FORUM

SOCIAL CAPITAL AND VACCINATION: A CASE STUDY OF MEASLES VACCINATION AMONG NINE-MONTH-OLD CHILDREN IN ETHIOPIA

Endrias Liranso – Fang Yang[1]

ABSTRACT: *A couple of studies in Ethiopia have explored the impacts of social capital on measles vaccinations. However, the basic relationship between social capital and measles vaccination remains unexplained. The purpose of this study was to investigate the influences of caregivers' structural social capital on measles vaccinations among nine-month-old infants in Ethiopia. The 2011 first round worldwide Young Lives Survey dataset for Ethiopia was utilized, and the situation of 1652 children living with a mother/father was analyzed through the clustered sample and logistic regression. Results show that caregivers' social interaction and membership (professional union, political, religious and funeral/credit groups), social support (from political pioneers, government officials, charitable NGOs, family/relatives, and friends), and collective activities (which they join along with other family units, and talk to local authorities) were significantly positively associated with measles vaccination at a 0.05 significance level after adjusting for covariates. Any future attempts to advance measles vaccination status in Ethiopia without understanding caregivers' social group enrolment, social support, and collective activity are likely to be unsuccessful.*

KEYWORDS: *caregivers, collective action, Ethiopia, social capital, measles vaccination*

1 *Endrias Liranso* is a PhD candidate at the Department of Sociology, School of Sociology and Political Science, Baoshan Campus, Shanghai University, China; e-mail address: endrias2019@shu.edu.cn. *Fang Yang* is a PhD and Associate Professor at the Department of Social Work, School of Sociology and Political Science, Baoshan Campus, Shanghai University, China; e-mail: ouyangfang2014@163.com.

INTRODUCTION

Background

Vaccinations area demonstrated, cost-effective technique for decreasing mortality among children (Central Statistical Agency [Ethiopia] 2016). According to the World Health Organization (WHO 2015), each year vaccination helps avoid more than two million deaths globally. Vaccination has brought comprehensive health benefits to many children worldwide and has been of concrete help in protecting children against vaccine-preventable diseases in low and middle-income countries (Feikin et al. 2016). However, according to Pitas and Ehmer (2020), individuals of a lower socio-economic status remain at greater risk of developing severe illness from the present-day COVID-19 pandemic and are less likely to receive vaccinations, showing that the maintenance of different types of social ties influence the response to the COVID-19 pandemic.

Bourdieu (1986) defined social classes as social groups defined by their relationship to the social space according to the possession and utilization of three key forms of capital: economic, cultural, and social. Economic capital refers to economic resources, such as one's income or assets, while cultural capital refers to the knowledge, skills, and formal education of the individual that function as a resource in society. Social capital refers to those resources that one can draw upon via their social networks (Bourdieu 1986). It is predicted that Bourdieusian conceptions of social class are correlated with vaccination status (Veenstra 2007).

Gebretsadik and Gabreyohannes (2016) in Ethiopia identified the mother's age, parent's educational status and knowledge about vaccination, postnatal care utilization, occupation, monthly income, and distance to health institutions as related to childhood vaccination status. More importantly, single parents have become a discernible phenomenon in the social landscape (Bergeron 2001), and since single-parent families consist of one parent raising one or more children on their own, mostly among lower-income groups who have taken their children to live with relatives, this factor may influence vaccination practices.

In an attempt to empower nations battling with higher rates of child mortality, the World Health Organization recommended that child vaccination target six infectious diseases – diphtheria, whooping cough, tetanus, measles, poliomyelitis, and tuberculosis in all nations, with specific attention to low-income countries including Ethiopia (Arístegui et al. 2003). However, African nations have consistently failed to realize this objective, which still needs the commitment of social structures. According to the Ethiopian Ministry of Health (2015a),

a large proportion of children in Ethiopia do not get vaccinations due to different factors.

According to the Ethiopian Ministry of Health (2015b), a measles vaccine should be provided to nine-month-old infants after birth and this signifies the completion of other routine vaccinations during infancy. However, the country's measles vaccination rate has been below the world average (Central Statistical Agency [Ethiopia] 2016). Measles vaccines are included within the national vaccination program schedule, in relation to which children can get two doses of measles vaccination: the first dose is given at the age of nine months and the second at elementary school age (Ethiopian Ministry of Health 2015a). However, giving measles vaccinations to nine-month-olds remains an issue and measles outbreaks continue in most parts of the country and a number of children are still not vaccinated (Akalu 2015; Central Statistical Agency [Ethiopia] 2016). Thus, without a focus on caregivers' social capital, the gap will not be addressed.

Justification

Berkman and Kawachi (2014) state that social capital encapsulates the organizing concepts of human life, including family, friends, religious groups, and socio-economic stratification, such as level of education, income, and another socio-economic status. The influences of the latter on the use of child vaccination services use are thus interconnected. Hence, addressing the mechanisms of basic social capital, particularly participation in social gatherings, social support, and collective action, represent a novel and special approach to understanding the health status of diverse populations. In any case, this area of research is one of the least well investigated areas of sociological inquiry in Ethiopia.

A few studies on the situation in Ethiopia, such as those of Fantahun et al. (2007) and De Silva–Harpham (2007), focused on the influence of social capital on child healthcare service use, yet little is known about this phenomenon. Fantahun et al. (2007) conducted a planned case-control study in Ethiopia that showed that low social capital in females is related to higher child mortality. Similarly, De Silva and Harpham (2007) conducted a study in four countries (Ethiopia, Peru, Vietnam, and India) and demonstrated that cognitive social capital was emphatically related to maternal and child wellbeing, and social group enrollment was contrarily related. Therefore, based on the limitation of De Silva and Harpham's work (2007), which requires further research and above all clarification, we attempted to look at the structural influence of caregivers'

social capital, including social group membership, social support, and collective action, on measles vaccination among nine-month-old infants in Ethiopia.

