Decision Making for Childhood Vaccinations; an Economic Approach to Explaining Demand for Vaccinations in Mphuka and Bwumve Traditional Authorites, Malawi

By

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Abstract

Background: There are large variations in vaccination coverage, not only between high and low-income countries but also across low income countries and within low income countries. The reasons behind these variations are only sketchily understood. In particular, the current understanding of demand for childhood vaccinations is limited. Due to inadequate vaccination coverage more than one million children die annually from vaccine preventable diseases.

Objective: The study set out to examine demand for childhood vaccinations from an economic perspective: to identify caretakers` perceptions of potential costs and benefits of vaccinating a child, and to examine the association between these perceptions and caretakers` decision making for childhood vaccination. Furthermore the study seeks to identify variables associated with caretakers` perception of benefits of vaccinating a child.

Methods: The study was cross sectional, used structured questionnaires and employed a two stage cluster sampling technique. Respondents were caretakers of children at the age 18 - 59 months, in total 635 respondents were included in the study. The study was conducted in two traditional authorities in Thyolo district, Malawi. Descriptive statistics were used to describe the variables of study. Logistic regression analyses (univariate and multivariate) were conducted to measure the association between predicted explanatory variables from economic theory and decision making for childhood vaccination, and to examine the relationship between predicted explanatory variables and perceived benefits.

Results: 96.1 percent of the respondents reported to fully have vaccinated their youngest child in the age 18 – 59 months for all routine EPI vaccinations. The large majority of caretakers scored the measured benefits of vaccinating a child to be high, while they to a large extent were divided in their perceptions of costs. A large share of caretakers had to travel substantial distances to vaccinate their children. Incorrect knowledge of vaccination schedule (OR = 2.95 (CI 0.97 – 8.99) P= 0, 06), fear for severity of side effects (OR= 3.8 (CI 0.89-16.17) P= 0.07), distrust in information on vaccination (OR=27.55 (CI 5- 149) P=0, 00) and giving birth at home (OR=2.52 (CI = 1.18-5.39) P=0.02) were found to be determinants for *vaccination default* (not having fully vaccinated youngest eligible child for all EPI routine vaccinations) in the univariate analysis. Not any of these determinants remained significant in the multivariate regression analysis (p-value < 0.05).

Distrust in received information (OR= 27.52 CI (6 – 131) P=0.00) and being aware of less than two side effects (OR= 2.32 (CI 1.15- 4.68) P=0.019) were found to be determinants for

limited perceived benefits (scoring the preventive effect of vaccination as limited) in the multivariate analysis.

Discussion and conclusion: The study documents and points to the possibility and necessity of achieving high vaccination coverage in areas where many caretakers need to travel long distances to reach vaccinations, and where a large number of caretakers perceive the traveling and waiting time as long. The study suggests that high level of trust in information and in vaccinators may be an essential explanatory factor; in the way that trust facilitates positive perceived benefits which again make caretakers seek childhood vaccinations even though there are considerable costs involved. The study, however, does not provide the final explanation for why caretakers in the study area vaccinate their children, and nevertheless for why caretakers vaccinate or do not vaccinate their children in other areas. More emphasis should be devoted to demand for childhood vaccinations, both in research and in policy making.

Abbreviations

CI – Confidence Interval

EPI – Expanded Program on Immunization

GAVI - Global Alliance for Vaccines Initiatives

Hep B- Hepatitis b

Hib - Haemophilus influenza type B

HSA - Health Surveillance Assistant

OR – Odds Ratio

MEDIC – Multi-disciplinary approach to Explaining Immunization Coverage

SUM – Centre for Development and Environment (Senter for Utvikling og Miljø)

UNICEF - United Nations International Children's Fund

WHO - World Health Organization

1: Introduction

1.1 SUM MEDIC

The present study was part of a larger ongoing research project named SUM MEDIC – a *Multi-disciplinary approach to Explaining Differential Immunization Coverage.* The main aim of SUM MEDIC is to improve knowledge of why some low-income countries and communities therein are far more successful than others in immunizing children, despite unfavourable political and economic circumstances (SUM MEDIC, 2010; Roalkvam et al., 2007). [1]

At present the reasons for this are only sketchily understood. In particular the demand side has been neglected in research on childhood vaccinations. To enhance the current understanding the project sets out to study the interface between demand and supply at different levels; from the global to the national and local levels (SUM MEDIC, 2010; Roalkvam et al., 2007).

Empirical research will be conducted in Malawi and India. Malawi has been chosen as a representative for countries that do well despite unfavourable economic circumstances, while India has been chosen as a representative for countries that perform poorly in regard to immunization even though their economic circumstances are good, at least better. (It should be noted that the picture is more nuanced. Both countries have large differentials in coverage across districts. On average, however, Malawi performs well and India poorly in regard to vaccination coverage.)

The project brings together researchers from across social sciences; political scientists, social anthropologists, economists and scientists with medical and public health background.

The present study looked at demand for childhood vaccinations at the local level from an economic perspective. The isolated aim was to examine demand for vaccinations strictly within the study site; Mphuka and Bvumbwe Traditional Authorities. Furthermore, the intention is to compare results from this study with results from similar studies that will be conducted in other areas (both in Malawi and India) at later stages. Information from the present study may also be useful as background information for other researchers in the project, both in order to generate hypotheses and to support qualitative findings.

[1] The project was initiated in 2007 and will be running until 2011, at least.

In this paper the study will be presented mainly with emphasis on its isolated objectives and rationalities. [2]

1.2 Background on childhood vaccinations

1.2.1 Vaccinations worldwide

Routine vaccinations are provided worldwide through the Expanded Program on Immunization (EPI). EPI was created by the World Health Organization (WHO) in 1974, and is run in near collaboration with the United Nations International Children's Fund (UNICEF) and more recently with the Global Alliance for Vaccines and Immunization (GAVI).

Originally EPI set out to target six diseases: polio, diphtheria, pertussis, tetanus, tuberculosis and measles. All of these are contagious, potential killer, infectious diseases. Later other diseases have been included in some countries, like haemophilus influenza type b (Hib) and hepatitis b (Hep B).

