 (0.66 - 1.51)
No	112	25 (22.3)	87 (77.7)	1	1
I can ignore gender roles to be involved in RCI					
Yes	321	96 (29.9)	225 (70.1)	1.15 (0.83 - 1.60)	
No	139	36 (25.9)	103 (74.1)	1	
I can forego work to take child or accompany partner for RCI					
Yes	306	96 (31.4)	210 (68.6)	1.34 (0.96 - 1.87)	0.93 (0.65 - 1.35)
No	154	36 (23.4)	118 (76.6)	1	1
I can use some money to be involved in RCI					
Yes	395	117 (29.6)	278 (70.4)	1.28 (0.80 - 2.05)	
No	65	15 (23.1)	50 (76.9)	1	
I do not mind the long distance to the immunization clinic					
Yes	362	107 (29.6)	225 (70.4)	1.16 (0.79 - 1.68)	
No	98	25 (25.5)	73 (74.5)	1	
Overall self efficacy					
High (yes to 4-5 SE factors)	333	104(31.2)	229 (68.8)	1.42 (0.98 - 2.04)	1.13 (0.78 - 1.63)
Low (yes to ≤3 SE factors)	127	28(22.0)	99 (78.0)	1	1

Lower levels of male involvement have been reported in other child health programs such as the prevention of mother-to-child transmission of HIV (PMTCT) programmes in Uganda [20, 23] and Tanzania [24]. The lack of male involvement is prohibitive for successful child health programs [20, 23], and is often related to the influence of hierarchy and power between men and women which underlies several aspects of decision making for health [3, 16, 25] Studies have indicated that most women cannot make the decision to have the child immunized alone and that some husbands refuse permission, especially if the child has previously developed vaccine side effects [3, 8]. A woman's lack of decision-making autonomy has been associated with a lower likelihood of fully immunizing the child [18]. Therefore implementation of strategies that increase male involvement in RCI cannot be overemphasized.

In our study, a man's positive attitude towards involvement in RCI was associated with high involvement in RCI similar to findings from an urban Ugandan setting where attitude was the strongest predictor of health seeking behavior among men [26]. Earlier studies show that an individual's intention and willingness to undertake a preventive health behavior increases when they have a positive evaluation of the behavior [14, 26, 27]. The majority of respondents in our study considered involvement in RCI as beneficial.

Therefore strategies that emphasize the benefits of men's involvement such as opportunity for child health care education, the importance of timely RCI schedule completion, the associated child health and economic gains of RCI would strengthen men's positive attitude towards involvement in RCI in this setting.

Older fathers were more involved in routine child immunization consistent with earlier findings from a high income setting [28]. It is possible that older men in our study setting have previously experienced firsthand the devastating health effects of vaccine preventable diseases (VPDs) among infants compared to the younger generation that has joined fatherhood in the era with reduced occurrence of VPDs [3, 29]. In addition, the benefits of child vaccination activities are not immediately apparent to child caretakers, thus there is little motivation especially among the younger fathers to prioritize vaccination services amidst competing demands for time [30].

Men whose main occupation was trade were significantly associated with lower involvement in RCI. Similar to findings from a PMTCT program in Eastern Uganda where men involved in occupations that kept them away from home for long hours were less involved in their child's health care [20]. The long waiting times known to prevail during child health activities could have hindered this category of men from participating in child health programs [2]. In addition, the gender role demarcations reported by most of our respondents act as a barrier to male involvement in their children's health [3, 25]. Moreover, the systems in place at many health facilities are oriented toward women to the extent that they have become institutional barriers to greater male involvement [3, 24, 25]. Nearly all men in our study expressed willingness to participate in RCI. The role of men therefore needs to move beyond an ancillary, supportive position and become one that strengthens the link between mother, child and the health system [9, 25].

Methodological considerations

Our study developed a composite measure of male involvement using questions from published literature. The composite measure used here gives a broader understanding of indicators which interact in a complex manner to influence male involvement in RCI. In contrast, a few studies done on male involvement in RCI have used a single involvement indicator to measure male involvement [28, 31]. Another strength in this study is that survey participants were selected within the community, essentially eliminating the selection bias that could have arisen if the participants were obtained at immunisation facilities. Finally, the ASE model has been useful in this study for examining factors associated with male involvement in this setting. However, self-efficacy factors were not statistically associated with male involvement. This deviation from the general precepts of the ASE model could be due to the "intention-behavior gap" described for ASE models [26]. Thus, although nearly all men were willing to participate in RCI only a third of them were involved to a satisfactory level. In addition, an individual's perceived and actual abilities to undertake the behavior should be measured in order to estimate self-efficacy; only perceived ability was measured for this study. Future studies should consider both aspects in measurement of self-efficacy.

Conclusions

This study used five indicators to measure male involvement in routine child immunization (RCI) differing from other reports that use only one of the five indicators for male involvement. Overall, a small proportion of fathers were involved in RCI in this rural setting. And several factors associated with their involvement have been identified. For instance, men's positive attitude towards involvement in RCI was associated with higher male involvement. Interventions to improve men's attitude such as health education or peer education are needed to increase their involvement. These interventions need to be centered

on the involvement of both parents in the health care of the family, in conjunction with local and policy-level changes that support an environment more conducive to men's participation [25]. Younger fathers and men with occupations that keep them away from home such as traders could be the primary target of these interventions.

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Conflict of Interest

The authors have declared that no competing interest exist.

Author Contributions

Conceived and designed the experiments: CB JNB PO LA. Performed the experiments: CB JNB PO. Analyzed the data: CB JNB PO PW LA. Contributed reagents/materials/analysis tools: CB JNB PO PW LA. Wrote the paper: CB JNB PO PW LA.

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