Research question

This study addresses the following questions:
– Do caregivers' social group memberships influence the measles vaccination rate for nine-month-old infants in Ethiopia, and if so, how?
– Is there a relationship between caregivers' social support (as received from different individuals) and measles vaccinations for nine-month-old infants in Ethiopia, and if so, what form does it take?
– Do caregivers' collective actions influence measles vaccination among nine-month-old infants in Ethiopia, and if so, how?

THEORETICAL FOUNDATION

The concept and theory of social capital

The theoretical forerunner of ideas about social capital can be claimed to be Aristotle (350 B.C.) and his expression that human creatures are social animals, Adam Smith (1776) and Durkheim (1951 [1897]) show how ideas about social capital travelled from political science to economics to sociology, and now to medical sociology research (Hyyppä 2010). Thus, the historical roots of social capital pervade the rationale underlying political and social life (Lin 2011).

Social capital is a multidimensional concept and its definition lacks agreement across disciplines (Kawachi et al. 2008). Having this in mind, the essential presumption about social capital is that it involves the presence of social connections such as family, friends, neighbors, religious and societal relationships and work associations, which constitute productive assets, operate on an ongoing basis, and may be targets.

Social capital can be categorized into three main perspectives, including structural, cognitive, and network social capital perspectives (Islam et al. 2006; Steven et al. 2004):
– For Moore and Kawachi (2017), structural social capital refers to the proximity of formal opportunity structures and defines how individuals develop their social affiliations. It alludes to general objectives and remotely discernible perspectives about social connections, groups and individual

affiliations, open and private institutions, and the rules and strategies they encapsulate (Grootaert–Van Bastelaer 2002). Structural social capital can be further reorganized into vertical or linking social capital, which indicates the associational relationship between individuals or groups with an unequal distribution of resources and powers, and horizontal social capital, which reflects the social ties between individual or groups who are socially near-equals (Islam et al. 2006).
– For Glanville and Story (2018), cognitive social capital refers to individuals' recognition, conviction, and state of mind toward their social environment. It includes the acknowledgment of interpersonal beliefs, shared measures, and a sense of having a place.
– For Moore et al. (2014), network social capital refers to the resources which individuals or groups obtain through their social ties. Putnam (2000) states that the thicknesses of one's social associations have a noteworthy effect on the social capital they have. For Bekkers et al. (2008), network thickness is the degree to which on-screen characters have contact with each other.

The primary forms of social capital also include social relationships and the norms that create mutual benefits through collective action (Uphoff 2000). This understanding was later incorporated into the social capital assessment tool developed by the World Bank team (Krishna 2002). For example, according to Isaacs (2014), many of the global challenges we face today, like the COVID-19 pandemic, require collective action.

Selection of the structural social capital perspective for the current study

According to Derose and Varda (2009), structural social capital is what individuals do, and it can be impartially quantified. It has significant influence on other members of society in relation to the free provision of child vaccination services. Thus, structural social capital is more important in countries with weak health systems like Ethiopia. It was on these grounds that we chose the conceptualization of structural social capital as the hypothetical foundation of this study. It is the approach best fit to the quantitative analysis and may contribute in a significant way to encouraging measles vaccination among nine-month-old infants due to the free provision of services. As Putnam (2000) and Story (2014) claim, structural social capital has an influence through the mechanisms of social group enrolment, social support, and collective action, thus we briefly explain these three mechanisms with empirical evidence.

Putnam (2000) contended that social capital is composed of membership in completely different groups, which phenomenon encourages participation and the swapping of data. Moreover, the significance of social structure is that it may guarantee social and financial benefits. To illustrate: the Commission on Social Determinants of Health (2008) found that the unbiased distribution of resources that support the social structure promote child vaccination and reduce child mortality. De Silva and Harpham (2007) found no noteworthy relationship between the group membership of mothers and child dietary status, advising that the impact of social group enrollment on health depends on the context.

Agreeing with Dominguez and Watkins (2003) and Berkman and Kawachi (2014), we hypothesize that the social support may be a shape of social capital in which a person comes out when the necessity arises. Putnam (2000) identifies casual social associations as forms of social capital, such as being with family, friends and neighbors, and socializing at night clubs. The presence of social support is emphatically related to a person getting money related back for getting to common health services when sick and being less likely to report obstacles to accessing care (Derose–Varda 2009).

According to Hyyppä (2010), the collective actions of people appear to be related to self-reported wellbeing. A few of the shapes of political engagement drain into collective action, which involves joining and going to gatherings of non-political deliberate relations (Putnam 2000). In this manner, collective action reflects common objectives, which may include the collective health protection, such as vaccinations that may prevent disease transmission in society. In this way, abundant stocks of social capital add to the stream of information that empowers citizens to resolve community issues more effectively (Putnam 2000). For instance, a study in Indonesia found a positive association between beliefs and collective action and mental health among Indonesians across the nation (Tampubolon–Hanandita 2014).

Research hypothesis – Gaps in the literature

Hypothetically, former research has tended to adopt a few viewpoints about social capital and health-promoting behavior, involving (a) basic social capital (Grootaert–Van Bastelaer 2002; Islam et al. 2006; Moore and Kawachi 2017), (b) cognitive social capital (Glanville–Story 2018; Uphoff 2000), and (c) network social capital (Moore et al. 2014). Hypotheses about social capital may be dated. Based on an audit of earlier investigations, there appears to be a knowledge gap related to understanding the child population and their caregivers. This sector of the population has been under-researched.