The story of vaccinations has to a large extent been a story of success. Since the launch of EPI the world wide coverage for the six originally target diseases have increased from around 5 percent to around 79 percent. According to UNICEF estimates more than 20 million lives have been saved due to protection from childhood vaccinations in the last two decades (UNICEF, 2010). The achievement makes childhood vaccinations one of the most cost effective health interventions in the world (Dean, 2006).

However, adequate worldwide coverage has not yet been accomplished. There are large variations in vaccination coverage, in particular between high and low-income countries but also across low income countries and within low income countries (SUM MEDIC, 2010; Roalkvam et al., 2007).[3] Due to inadequate vaccination coverage many children still die from vaccine preventable diseases. In 2003, WHO estimated that 1, 4 million deaths among children under five were caused by diseases which could have been prevented from routine childhood vaccinations (WHO, n.d.).

[2] It should be emphasized that the candidate/researcher is entirely responsible for the present study - data collection and analyses - in the sense that all wrongs should be subscribed to the researcher/candidate. Without assistance from SUM MEDIC both in terms of economic and academic support the study would never have taken place, (see acknowledgements).

[3] See (WHO, 2010a) for a complete overview of worldwide coverage data. (Access *complete country profile* for each country of interests to see estimates from all available sources - WHO/UNICEF, DHS, Social indicator survey etc.)

Not only is it a challenge to reach the remaining population not yet reached, it may also be a tremendous challenge to sustain vaccination coverage in areas where high coverage rates have been achieved. A concern raised by some researchers is that too much effort in the EPI have been devoted to reach short term numerical targets, and that this approach may provide a weak foundation for sustainability (Nitcher, 1995; Greenough, 1995; Streefland, 1995; Roalkvam et al., 2007).

1.2.2 Vaccinations in Malawi

EPI routine vaccinations are currently provided by health workers in all health institutions in Malawi - central hospitals, district hospitals, health centers, private and faith based clinics - free of charge. In addition vaccinations are provided in outreach services by Health Surveillance Assistants (HSAs). Due to lack of fixed health facilities and trained health workers in Malawi, the outreach service run by HSAs constitutes the backbone in the vaccination program in Malawi, in particular in the rural areas. In fact more than 60 percent of the EPI delivery is done by HSAs (Katsulukuta, 2010).[4]

The vaccination coverage estimates for Malawi varies between districts and information sources. According to the most recent Demographic and Health Survey (DHS) of 2004, 64 percent of all children in the age of 12 – 23 months had received all vaccinations (Phoya & Kang'oma, 2004). The coverage figures range from above 90 percent in some districts to just above 50 percent in others. Reports from WHO/UNICEF indicate considerable higher vaccination coverage. According to 2008 figures the coverage in Malawi exceeds 90 percent for each routine vaccination, with exception from measles (WHO, 2009a). The national wide measles coverage was 88 percent in according to WHO/UNICEF estimates. District estimates range from above hundred percent for some vaccinations in some districts, to around 80 percent for some vaccinations in other districts (unpublished WHO data). The difference between WHO/UNICEF and DHS estimates point to the uncertainties attached to vaccination coverage figures, (see 5.2.1 for further discussion on reliability of vaccination coverage data).

[4] HSAs are provided with 10 weeks of training, and are usually recruited from the same areas as where they work. Currently the HSA/Population ratio is 1:1200. Commonly one HSA is responsible for 3-7 villages (A. Katsulukuta, 2010). HSAs are not only largely responsible for vaccinations in rural areas but also for other basic health tasks such as weight monitoring, water and sanitation and health education. In regard to vaccination services HSAs from nearby areas cooperate; normally vaccinations are provided at monthly held sessions at a middle point between several villages, commonly 6-8 villages depending on area characteristics. An important notion is that the outreach service in Malawi is not synonymous with close to doorstep services; a large share of the population in Malawi still needs to cover substantial distances to reach outreach services.

An interesting trend observed in the Malawi DHS figures is that the vaccination coverage declines substantially in the period 1992 – 2004. For instance, the percentage of children considered fully immunized declined from 82 percent in 1992 to 64 percent in 2004 (Phoya & Kang'oma, 2004). (WHO/UNICEF estimates do not capture this chancing trend)

The vaccine preventable disease burden in Malawi is low. In according to official reported figures only tuberculosis continues to be a large public health challenge; 48000 new cases of tuberculosis were reported to occur in Malawi in 2008 (WHO report, 2009). In addition measles have occurred in occasional outbreaks (WHO, 2009b). (The low vaccine preventable may be the strongest indicator in that Malawi has achieved, at least, fairly high vaccination coverage.)

1.3 Factors associated with vaccination coverage – a review of literature

The following review will account for the main known determinants for why caretakers vaccinate or do not vaccinate their children (vaccination coverage), with main focus on studies from developing countries.

1.3.1 Socio demographic factors

The majority of literature which looks at determinants for vaccination seeking behaviour focuses on socio demographic and economic factors; such as education, regional belonging, gender, ethnicity, birth order, religion, household characteristics and family income. Much of the data derive from broad demographic studies which address childhood vaccinations as one of several topics, the literature is vast.

The typical pattern found is that vaccination status of children is positively associated with mothers` education (Chhabra et al., 2007; Munthali, 2007; Teklay & Michael, 2003; Chowdhury et al., 2003) and socio economic status (Nath et al., 2007; Cui& Gofin, 2007; Chowdhury et al., 2003). Further, numerous studies have found that vaccination coverage is higher in urban areas than in rural areas (Munthali, 2007; Chowdhury et al., 2003). The reason for urban/rural differences is usually assumed to derive from differences in availability of vaccinations. The typical pattern observed in relation to birth order is that first borne children have a larger chance of being fully vaccinated than later borne children (Nath et al., 2007; Munthali, 2007). Concerning gender, boys have in some areas been found to have a greater chance of being fully vaccinated than girls (Nath et al., 2007; Chowdhury et al., 2003)

These relationships have been observed across countries and continents, and they have also been found in Malawi with exception of differences in accordance to gender (Munthali, 2007). A major limitation of Munthali`s study is that the study does not adjust for any potential confounding factors, (performs only univariate regression analyses).

The pattern however is not completely consistent. Findings in according to socio demographics vary to some extent across studies, in the way that these factors are found to influence vaccination coverage in the directions described above in many studies but not in all. Some few studies have even found significant opposite associations to the usual associations described above. For instance a study from Ethiopia found that the vaccination coverage was higher in urban than in rural districts (Teklay & Michael, 2003).