Additionally, most preexisting studies have investigated the situation in developed nations (Story 2014). In this respect, we see insufficient empirical evidence in the area of interest. Finally, former inquiries typically take the form of subjective research concerning the impact of social capital on vaccinations for children, thus there is a shortage of prior quantitative inquiry.

Therefore, based on the literature and the research objectives, we theorize that caregivers' structural social capital may promote the probability of measles vaccination among nine-month-old infants in Ethiopia. In line with this, we hypothesize that:

- Caregivers' social group membership may lead to an increase in the likelihood of measles vaccination among nine-month-old infants after adjusting for confounders.
- Caregivers' social support received from individuals may lead to increase in the likelihood of measles vaccination among nine-month-old infants after adjusting for confounders.
- Caregivers' participation in collective action may lead to an increase in the likelihood of measles vaccination among nine-month-old infants after adjusting for confounders.

DATA AND METHOD

Study setting and data source

Ethiopia was purposively chosen due to our familiarity with the area. Creswell (2009) says that a study site can be chosen purposively based on the researchers' deliberations, such as their familiarity with a place. The country is found within the Horn of Africa, lies between 3° and 15° north and 33° and 48° east longitude, and covers 1,104,300 square kilometers (https://reporting.unhcr.org/).

We used the 2011 *Young Lives Survey* dataset for Ethiopia (https://www.younglives.org.uk/). In the absence of up-to-date census information, it may be considered a reliable data source. The Ethiopian Development Research Institute (https://www.edri.org.et/) is responsible for the Young Lives Survey data for Ethiopia. There are three rounds of data in the 2011 Young Lives Survey dataset. However, we utilized only the first-round information, because it included basic measles vaccination data for nine-month-old infants.

Based on the nature of the information, we utilized a cross-sectional investigation plan. A cross-sectional research design could be a research plan in which the information utilized for the investigation collected at a

single point in time without affecting variables than a longitudinal plan. Our study population comprised the younger cohort of children in accordance with measles-vaccination-related data from the first round Young Lives dataset.

The 2011 Young Lives Survey dataset employed the balanced social capital assessment apparatus. This tool was initially created by the World Bank (Krishna–Shrader 2000) and later developed by Harpham et al. (2002) to measure social capital in the context of low and middle-income countries. The former involved the use of social-capital-related questions developed in English from the balanced social capital assessment apparatus (De Silva–Harpham 2007), modified for the Ethiopian context and translated into local languages.

Sampling procedure and size

The 2011 Young Lives Survey dataset sampling procedure first included the five largest regional states: namely, Amhara, Oromia, SNNPR, Tigray, and Addis Ababa, were selected from the country's 11 administrative regions. The main criterion was national coverage, and these five selected regions account for 96% of the total population of Ethiopia. Second, three to five districts were selected in each region (20 in total), with a balanced representation of poorer households and less poor households in both rural and urban areas. Third, at least one kebele in selected rural and urban districts was chosen. The selected kebele could either be considered a sentinel site in its own right or as a center for creating a sentinel site along with an adjacent kebele, depending on the number of eligible households within the kebele. Finally, children were selected randomly at each site.

A representative sample of children with at least one living parent was chosen, and information about measles vaccinations for nine-month-old infants was collected. After eliminating cases with missing information, 1652 children with mothers/fathers in twenty communities represented the final sample size in Ethiopia. The examination was restricted to natural caregivers or mothers/fathers, as a larger proportion of the sample of children come from diverse families with natural mothers/fathers.

Variables

Outcome variable

The dependent variable is measles vaccination status among nine-month-old infants in Ethiopia. According to the Ethiopian Ministry of Health (2015a), each child in Ethiopia requires a measles vaccination at the age of nine months. Hence, the reaction variable illustrated whether the respondent's child had been vaccinated or not at that age. In order to meet the defined objectives, we defined the binary response variable as (0) in the event that a child aged nine months had not been vaccinated with the suggested measles vaccination, and (1) in the event that they had.

Predictor variable

The independent variable for this study was the caregivers' structural social capital, including the caregivers' social group enrolment, social support, and collective action. This was made possible essentially because of the Young Lives dataset that identifies mechanisms of structural social capital such as group enrolment, social support, and collective action measured through the balanced social capital assessment apparatus.

First, to assess caregivers' social group membership, one question asked the following: "Within the final 12 months, have you been a member of social groups such as professional union, political, religious, and funeral/credit groups?" In this way, social group membership could be identified by including all the response items. In order to meet the first objective, we categorized social group membership in the following way: (0) the caregiver is not a member of any social group; (1) is a member of professional union; (2) a political group; (3) a religious group; or (4) a funeral/credit group.

Second, to measure caregivers' social support received from different individuals, one question asked: "Within the final 12 months, have you received social support from political leaders, government officials, charitable NGOs, family/relatives, and friends?" In this way, the caregivers' social support from diverse people could be captured through the response items. Subsequently, to meet the second objective, we categorized caregivers' social support from different individuals in the following way (0) no social support; (1) received support from political leader; (2) government official; (3) NGOs; (4) families/relatives; or, (5) friends.