To identify the relationship between socio demographic factors and vaccination coverage is important mainly in order to monitor the equity of vaccination programs; to ensure that all children get vaccinated independent of economic status, level of education and regional belonging etc. The shortcoming of these studies is that they don't grasp the core reasons for why caretakers vaccinate their children or not, and consequently they provide limited insight into how current approaches to vaccinations can be improved.

For instance, studies which point out mothers` education as an important determinant for vaccination seeking behavior do not point out what aspects of education that influence demand; whether it is education per se or some kind of common shared characteristics which make some people seek education and vaccinations and others to not seek education and vaccinations. A common shared characteristic may be different valuing of present and future time (discounting rate) since both education and vaccination represents investments in the future, other explanations may be that highly educated people live closer to health services than not highly educated people or that highly educated are better informed about the benefits of vaccinations than not highly educated people. Studies which have examined the relationship between education and vaccination seeking behavior more profoundly, by adjusting for factors like direct knowledge of vaccinations and distance to nearest vaccination clinic have found that formal education does not in itself determines vaccination coverage (Desai, S. & Alva, 1998; Streatfield et al., 1990; Steele, et al., 1996).

Since it hardly is possible to modify socio demographic factors like education and socio economic status it is necessary to gain more knowledge about the core reasons for why

children get vaccinated or not. (Neither is it obvious whether changes would lead to indent effects. For instance if the reason for why mothers with high education are more likely to vaccinate their children than mothers with little or no education is that they are more inclined to invest in the future, then it is not obvious whether a forced or highly government induced increase in the education level would lead to an increase in vaccination coverage.)

1.3.2 Supply – availability of vaccinations and quality of vaccination services

A number of intervention studies show how vaccination coverage tends to increase when access to vaccination services is improved; in particular the use of outreach services and involvement of non-health workers have been pointed out as key interventions to increase vaccination coverage, (see Ryman et al. (2008) for a review of intervention studies in developing countries). Also a number of other studies have found that access to vaccinations influence vaccination seeking behavior (Das & Das, 2003; Jani et al., 2008). Das and Das (2003) report that caretakers only vaccinate their children if vaccinations are brought close to the doorstep, while Jani et al. (2008) found that caretakers were willing to cover substantial distances but not beyond a certain level. Another access related indicator which has been examined is the coherences between vaccination coverage and density of health workers. An extensive study based on data from 49 developing countries found that density of health workers (nurses/midwives) had considerable impact on vaccination coverage in the way that countries with high density of health workers tend to achieve higher vaccination coverage than countries with low density (Anand & Bärnighausen, 2007). The study does not conclude on the causal pathway; whether the difference mainly is attributed to the obvious effect that nurses and midwives density increase access to immunisation or if other aspects such as health workers` educating role are part of the explanation.

Although the relationship between access and vaccination coverage described above is well documented, empirical observations are not completely consistent in the sense that close services equal high vaccination coverage and that far away services equal low vaccination coverage.

A study from Uganda which only targeted respondents who live close to health facilities shows that the vaccination coverage was low (Malision et al.,1987). The same phenomenon has been observed in an area with high density of vaccination clinics in Burkina Faso (Sanou et al., 2009).The study found that only 52 percent of children in the age 12-23 months were

fully vaccinated even though the average distance to the nearest vaccination clinic was less than 500 meters, and more than 90 percent of the population in the study area lived within 1000 meters to a vaccination station. Other studies report similar findings. A report from India which looks at the vaccination program in 6 poorly performing states concluded that the health infrastructure was in place. The main problem, in according to the report, was that the quality of services was not good enough (WHO INDIA, 2004). Also several other studies show that quality of services may be as influential on vaccination coverage as access to services measured in distance (De la Hoz et al., 2005; Ryman et al., 2008).

On the other hand studies have found that caretakers vaccinate their children even though they have to cover substantial distances to reach vaccination services. Streefland et al. (1999) found in an extensive cross country study conducted in Ethiopia, Malawi, India, Philippines and Netherlands that most caretakers were willing to devote considerable time and efforts to bring their children for vaccinations. That being said, also Streefland et al. (1999) reports that some mothers refuse to vaccinate their children due to very difficult access. Jani et al. (2008) makes similar observations in Mozambique. Further, a national wide study from Malawi which looks at the relationship between health facilities and vaccination coverage (among other things) found no difference between districts with good, medium and bad access to fixed health facilities in according to vaccination coverage (Bowie et al., 2006). Some of the explanation is likely to be attributed to outreach services. Still, it is well documented that Malawi has achieved high vaccination coverage even though a large share of the population have to cover considerable distances to reach vaccinations.

The studies point to the obvious (but somehow neglected fact) that the availability of vaccinations services alone do not determine vaccination coverage.

A research question with large potential policy implication is why vaccination coverage is high in some areas where many caretakers have to cover substantial distances to reach vaccinations and why coverage is low in some areas where most caretakers live close to services. To gain more knowledge about why caretakers in some areas vaccinate their children in areas with limited availability is in particular important since the only possible, at least sustainable, solution to maintain high vaccination coverage depends on caretakers who

vaccinate their children even though they have to cover substantial distances to reach services.[5]

1.3.3 Demand – caretakers` perceptions of vaccinations and vaccinators

Relatively few studies have addressed caretakers` perceptions of vaccinations and vaccinators and the core reasons for why caretakers vaccinate or do not vaccinate their children, in particular in developing countries.

The most extensive study performed on this topic, to the best of my knowledge, is the cross country study from Ethiopia, Malawi, India, Philippines and the Netherlands referred to above (Streefland et al., 1999). Streefland et al. (1999) documented that some mothers had negative perceptions towards vaccinators (impolite behavior, lack of competence) and vaccinations (fear of side effects, social resistance movements), and that these perceptions influenced some caretakers to not vaccinate children. The study does not make quantitative assessments of the association between negative perceptions and vaccination seeking behavior. Neither does the study provide accurate prevalence figures on negative perceptions. Other influencing reasons for why mothers refused to vaccinate children, in according to the study, were lack of vaccinations at vaccination stations, interruptions of schedule (opening too late, leaving too early), practical issues like work, sickness and funerals, and lack of information (practical information and information about purpose and side effects of vaccinations). However, the study reports that most mothers had positive perceptions and that most mothers were willing to devote considerable efforts to vaccinate children.