Last, to measure collective action, two questions were employed: ("Within the last 12 months, have you joined in conjunction with other community individuals to address a community issue? And, within the final 12 months, have you talked with local authorities about issues concerning your community/ neighborhoods?") Collective action is captured in this way by including the reactions to both questions. Therefore, to meet the third objective we categorized collective action as (0) if a caregiver has engaged in no collective action; (1) if a caregiver joined together with other households; and, (2) if a caregiver talked to authorities.

Confounding variables

There are potential variables such as place of residence, education, household wealth, religion, living region, and head of household that may affect the relationship between basic social capital and measles vaccination. Place of residence illustrated whether the caregiver came from an urban or rural area and was coded as (1) in the case of urban, or (2) rural. Education indicates the highest educational achievement and was coded as (0) in the case of no education, (1) primary, (2) secondary, and, (3) higher education. Household wealth indicates the socio-economic status of caregivers and was coded as (1) extremely poor, (2) very poor, (3) less poor, or (4) better off. Religious affiliation was coded as (1) Christian (2) Muslim, or (3) traditional religion. The head of the household is assumed to be the foremost dependable person and was coded with (1) if the household head is a husband, and (2) if the household head is a wife. Region refers to the living locale and was coded (1) in the event that the caregiver was from Tigray, or (2) Amhara, (3) Oromiya, (4) SNNPR, or (5) Addis Ababa.

Data analysis strategy

To analyze the data, descriptive statistics and logistic regression were used. For the descriptive analysis, percentage and cross-tabulation were used. The logistic regression was implemented in the conditional probability form $P\{Y=1\}$. It was essentially used to predict the probability of a binary outcome based on independent variables. Therefore, logistic regression was considered the best type of analysis, but factor analysis would not have applied because it is used to assess the measurement of invariance across the population, and the outcome variable for this study was dichotomized.

Three logistic regression models were fitted for this study (*Appendix F*). Model 1 was fitted with the caregivers' social group membership and the covariates of socio-demographic characteristics (*I* in *Appendix F*). Model 2 incorporated caregivers' social support and covariates of socio-demographic characteristics (*II* in *Appendix F*). Model 3 included the caregivers' collective action and covariates of socio-demographic characteristics (*III* in *Appendix F*). Based on Pallant (2007), we used SPSS Version 21 for the whole data analysis process. The results of logistic regression analysis were detailed utilizing a significance level of 95% *CI* and odds ratios.

Ethical considerations

We used the 2011 Young Lives Survey dataset for Ethiopia and were not engaged in any primary information collection processes. The 2011 Young Lives Survey dataset had obtained all the necessary ethics-related approvals and is accessible online. We asked for the 2011 Young Lives Survey dataset for Ethiopia by registering online and described the purpose of our research project. After getting permission, we downloaded the 2011 Young Lives Survey data for Ethiopia from the host website https://www.younglives.org.uk/. No personal information was identified in the dataset or disclosed to any third person.

RESULTS

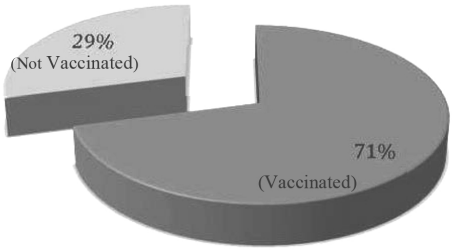
Descriptive results of sample characteristics

As shown in Figure 1 below, the measles vaccination status for nine-month-old infants' shows that in Ethiopia 71% were vaccinated and 29% not vaccinated before the survey.

In the table of *Appendix A*, it can be seen that with respect to the caregivers' place of residence and measles vaccination status, almost 28.5% of caregivers were from an urban zone and 71.5% from a rural one. Similarly, about 19% of caregivers had no education, 46% had completed primary education, 28% secondary education, and 12.4% higher education. In addition, in respect of caregivers' religion and infant measles vaccination status, about 58% were Christian, 25.4% Muslim, and 16.7% followed a traditional religion. About 59.2% of the caregiver household heads are husbands, and 40.8% wives. Similarly, in terms of the living locale and measles vaccination 36.4% were from Oromiya,

25.5% from Amhara, 18.3% from SNNPR, 7.8% from Tigray, and 11.9% from Addis Ababa.

Figure 1. *Measles vaccination status in Ethiopia*



Source: Authors' analytical results from the Young Lives Survey dataset for Ethiopia (2011).

As indicated in the table of *Appendix B*, regarding the caregivers' social group status and infant measles vaccination about 18.5% of caregivers were members of a professional union, 31.3% a political group, 18.9% a religious group, 17% a funeral/credit group, and 14.6% had no group membership. Similarly, in *Appendix B* it can be seen that in terms of social support received from different individuals,14% got support from political leaders, 26.7% from government officials, 18% from NGOs, 18.2% from family/relatives, 12.9% from friends and 10.2% no support. In the last category (caregivers' collective action), 41.3% of respondents had joined together with other households to solve community problems, 29.3% talked to local authorities, and 29.4% had undertaken no collective action.

Logistic regression results

The influence of caregivers' social group membership on measles vaccination among nine-month-old infants in Ethiopia

As presented in Table 1 (see also *Appendix C*), Model 1 demonstrates that a caregivers' social group membership in a professional union is essentially related to their children's measles vaccination status (P-value of 0.002) at a significance level of 0.05. Similarly, caregiver membership of political, religious, and funeral/credit groups was significantly positively correlated with infants having had a measles vaccination (P-values of 0.001, 0.000, and 0.003 separately) at a significance level of 0.05.