Also a number of other studies have identified negative perceptions as an inhibitor on demand for childhood vaccinations, without making quantitative assessments of the impact. A study which investigates reasons for a reoccurrence wave of polio in northern parts of Nigeria identifies distrust in the polio vaccination to be the main reason (Renne, 2006). The study found that some mothers believed that the vaccine was contaminated by anti-fertility substances. Similar reports derive from a number of other studies; vaccinations have for instance been connected to birth control programs and guinea pig trials for western countries in certain areas in India (Nitcher, 1995).

[5] The claim "*only possible*" is based on the need for keeping vaccinations cold (electricity), structural challenges and economic constraints that will unable the achievement of "doorstep like services" in developing rural areas in near foreseeable future.

One of the few studies which have attempted to quantify the association between caretakers` perceptions and vaccination seeking behaviors is a study from Gambia (Cassell et al, 2006). The study made separate regression analyses for urban and rural mothers, and found that mothers with negative perception toward vaccinators were more likely than others to be BCG defaulters in urban areas. The study, however, found no significant differences in the rural study area. Like Streefland et al. (1999), Cassel et al. (2006) reports that most caretakers had positive perceptions towards vaccinations and vaccinators and that most caretakers vaccinated their children. The observed reasons for non uptake of vaccinations were mainly related to day to day problems – work, sickness etc. rather than active recession and/or negative perceptions.

Several studies back up Streefland et al. (1999) and Cassel et al. (2006) observations in that most caretakers hold positive perceptions toward vaccinations and vaccinators, and that most caretakers vaccinate their children. A study from Kongo found that nearly all respondents had positive perception of childhood vaccinations and vaccinators, while the coverage in the study area was 86 percent in according to self reported information (Mapatano et al., 2008). The match between mothers` positive perceptions and high coverage indicate that positive perceptions may be an explanatory factor on the high achieved vaccination coverage. The study, however, does not find that negative perceptions explain why the remaining 14 percent had not fully vaccinated their children. Similar findings have been reported in a national survey from Kazakhstan (Fowler et al., 2008). According to the survey nearly all caretakers had positive perceptions toward vaccinations and vaccinators, while about 90 percent reported to have fully vaccinated their children.

Few studies (none to the best of my knowledge) have quantified the impact of negative perception on demand for childhood vaccination in areas with low coverage of vaccinations.

In regard to knowledge and beliefs, Streeflandet al. (1999), J A cassel et al. (2006) and Mapatano et al. (2008) all have found that caretakers recognize the purpose of vaccination in a general sense; they know that vaccinations provide protection against disease and/or that vaccination is good for health without being able to connect specific vaccinations to specific diseases, although many caretakers are aware of a few specific diseases.

There exists a more extensive literature on the relationship between caretakers` perceptions of vaccinations and vaccinators and vaccine seeking behavior in developed countries. Negative perceptions of vaccinations and/or vaccinators have been identified as inhibitors on demand for childhood vaccination in a number of qualitative studies, and not in a number of others. (See Mills et al. (2005) for a review of qualitative studies in developing countries.) Similarly, some quantitative studies have found parental perceptions to influence vaccination seeking behavior (Gust et al., 2004; Shawn & Gold 1987), while others have not found the relationship to be significant (Strobino et al., 1996).

1.3.4 Sum up – gaps in the current understanding of vaccination seeking behavior

Empirical evidence shows that vaccination coverage not only depends on access to services; districts with limited access have received high coverage and opposite. The current understanding of demand for childhood vaccinations is limited. Few studies address caretakers` perceptions of vaccinations and vaccinators, and caretakers` core motivation for seeking vaccinations in developing countries. Most of the studies which do address the issue have applied qualitative approaches. Several of these studies have discovered that some caretakers (mothers for the most part) have concerns about vaccinations and vaccinators, and that some of them refuse to vaccinate their children due to these concerns. The magnitude of the problem is not well known since very few studies have examined the issue by applying quantitative approaches. To the best of my knowledge no previous study has quantified caretakers` perceptions of vaccinations and vaccinators in Malawi, (which obviously mean that no study has quantified the association between perceptions and vaccination seeking behavior in Malawi).

1.4 Study rationalities and objectives

1.4.1 Rationalities

As pointed out more than 1.4 million children die annually from vaccine preventable diseases due to inadequate vaccination coverage. Since the current understanding of why caretakers vaccinate or do not vaccinate their children in developing countries is limited, an enhanced understanding of the mechanisms at stake can lead to improvements in current approaches to immunization so that resources available can be used more effectively and equitable.

The purpose of the present study was mainly to enhance the understanding of why caretakers vaccinate or do not vaccinate their children in Mhuka and Bwumve Traditional authorities,

Malawi. In addition information from the present study may be used to compare results from other areas, and the analytical approach may inspire future research on demand for childhood vaccinations.

Improvements of the current approach to immunisation represent a potential key approach to reach the United Nations millennium goal number four: to reduce by two thirds the mortality rate among children under five within 2015.

1.4.2 Objectives

1.4.2.1 Overall objective

The overall objective of the study was to identify caretakers` perceptions of potential costs and benefits of vaccinating a child, and to examine the association between these perceptions and caretakers` decision making for childhood vaccination. Furthermore the study seeks to identify factors associated with caretakers` perception of benefits.

1.4.2.2 Specific objectives

The specific objectives of the study were:

1. To identify caretakers` perceptions of: a) vaccinations (efficiency and side effects) b) vaccine preventable diseases (risk) c) availability of vaccinations (travelling distance and waiting time) d) vaccinators (trust) and e) information provided on vaccination (trust).[6]

2. To identify caretakers` knowledge about vaccinations and vaccine preventable diseases.

3. To determine vaccination status of caretakers` youngest child at the age 18-59 months.

4. To identify socio demographics; education, ethnicity, religion, household characteristics, gender of child, number in sibling line, age.

[6] A profound explanation for why the study seeks to identify these perceptions follows in the theoretical chapter.