Further, Model 1 (see also *Appendix C*) accounts for the covariates of the place of residence, education, household wealth, religion, household head, and living region in Ethiopia which are considered confounders. For example, living in an urban region was positively associated with infant measles vaccination status (P-value of 0.005) at a significance level of 0.05. Similarly, caregivers' primary, secondary, and higher educational achievement is noteworthy for its association with the measles vaccination for children (P-values of 0.004, 0.001, and 0.000, respectively) at a significance level of 0.05. This suggests that the higher the educational qualification, the less likely it is that children will not be vaccinated.

Finally, the overall observation rate is 70.2% in Model 1 with a Hosmer–Lemeshow test result of 0.285, which is greater than the significance level of 0.05 (see *Appendix C*). This confirms the validity of Model 1. As indicated by Pallant (2007), for the Hosmer–Lemeshow test, a poor fit is indicated by a significance level of less than 0.05.

The influence of caregivers' social support on measles vaccination among nine-month-old infants in Ethiopia

As presented in Table 1 (see also *Appendix D*), Model 2 demonstrates that the impact of caregivers' social support from political leaders is correlated to having a measles vaccination (P-value of 0.003) at a significance level of 0.05. Similarly, the impact of caregivers' social support from government authorities, NGOs, family/relatives, and friends is associated with the infant measles vaccination (individual P-values of 0.001, 0.000, 0.001, and 0.002, respectively) at a significance level of 0.05.

Model 2 results in Table 1 also accounted for the caregivers' place of residence, education, household wealth, religion, household head, and living region in Ethiopia. For example, except for traditional religious practices, there is a statistically significant relationship between all socio-demographic covariates and measles vaccination among nine-month-old infants in Ethiopia (following a traditional religion is not associated with having the measles vaccination (P-value of 0.116 at significance level of 0.05). This may be because most traditional religious practices discourage the use of modern healthcare services, including measles vaccination in Ethiopia. Thus, the general observation rate of 63.8 given a diagram of precise forecast in Model 2, and 0.745 from the Hosmer–Lemeshow test is bigger than the 0.05 significance level, illustrating support for Model 2 (*see in Appendix D*).

Table 1. *Summary of logistic regression estimates from three models*

Predictors	Model 1		Model 2		Model 3	
	Sig.	Exp(B)	Sig.	Exp(B)	Sig.	Exp(B)
Social group membership						
No group membership (Ref.)						
Professional union member	0.002	3.533				
Political group member	0.001	2.732				
Religious group member	0.000	3.323				
Funeral/credit group member	0.003	5.718				
Social support received						
No social support (Ref.)						
Political leader			0.003	1.086		
Government officials			0.001	1.004		
NGOs/charity			0.000	1.870		
Family/relatives			0.001	3.815		
Friends			0.002	3.523		
Collective action						
No collective action (Ref.)						
Joined with other households					0.001	1.598
Talked to authorities					0.003	1.675
Socio-demographic predictors						
Place of residency						
Urban (Ref.)						
Rural	0.005	5.700	0.001	3.412	0.002	3.978
Education						
No education (Ref.)						
Primary education	0.004	2.863	0.003	2.863	0.012	1.506
Secondary education	0.001	4.248	0.002	3.053	0.001	3.519
Higher education	0.000	5.992	0.000	3.646	0.000	3.889
Household wealth						
Better-off households (Ref.)						
Extremely poor household	0.013	0.672	0.013	0.519	0.014	0.795
Very poor household	0.012	0.412	0.042	0.621	0.012	0.642
Less poor household	0.000	1.008	0.000	1.526	0.000	0.779
Religion						
Christian religion (Ref.)						
Muslim religion	0.011	0.512	0.000	0.501	0.013	0.829
Traditional religion	0.123	0.678	0.116	0.670	0.413	0.713
Household head						
Husband (Ref.)						
Wife	0.013	0.502	0.014	0.252	0.012	0.509
Living regions						
Addis Ababa City (Ref.)						
Tigray region	0.000	1.904	0.001	2.345	0.001	2.488
Amhara region	0.000	2.743	0.000	3.186	0.000	7.859
Oromiya region	0.000	2.845	0.001	3.486	0.000	3.406
SNNPR region	0.000	2.648	0.002	1.724	0.004	1.575
Constant	*0.000*	*5.842*	*0.000*	*2.282*	*0.000*	*0.296*

Note: Sig = P-value, Ref. = reference group, and all the results were estimated in three separate models with the control variables included.

Source: Authors' analytical results from Young Live Survey dataset for Ethiopia (2011).

The influence of caregivers' collective action on measles vaccination among nine-month-old infants in Ethiopia

As indicated in Table 1 (see also *Appendix E*), Model 3 results show that the impact of caregivers' collective action such as joining with other family units to solve existing community issues is essentially associated with having the measles vaccination (P-value of 0.00) at a significant level of 0.05. This demonstrates that caregivers who acted in conjunction with other family units to solve community problems are more liable to vaccinate their children compared to those who engaged in no collective action. In the same way, talking to the local authorities to handle community issues was positively associated with having the measles vaccination (P-value of 0.003) at a significance level of 0.05. This demonstrates that caregivers who talked to nearby authorities to sort out preexisting community issues are more liable to vaccinate their children than those who do not.

Moreover, Table 1 (see also *Appendix E*) shows how Model 3 also accounted for covariates. For instance, having a female caregiver who is the family head is positively associated with children having a measles vaccination, with a P-value of 0.012 at significance level 0.05. Thus, the overall observation rate for the prediction of the outcome variable demonstrates a 62.8% level of exactness in Model 3. The Hosmer–Lemeshow test result is 0.348, which is larger than the significance level of 0.05, showing support for Model 3 (see *Appendix E*).

DISCUSSION

Social capital and vaccination

The Model 1 logistic regression result in Table 1 (see also *Appendix C*) concerning the first hypothesis revealed the significant influence of social group membership (in professional union, political, religious, and funeral/credit groups) on infant vaccination at a 0.05 significance level after accounting for covariates. That is, caregivers' social group membership is positively related to measles vaccination of nine-month-old infants in Ethiopia. This finding agrees with prior findings by Kim and Kawachi (2017) that showed that mothers who were members of social groups vaccinate their children and benefit from vaccination than mothers without any social group interests. In any case, this contrasts with findings by De Silva and Harpham (2007) that yielded conflicting patterns of association in four nations. Correspondingly, the first research questions if and how caregivers' social group memberships

influence measles vaccination is addressed. This affirms the claim by Islam et al. (2006). Subsequently, the first research hypothesis that caregivers' social group membership may lead to an increase in the likelihood of measles vaccination among nine-month-old infants after adjusting potential confounders is found to be valid and acknowledged.

The Model 2 logistic regression result in Table 1 (see also *Appendix D*) related to the second hypothesis revealed the critical impact of social support from political pioneers, government authorities, charitable NGOs, families, and companions on measles vaccination among nine-month-old infants in Ethiopia at a significance level of 0.05 after accounting for covariates. This demonstrates that caregivers who received social support from people were more likely to utilize the measles vaccination for their children compared to caregivers who did not receive social support. This finding confirms other disclosures such as those of Berkman and Kawachi (2014), and Story (2014). In this way, the second research question concerning the relationship between caregivers' social support from different individuals and measles vaccination is addressed. Subsequently, the second research hypothesis that social support from individuals may lead to an increase in the likelihood of measles vaccination among nine-month-old infants after accounting for potential confounders is found to be satisfactory and is accepted.

Collective action and vaccination

Model 3 logistic regression resulted in Table 1 (see also *Appendix E*) associated with the third hypothesis. This revealed the significant influence of caregivers' collective action on vaccination. Namely, the activity of caregivers joining other households to solve community issues (P-value of 0.001) and talking to nearby authorities to solve community issues (P-value of 0.003) was associated with measles vaccination of nine-month-old infants after accounting for covariates. This demonstrates that caregivers who take an interest in collective action were more liable to have their children vaccinated compared to those who do not. This finding is consistent with the earlier studies by Hyyppä (2010), Putnam (2000), and Tampubolon and Hanandita (2014) Consequently, the third question concerning whether and how caregivers' collective action impacts measles vaccination is addressed, and the third research hypothesis is confirmed.

Strengths and limitations

The study was designed to generate knowledge about the influence of caregivers' social group enrolment, social support, and collective action on vaccination. Logistic regression examination techniques were undertaken to test the hypotheses. We propose that the results described in this paper may offer lessons to other Sub-Saharan African nations that are in directly comparable circumstances to those Ethiopia is experiencing.

However, this paper is not able to clarify the causal relationship between the variables due to the nature of the information that was utilized. The secondary data used for analysis came from the 2011 Young Lives Survey dataset for Ethiopia, circumstances may since have changed in Ethiopia.

CONCLUSIONS

In general, higher education and family income level, belonging to socio-economically advantaged groups, mostly receiving recommendations from health professionals increase vaccination uptake than those disadvantaged groups. Therefore, the government's exertions related to diminishing child mortality must center on the different dimensions of social capital. A caregiver who is well educated and not confronted with financial pressure is better able to have social relationships than a caregiver who is under financial pressure. Hence, the operational intervention must involve planning to improve the educational, financial, and other social circumstances of caregivers.

Future research can engage with institutions that generate and shape common understandings about vaccination such as family, religious groups, educational organizations, the government, etc., and health policy needs to expand its concern for future generations and move towards greater equity in health. Under typical conditions, caregivers work together to achieve shared objectives and every effort must be made to decrease the impact of poverty. That is, any future attempts to improve vaccination status in Ethiopia without considering social capital are likely to be unsuccessful. We assume that future research about social capital and vaccination will be best served by examining numerous similar features to those addressed in this paper.

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APPENDICES

Appendix A

Cross-tabulation between socio-demographic characteristics and measles vaccination (N, %)

Socio-demographic characteristics of the sample (N=1652)	Measles vaccination		
	Not vaccinated	Vaccinated	Total
Place of residence			
Urban	58 (3.5%)	413 (25.0%)	471 (28.5%)
Rural	421 (25.5%)	760 (46.0%)	1181 (71.5%)
Education			
No education	277 (16.0%)	46 (3.0%)	323 (19.0%)
Primary education	119 (7.0%)	541 (33.0%)	660 (40.0%)
Secondary education	56 (3.0%)	408 (25.0%)	464 (28.0%)
Higher education	27 (1.6%)	178 (10.8%)	205 (12.4%)
Household wealth			
Extremely poor	189 (11.4%)	42 (2.5%)	231 (14.0%)
Very poor	197 (12.0%)	134 (8.0%)	331 (20.0%)
Less poor	62 (3.8%)	596 (36.0%)	658 (39.8%)
Better off	31 (1.9%)	401 (24.3%)	432 (26.1%)
Religion			
Christian	198 (12.0%)	759 (46.0%)	957 (58.0%)
Muslim	28 (1.7%)	391 (23.7%)	419 (25.4%)
Traditional religion	253 (15.3%)	23 (1.4%)	276 (16.7%)
Head of household			
Husband	256 (15.5%)	722 (43.7%)	978 (59.2%)
Wife	223 (13.5%)	451 (27.3%)	674 (40.8%)
Living region			
Oromiya	284 (17.2%)	318 (19.2%)	602 (36.4%)
Amhara	93 (5.6%)	329 (19.9%)	422 (25.5%)
SNNPR	46 (2.8%)	257 (15.6%)	303 (18.3%)
Tigray	36 (2.2%)	93 (5.6%)	129 (7.8%)
Addis Ababa	20 (1.2%)	176 (10.7%)	196 (11.9%)

Source: Authors' analytical results from Young Lives information set for Ethiopia (2011).