5. To examine the association between caretakers` perceptions of costs and benefits and decision making for childhood vaccination. Also the association between decision making and socio demographics, knowledge and trust will be examined.

6. To identify factors associated with caretakers` perceptions of benefits.

7. To examine actual decision making for childhood vaccinations.

2: Theoretical framework

2.1 Introduction

Economic theory can be applied for a number of purposes; descriptively (to describe how individuals choose), explanatory (to explain decisions - ex post), predicatively (to predict how people will act- ex ant), or normatively (to tell how people should choose) (Torsvik, 2003).[7] The present study applied economic theory mainly for explanatory purposes (to explain decision making for childhood vaccination – ex post). The claim is not that the economic approach provides the ultimate explanation for why caretakers either vaccinate or do not vaccinate their children. The claim is merely that the economic approach may generate some new hypotheses and data which may contribute to the current understanding of vaccination seeking behavior. [8]

The chapter is divided into two parts. In the first part I will give a brief introduction into the economic theory of human behavior. In the second part I will introduce an economic model related to decision making for childhood vaccination. The main purpose of the chapter is to explain why the study sought to identify the variables of study and how these were assumed to influence decision making for childhood vaccination – bring to front and explain the hypotheses of the study.

2.2 The economic approach to human behavior

2.2.1 Rationality

The economic approach to explain social phenomena is founded on the assumption of individuals who act rationally. Rational behavior will probably, for many, be associated with behavior far from how humans actually behave, at least, outside explicit marked situations; like egoistic and materialistic motivated behavior and behavior based on infinite information processing skills. If my assumption is right, many will probably be skeptical about a suggestion to examine vaccination seeking behavior within an economic model – (egoistic

[7] Economic theory explains social phenomena as the sum of individual choices.

[8] The economic perspective has, so far, been neglected in research on childhood vaccination at community/individual level. Our hope is that the economic approach may generate new hypotheses and data that will contribute to the current understanding of why vaccination coverage is high in some areas, low in others and why coverage varies between areas where vaccinations are available, (see model presented in paragraph 2.3) The present study applied theory only in an attempt to explain decision making/vaccination coverage within the defined study area.

and materialistic motivation to protect ones beloved child!) However, as I will emphasis, the requirement to rational behavior is not restricted to behavior as delineated above.

Actually there is no clear consensus on what the term “rational” implies. Or more precisely there is no clear consensus on how rationality should be defined in economic models. It is therefore necessary to specify what we mean by rationality. (In relation to the present study because the definition of rationality will have impact on the hypotheses which follow from the economic model; different definitions of rationality will point to different variables of interests.)

In short, rational choice theory explains human actions as means to reach desired goals. To put it a bit more thoroughly, the core requirement to rational choices is that an individual, when facing several courses of actions, choose the course of action which he/she expects to generate the best consequences given his/her goals, beliefs and information. This definition of rationality is often referred to, in literature, as *thin rationality* (see (Elster, 1983, Ch.1))

As an example let us consider the choice situation of vaccinating a child. A caretaker will then face two courses of action; to vaccinate or not to vaccinate. Before deciding, a rational caretaker will form beliefs about circumstances she regards as relevant; like the preventive effect of vaccinations, the probability for a child to be exposed to diseases which she recognizes as vaccine preventable, the severity if a child actually catches vaccine preventable disease, potential side effects etc. Her beliefs will be formed on the information she has about these circumstances. (It is not a requirement that she takes objectively relevant circumstances into account or that her beliefs about these circumstances need to be correct.) On the ground of her beliefs a rational caretaker will *calculate* the consequences of vaccinating and not vaccinating her child (alternative courses of action) before she chooses the action which she expects to generate the best consequences given her goals.

It can be seen that the definition is silent about requirements to goals, beliefs and information. Without further requirements nearly all actions can be interpreted as rational, no matter how stupid or wrong the actions may seem to be. From an explanatory perspective that is not satisfying. There is a huge discussion in literature that revolves around these requirements; to what extent actions need to be based on complete information and optimal beliefs to be labeled rational, what the requirements to optimality really imply (when is information and beliefs considered to be optimal), whether individuals manage to behave

according to different definitions of rationality and whether individuals actually behave rational even if it is feasible in accordance to the definition of rationality etc. (These issues connect to what Elster (1983, Ch.1) refers to as *broad rationality*.)[9]

An assumption frequently seen in economic models is the assumption of *perfect rationality*; that individuals have *stable, complete and transitive* preferences,[10] that individuals choose their course of action on the ground of *complete information*, in the sense that an individual knows all possible alternative courses of action and is completely aware of the consequence which will follow from the different courses of actions, and that individuals pick the alternative which produces the *highest level of goal attainment.* (See Simon (1955) for a brief description of, what he refers to as, the traditional assumption of individual behavior in economic theory.)

Much of the criticism against the economic approach to human behavior has been directed to the lack of realism in these assumptions. The requirements to information processing and calculation skills (ability to process unlimited information) are obviously extremely demanding, and also the requirements to preferences may be questionable.[11] Few will challenge the claim about the lack of realism in the assumptions. The defense has rather been that the realism of the assumptions is not the purpose – the whole point of a model is to simplify – and that models instead should be judged on their predictive value (Frideman, 1953, part 1). It may be a valid argument or not, anyway the argument limits the defense solely to economic models as an instrument to blindly predict outcomes. The criticism may hit harder if one considers economic models as an instrument to explain social phenomena; if all the assumptions about human behavior is out of touch with actual human behavior it will be difficult to defend an economic model as an instrument to understand human behavior (Torsvik, 2003; Simon,1955).

[9] To thoroughly and critically discuss the theory is beyond the scope of this paper.
[10] *Stable* – underlying preferences are assumed to not change substantially over time. *Transitivity* - if you strictly prefer A to B and B to C, then you must also prefer A to C. *Completeness* - for any options the agent must either prefer one to the other or be indifferent. Thus "I do not know" is not allowed. In addition it is often assumed that preferences have the property of *continuity* – if you prefer A over B and A undergoes a very little change then the preferences should not be reversed. The requirement to *continuity* is included mainly as a technicality, which together with *completeness and transitivity* makes it possible to represent preferences with a real utility function (Elster, 1983, Ch1). (Note that neither *completeness* nor *continuity* represents core requirements to rationality).
[11] In this paper I will in particular pay attention to the assumption of information, since the requirement to information will have direct impact on the explanatory model related to decision making for childhood vaccination.