Appendix B

Cross-tabulation between social capital mechanisms and measles vaccination (N, %)

Structural social capital mechanisms (N=1652)	Measles vaccination		
	Not vaccinated	Vaccinated	Total
Social group membership			
Professional union	46 (2.8%)	254 (13.4%)	300 (18.2%)
Political group	84 (5.1%)	433 (26.2%)	517 (31.3%)
Religious group	97 (5.9%)	216 (13.1%)	313 (18.9%)
Funeral/credit group	64 (3.9%)	217 (13.1%)	281 (17.0%)
No group	188 (11.4%)	53 (3.2%)	241 (14.6%)
Social support received from			
Political leaders	77 (4.7%)	154 (9.3%)	231 (14.0%)
Government officials	91 (5.5%)	349 (21.1%)	441 (26.7%)
Charitable NGOs	53 (3.2%)	244 (14.8%)	297 (18.0%)
Family/relatives	99 (6.0%)	202 (12.2%)	301 (18.2%)
Friends	44 (2.7%)	170 (10.2%)	214 (12.9%)
No support received	114 (6.9%)	54 (3.3%)	168 (10.2%)
Collective action			
Joined with other households	68 (4.1%)	615 (37.2%)	683 (41.3%)
Talked to authorities	49 (3.0%)	435 (26.3%)	484 (29.3%)
No collective actions	362 (21.9%)	123 (7.4%)	485 (29.4%)

Source: Authors' analytical results from the Young Lives information set for Ethiopia (2011).

Appendix C

Model 1 – Influence of caregivers' group memberships on chance of measles vaccination

Predictor	B	SE	Wald	df	Sig.	Exp(B)
Social group membership						
No group membership (Ref.)						
Professional union member	1.262	0.501	6.385	1	0.002	3.533
Political group member	1.091	0.512	3.847	1	0.001	2.732
Religious group member	1.203	0.521	5.362	1	0.000	3.323
Funeral/credit group member	1.742	0.513	11.418	1	0.003	5.718
Socio-demographic predictors						
Place of residency						
Urban (Ref.)						
Rural	1.701	0.502	12.147	1	0.005	5.700
Education						
No education (Ref.)						
Primary education	1.087	0.232	8.712	1	0.004	2.863
Secondary education	1.455	0.501	8.152	1	0.001	4.248
Higher education	1.790	1.049	2.911	1	0.000	5.992
Household wealth						
Better-off households (Ref.)						
Extremely poor household	–3.382	0.244	6.102	1	0.013	0.672
Very poor household	–2.061	0.250	4.112	1	0.012	0.412
Less poor household	0.504	0.122	5.404	1	0.000	1.008
Religion						
Christian religion (Ref.)						
Muslim religion	–5.712	0.104	15.403	1	0.011	0.512
Traditional religion	–3.302	0.244	2.413	1	0.123	0.678
Household head						
Husband (Ref)						
Wife	–0.623	0.255	6.102	1	0.013	0.502
Living region						
Addis Ababa City (Ref.)						
Tigray region	0.901	0.206	10.903	1	0.000	1.904
Amhara region	1.021	0.251	8.174	1	0.000	2.743
Oromiya region	1.121	0.311	7.913	1	0.000	2.845
SNNPR region	1.072	0.291	9.218	1	0.000	2.648
Constant	*1.762*	*0.504*	*12.142*	*1*	*0.000*	*5.842*

Note: Sig = P-value, Ref. = reference group, and the model fit statistics included Hosmer–Lemeshow test = 0.285, Cox–Sneel R^2 = 0.148, Nagelkerke R^2 = 0.314, –2 Log Likelihood = 1066.730(a) and Overall Observation = 70.2%.
Source: Authors' analytical results from Young Lives information set for Ethiopia (2011).

Appendix D

Model 2 – Influence of caregivers' social support on chance of measles vaccination

Predictor	B	SE	Wald	df	Sig.	Exp(B)
Social Support						
No support (Ref.)						
Political leader	0.084	0.028	9.132	1	0.003	1.086
Government officials	0.062	0.022	5.420	1	0.001	1.004
NGOs/charity	0.625	0.130	23.065	1	0.000	1.870
Family/relatives	1.340	0.388	11.939	1	0.001	3.815
Friends	1.261	0.511	6.386	1	0.002	3.523
Socio-demographic predictors						
Place of residency						
Urban (Ref.)						
Rural	1.121	0.252	12.121	1	0.001	3.412
Education						
No education (Ref.)						
Primary education	1.002	0.231	8.711	1	0.003	2.863
Secondary education	1.017	1.013	7.162	1	0.002	3.053
Higher education	1.212	0.502	9.112	1	0.000	3.646
Household wealth						
Better-off household (Ref.)						
Extremely poor household	–0.655	0.264	6.172	1	0.013	0.519
Very poor household	–0.476	0.234	4.155	1	0.042	0.621
Less poor household	0.509	0.134	14.444	1	0.000	1.526
Religion						
Christian religion (Ref.)						
Muslim religion	–6.912	0.164	18.413	1	0.000	0.501
Traditional religion	–3.389	0.244	2.463	1	0.116	0.670
Household head						
Husband (Ref.)						
Wife	–0.303	0.225	6.111	1	0.014	0.252
Living region						
Addis Ababa City (Ref.)						
Tigray region	0.781	0.264	9.953	1	0.001	2.345
Amhara region	1.061	0.220	7.171	1	0.000	3.186
Oromiya region	1.162	0.512	9.412	1	0.001	3.486
SNNPR region	0.574	0.293	2.739	1	0.002	1.724
Constant	*0.826*	*0.161*	*26.468*	*1*	*0.000*	*2.282*

Note: Sig = P-value, Ref. = reference group, and the model fit statistics included Hosmer–Lemeshow test = 0.745, Cox–Sneel R^2= 0.179, Nagelkerke R^2= 0.256, –2 Log Likelihood = 1250.678(a) and Overall Observation = 63.8%.
Source: Authors' analytical results from Young Lives information set for Ethiopia (2011).

Appendix E

Model 3 – Influence of caregivers' collective action on chance of measles vaccination

Predictor	B	SE	Wald	df	Sig.	Exp(B)
Collective action						
No collective action (Ref.)						
Joined with other households	0.469	0.147	10.174	1	0.001	1.598
Talked to authorities	0.541	0.287	2.539	1	0.003	1.675
Socio-demographic predictors						
Place of residency						
Urban (Ref.)						
Rural	1.324	0.532	9.124	1	0.002	3.978
Education						
No education (Ref.)						
Primary education	1.456	0.501	7.152	1	0.012	1.506
Secondary education	1.173	0.237	6.712	1	0.001	3.519
Higher education	1.295	1.049	8.142	1	0.000	3.889
Household wealth						
Better-off household (Ref.)						
Extremely poor household	–0.265	0.278	2.102	1	0.014	0.795
Very poor household	–0.214	0.219	1.155	1	0.012	0.642
Less poor household	0.259	0.134	4.194	1	0.000	0.779
Religion						
Christian religion (Ref.)						
Muslim religion	–1.817	0.104	8.513	1	0.013	0.829
Traditional religion	–4.215	0.834	9.413	1	0.413	0.713
Household head						
Husband (Ref.)						
Wife	–0.656	0.255	6.173	1	0.012	0.509
Living regions						
Addis Ababa City (Ref.)						
Tigray region	0.911	0.264	11.953	1	0.001	2.488
Amhara region	2.062	0.250	68.174	1	0.000	7.859
Oromiya region	1.226	0.307	15.946	1	0.000	3.406
SNNPR region	0.454	0.283	2.538	1	0.004	1.575
Constant	*0.640*	*0.255*	*6.314*	*1*	*0.000*	*0.296*

Note: Sig = P-value; Ref. = reference group; and model fit statistics included Hosmer–Lemeshow test = 0.348, Cox–Sneel R^2= 0.135, Nagelkerke R^2= 0.193, –2 Log Likelihood = 956.658(a) and Overall Observation = 62.8%.
Source: Authors' analytical results from Young Lives information set for Ethiopia (2011).

Appendix F

Model specification

I. Log istic regression estimates of the influence of caregivers' social group membership on measles vaccination among nine-month-old infants in Ethiopia

$$Ln=\{P/(1-P)\}=\alpha_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\cdots\beta_nX_n+e,$$

Where;
e = The residual value/Error term
β_i = The coefficient of $X_iV_i=1,2,.....n$
P = Probability of no measles vaccination
$(1-P)$ = The probability of measles vaccination
$Ln=\{P/(1-P)\}$ = Log-odds of no measles vaccination to log-odds of measles vaccination.

So, Model 1 indicates;
α_0 = Constant
β_1 = Change in log-odds of measles vaccination with member in professional union
β_2 = Change in log-odds of measles vaccination with member in political group
β_3 = Change in log-odds of measles vaccination with member in religious group
β_4 = Change in log-odds of measles vaccination with member in funeral group

II. Logistic regression estimates of the influence of caregivers' social support on measles vaccination among nine-month-old infants in Ethiopia

$$Ln=\{P/(1-P)\}=\alpha_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\cdots\beta_nX_n+e,$$

Where;
e = The residual value/Error term
β_i = The coefficient of
P = Probability of no measles vaccination
$(1-P)$ = The probability of measles vaccination
$Ln=\{P/(1-P)\}$ = Log-odds of no measles vaccination to log-odds of measles vaccination.

Thus, Model 2 implies:
α_0 = Constant
β_1 = Change in log-odds of measles vaccination with support from political leaders
β_2 = Change in log-odds of measles vaccination with support from gov't officials
β_3 = Change in log-odds of measles vaccination with support from NGOs officials
β_4 = Change in log-odds of measles vaccination with support from family/ relatives
β_5 = Change in log-odds of measles vaccination with support from friends

III. Logistic regression estimates of the influence of caregivers' collective action on measles vaccination among nine-month-old infants in Ethiopia

$$Ln=\{P/(1-P)\}=\alpha_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\cdots\beta_nX_n+e,$$

Where;
e = The residual value/Error term
β_i = The coefficient of $X_iV_i=1,2,.....n$
P = Probability of no measles vaccination
$(1-P)$ = The probability of measles vaccination
$Ln=\{P/(1-P)\}$ = Log-odds of no measles vaccination to log-odds of measles vaccination.

Therefore, Model 3 indicates:
α_0 = Constant
β_1 = Change in log-odds of measles vaccination with joined other households
β_2 = Change in log-odds of measles vaccination with talked to authorities