The last point cannot be ignored in relation to the present study. The assumption of *complete information* is indisputable far from realistic in the choice situation of vaccinating a child, like in most other choice situations. One could still defend the assumption of complete information as a simplifying grip without essential relevance for the phenomena of study, (the point of a model is to simplify). However, I will argue that the constraints of information in itself is of essential relevance in the decision making process for vaccination. An economic model to explaining decision making for vaccination built on the assumption of perfect rational individuals would therefore be likely to miss core mechanisms in the decision making process. (The implications of info constrains will be discussed under paragraph 2.3)

The criticism of economic models based on the assumption of *perfect rationality* should not be confused with general criticism of the economic approach to human behavior.[12] The only core requirement to rationality (*thin rationality*) is that individuals choose the action which they *expect* will generate the best consequences. Nothing is said about whether or not the action actually needs to be the best action. Hence there is nothing wrong in labeling a decision made on the ground of *incomplete information* - without knowing all consequences from an action – as a rational choice. All one would have to do is to justify why individuals do not have *complete information*. The economic answer would be to take the limited information processing skills of individuals into account. In the perfect rational model individuals are simply assumed to hold all relevant information, sort of as an inherit property. The relevant question that emerges when the difficulties (costs) of processing information is taken into account, is how much information it would be optimal to process. According to the standard economic line of thought the simple answer would be to seek information up to the point at which the marginal benefit of acquiring additional information equals the marginal cost of achieving the benefit – *optimal information*. Not to seek information until complete information is achieved. (See 2.2.3 for a brief explanatory remark on economic terminology.)[13]

[12] Although such criticism sometimes, at least seemingly, is directed to the field of economics in general - assuming that economics is all about the perfect rational model.

[13] There is, however, one important conceptual problem; to know the expected benefits and costs of processing more information is seemingly impossible. The problem is referred to as the problem of infinite regress. According to Elster the problem of infinite regress will in most choice situations prohibit individuals from making truly rational choices, while others argue that rational decisions concerning information gathering is possible. For a thoroughly discussion see Melberg (1999).

By loosening the requirements to *complete information*, together with other highly unrealistic requirements, *such as lightning fast calculation*, the economic approach becomes more widely applicable. Becker (1976) shows how economics can be applied to explain nearly all kind of human behavior; marriage, criminology, fertility to mention a few examples.

Thus, in relation to the present study, even if caretakers make decisions based on *incomplete information* and without making speedy calculations of all relevant alternatives their actions may still be understood as rational, and the economic approach may still provide a fruitful explanatory scope on vaccination seeking behaviour. Neither is it a requirement that all individuals have to act rational, as in a limited sense, all the time. It should be noted that some irrational actions do not subvert the whole economic approach; the economic approach is concerned about average behavior and central tendencies. [14]

2.2.2 Motivation

The economic approach is often linked to the assumptions of selfish individuals driven by material interests. Rightfully these assumptions have been prevailing within economic models.[15] They are, however, not core assumptions in the economic theory of human behavior. Selfishness and material interests are substantial assumptions; specification of human motivation used in explanatory models of specific phenomena, and should not be mixed with absolute premises in economic/rational theory.

Economic models may very well capture human behavior motivated by unselfish and nonmaterial goals; for instance social status, fairness and altruistic motivations, (as long as the motivation reflect individual preferences). In relation to decision making for childhood vaccination such "alternative motivations" may definitely play an important role. It should also be noted that economic theory does not require individuals to be conscious about their goals (Becker, 1976, part 1)

[14] Human behavior is most likely driven by a mixed set of forces – some of them rational (maximization of net benefit) and others non-rational (norms and emotions). The main reason for why non-rational factors are excluded in the present study is due to parsimony. I do not claim that inclusion of non rational factors would not contribute to the explanatory power (increase the ability to explain vaccination seeking behavior). However, to measure and empirically test the impact of non-rational factors would be difficult, and the inclusion would therefore have reduced the reliability of the study (the uncertainty of the explanation). (Hence, if vaccination seeking behavior is, in large, is irrational, then, the economic approach is not likely to contribute to the understanding of decision making for childhood vaccination.)

[15] Together with the assumption of perfect *rationality* these have been the standard assumptions of individuals in the neoclassic school of economics – *homo economicus.*

2.2.3 Economic terminology – benefits and costs

Individuals are usually, in applied economic analysis, described to calculate the consequences of alternative courses of action in the terms of costs and benefits. Benefits represent any contribution in fulfilling desired goals, while costs represent the amount of resources which need to be spent in order to attain these benefits. Economic theory predicts that an individual will choose to carry out an action if he/she perceives the benefits to exceed the costs of the action; when the net benefits are positive. (And opposite, choose not to carry out an action if he/she perceives the costs to exceed the benefits.) It should be noted that the costs probably is interpreted more extensively by economists than non economists. Not only is the direct cost of achieving benefits included, like monetary and time costs, also the lost benefits of not spending resources on the second best alternative should be calculated as costs of choosing the best alternative. This follows from the essential economic understanding in that means (resources) have alternative uses.

2.3 An economic approach to explaining decision making for childhood vaccinations – preferences, beliefs and opportunities

The economic theory of human behaviour predicts that a caretaker for an eligible child will choose to vaccinate her child as long as she perceives the benefits to exceed the costs of vaccinating her child; and opposite choose not to vaccinate her child if she perceives the costs to exceed the benefits. Thus, to examine decision making for childhood vaccination, from an economic perspective, we need to empirically identify how caretakers perceive potential benefits and costs of vaccinating a child.

2.3.1 Benefits

An instrumental rational caretaker will calculate the net benefits of vaccinating a child in relation to her goals/motivations.

In line with the assumptions of an egoistic and materialistic *homo economicus* we will expect perceived benefits merely to depend on the instrumental value of vaccinating a child in relation to caretakers own material interests. Unless a caretaker acknowledges the action to vaccinate her child as a mean to attain material interests, we will expect her to perceive the benefits as low, even if she acknowledges the health gains from vaccinations.

In reality there will usually be a strong relationship between the health of a child and economic interests of a caretaker. For instance in areas without a solid welfare system, like in the area where this study was conducted, children may be an important "retirement insurance". The action to vaccinate can from that perspective be recognised as a mean to ensure own material interests. However, to look at the instrumental value of a healthy child solely in relation to material interests seems unsatisfactory. Other motivations such as the wellbeing of the child in itself and benefits to other children in the community should not be ignored as potential motivations for vaccinating a child. [16]

Given that caretakers desire healthy children, for whatever motivation, we will expect the perceived benefits of vaccinating a child to reflect the perceived medical effect of vaccinating a child. How caretakers perceive the medical effect of vaccinating a child is likely to depend on at least three different components: 1) how they perceive the preventive effect of vaccinations (*vaccination efficiency*), 2) how they perceive the likelihood for a child to catch vaccine preventable disease without being vaccinated, and 3) how they perceive the severity of vaccine preventable disease if a child catches vaccine preventable disease. Note that low scoring of only one variable (*low perceived efficiency, likelihood* or *severity*) may be sufficient to turn the overall perceived benefits of vaccinating a child to be low. [17]

Main hypothesis:

[16] Basically there are two health outcomes vaccinating a child; reduction in the risk of disease for the vaccinated child (private preventive effect) and reduction in the risk of disease for other children through the reduction of transmission risk (*community preventive effect*).

[17] These components were used as indicators on perceived benefits in the study. Two caretakers who score the measured benefits (medical effect of vaccinating a child) equally, may still perceive the benefits differently, and consequently make a different choice in accordance to childhood vaccinations, for a number of reasons: **1)Income effect.** Material wealth at the outset and income may have impact on the perceived benefits of childhood vaccinations. Not totally obvious in which direction. It is possible to examine the effect in statistical analyses. **2) Risk aversion.** To vaccinate a child reduces the risk of attracting disease. Thus, caretakers` attitude towards risk may influence the perceived benefits of childhood vaccinations; a risk averse caretaker will value the reduction in risk provided by vaccination more than a risk a neutral caretaker, all other things being equal. It was beyond the scope of this paper to measure caretakers` attitude toward risk. **3) Discounting.** To vaccinate a child represents an investment in the future - the benefits will not occur immediately. (In particular not from the retirement insurance perspective) It implies that caretakers who value the present and future time differently may perceive the benefits of vaccinating a child differently, even though they perceive the health outcomes equally. It was beyond the scope of this paper to measure discounting. **4) Indirect benefits.** Other motivations than the health outcomes may motivate caretakers to seek vaccinations. Caretakers may for instance value the social aspect of vaccination sessions or vaccinate children due to incentives attached to vaccinations, (mosquito nets, access to other health services etc.). Thus caretakers who perceive the medical effect as low may still perceive the benefits of vaccinating a child as high. The study sought to identify "other motivations".

Caretakers who score the medical effect (benefits) as high will demand childhood vaccinations to a larger extent than caretakers who score the medical effect (benefits) as low, all other things being equal.

2.3.2 Potential influencing factors on perceived benefits

2.3.2.1 Objective disease burden and actual preventive effect of vaccinations

Given the assumption of *perfect rationality* we will expect caretakers` perceptions of the medical effect of vaccinating a child to depend merely on objective circumstances such as actual disease burden and actual preventive effect of vaccinating a child, as if caretakers manage to independently and precisely judge the benefits related to the medical effect of vaccinating a child; (*complete information/ knowledge is thought of as an inherent property*). These factors may definitely have an influencing role. Still, as pointed out earlier, the assumption of *perfect rationally* is probably not fruitful for the purpose of explaining decision making for childhood vaccinations.

2.3.2.2 Information and trust

Incomplete information

When vaccinating a child it is not possible to know with certainty in advance whether the child ever will be exposed to vaccine preventable disease or to potential side effects. Neither is it certain whether the action to vaccinate actually will immunize the child. Some of the uncertainties will be attached to "natural events" such as frequencies of disease outbreaks. Other uncertainties will be attached to the information provided about the benefits of vaccinations, the competence and efforts of vaccinators and similar items; (*complete information/ knowledge is, in reality, not an inherent property*).

Suppose for simplicity that there are two possible outcomes of vaccinating a child; protect severe disease or not protect severe disease. Let A denote the net benefits in the case where the action to vaccinate prevents disease and B denote the net benefits in the situation where the action to vaccinate does not prevent disease. Before deciding it will not be possible to know with certainty whether A or B materialize. Let p_A denote the perceived probability for outcome A to occur and p_B denote the perceived probability for outcome B to occur. The *expected* net benefit of vaccinating a child will in that case be $p_A \cdot A + p_B \cdot B$.

Note that a caretaker may perceive the benefits of outcome A to be high and at the same time perceive the expected net benefits of outcome A to be low, if she believes that the probability for outcome A to occur is slim. (The probability may be perceived as slim due to beliefs about slim probabilities for vaccine preventable diseases or beliefs about slim probabilities for preventive effect of vaccination). Thus, expected benefits will to a large extent depend on the probabilities assigned to the possible outcomes of vaccinating a child.

Probabilities may be formed either objectively or subjectively. We speak of objective probabilities when probabilities are formed based on recorded observation from previous experience. For instance if one throws a dice a frequent number of times, it will be possible to estimate the probability for the likelihood of hitting three, the accuracy of the estimate will increase with the frequency. When caretakers assign probabilities to outcomes of vaccinating a child, previous experience may certainly have an influencing role. To fully vaccinate a child, and for many caretakers several children, requires several repeated choices, (minimum three sessions for a total of eight vaccinations). However, due to the relatively limited repetitions of the choice situation and blur relationships between the action to vaccinate and outcomes, it will be difficult to form objective probabilities. Findings from empirical studies have found that caretakers do not manage to observe objective factors such as disease burden and the preventive effect of vaccination very well. See for instance Das & Das (2003). In choice situations with limited repetitions and blur relationships between actions and outcomes it seems more reasonable to assume that decision makers form subjective probabilities. We speak of subjective probabilities when caretakers assign probabilities based on personal experiences and information provided from various sources, rather than mathematical calculation of observed data. Subjective probabilities imply that two caretakers who face what objectively seems to be the same choice situation still may judge the probabilities differently, and hence the expected benefits differently.

A model based on caretakers with *incomplete information* generates some additional hypotheses; information constraints imply that access to information, the content of provided information and trust in distributors of information and distributors of vaccines may influence caretakers` perception about expected benefits of vaccinating a child.

Information

No caretaker will, obviously, calculate the expected benefits of vaccinating a child if she is not familiar with vaccinations as a product. The further relationship between information and expected benefits is not obvious.

Whether information will influence caretakers perceptions of benefits positively or negatively depends on the content in the information and caretaker`s belief at the outset. In order to increase the expected benefits, the signaled benefits need to be higher than expected benefits at the outset. (It is not necessarily sufficient- see next paragraph related to trust)

An interesting point, in relation to vaccination policy, is that accurate information (as in the sense of true information) not necessarily will influence caretakers` perception of benefits positively; caretakers who form their belief about benefits on the ground of incomplete information may just as well overestimate as underestimate the benefits.

Trust

To trust someone (or something) is to put confidence in something that is not known with certainty (Roalkvam et al., 2007). Since it is not possible to know with certainty the outcome of vaccinating a child or to form independent judgements of the probabilities of various outcomes, demand for childhood vaccination will depend on the degree of trust that caretakers place in various agents at the chain of supply; including manufactures, policy makers at global and national levels, vaccinators at frontline clinics and information agents. From an economic perspective trust may be understood as a factor that influences the probabilities assigned to various outcomes of vaccinating a child, and in that way influences caretakers` perceptions of net benefits (Mæstad et al., 2008).

It may be useful to distinguish between two categories of trust in relation to vaccinations; *information trust and performance trust.* Information trust represents caretakers` trust in producers and distributors of information on vaccinations, and performance trust represents caretakers` trust in producers and distributors of vaccinations. To develop a clear conceptual distinction we will in the following assume that information provided about vaccinations always assumes that the performance is optimal, in the sense that the quality of the physical process of producing, transporting and injecting vaccinations is optimal (Mæstad et al., 2008).

If a caretaker totally trusts the information she receives about benefits of vaccinations there will be no difference between the expected benefits as signalled in the received information and her actual perception of expected benefits, given complete performance trust. However, if a caretaker for some reason does not trust the information she receives about vaccinations, there will be a difference between her perception of expected benefits and the benefits as signalled in the received information. The difference may be interpreted as a measure of the absence of information trust (Mæstad et al., 2008).

As an example on how information trust may influence the assigned probabilities one may think of a health worker who tells a caretaker that a certain vaccine will reduce the risk of a certain disease with 80 percent. If the caretaker completely trusts the message she will believe that the outcome of vaccinating a child is an eighty percent reduction in the risk of disease, given that the performance is optimal. If she for some reason does not completely trust the message she will believe that the outcome of vaccinating a child deviates from 80 percent, she may believe that the information is biased or simply imprecise. [18]

Information on vaccinations can be obtained through sources like health workers, health campaigns and education and through sources like friends and family. Information trust will most likely be closely linked to perceived competence of producers and distributors of information.

As pointed out we have assumed that the information provided on vaccinations assumes that the performance is optimal, in the sense that the quality of the physical process of producing, transporting and injecting the vaccine is optimal. Thus, even if a caretaker completely trusts the information she receives about benefits of vaccinations, there may still be a difference between her perceptions of benefits and the benefits as signalled in the received information, if she for some reason doubts the quality of production or distribution of vaccinations. Several factors may cause caretakers to question the quality of producers and distributors; a caretaker may for instance suspect the local vaccinators to provide vaccinations inadequately due to

[18] Note that two caretakers who have the same degree of trust in information (perceive the quality of information identically) still may act differently on the information. For instance, a risk neutral caretaker will act on the information at face value even if she acknowledges that the information may be imprecise, and consequently appears to have complete trust in provided information. A risk averse caretaker, however, will respond to assumed uncertainties by adjusting perceived benefits downwards. Thus the risk neutral caretaker may appear to have a larger degree of trust in information than the risk averse caretaker, although they perceive the quality of information identically (Mæstad et al., 2008).

lack of competence or lack of motivation. Distrust may relate to the performance along the whole line of distribution, from factory to clinic.

Distrust in providers (production and/or distribution) of vaccinations may be described as the difference between caretakers` perception of expected benefits assuming that the performance is optimal and caretakers` actual perception of expected benefits. Performance trust is likely to be linked to perceived competence and benevolence of producers and distributors of vaccines (Mæstad et al., 2008).

Whether trust in information will influence perceived benefits positively or negatively will depend on the content in the provided information, and the initial belief of each caretaker. To grasp the role of trust, as thought of within an economic framework, one may think of trust in information as something that reinforces the impact of information. Thus, trust in information will influence caretakers` perceptions of benefits positively as long as the signalled benefits are higher than expected benefits at the outset. If the signalled benefits are lower than expected benefits at the outset, trust will influence caretakers` perceptions of benefits negatively. Since the content of information may vary from different representatives of each group, it is not obvious what impact trust in sources like religious leaders, traditional healers, and friends will have on caretaker perceptions of benefits of vaccinating a child. Concerning information provided by health workers and through official/EPI campaigns it seems reasonable to expect the correlation between trust and perceived benefits to be positive. The correlation between trust in providers of vaccinations and perceived benefits is obviously expected to be positive, seen from an economic perspective.

Main hypotheses:

Caretakers who trust received information (from official sources) will perceive the benefits of vaccinations as higher than caretakers who do not trust received information, all other things being equal.

Caretakers who trust providers of vaccinations (believe that the quality of the physical process of producing, transporting and injecting vaccinations is at least close to optimal), will perceive the benefits of vaccinations as higher than caretakers who do not trust providers of vaccinations, all other things being equal.

2.3.3 Costs

In most countries there are no user fees on vaccinations. That should not be interpreted as if there are no costs related to vaccinating a child. Unless vaccinations are delivered at the doorstep, caretakers need to spend time and efforts to bring their children for vaccinations. The time and efforts spent to vaccinate a child represents costs of vaccinating a child. These costs may be divided into travelling costs (travel time, transport costs, efforts) and waiting time costs. Further, side effects may represent costs of vaccinating a child. How caretakers perceive the costs of side effects is likely to depend on how they perceive the severity and likelihood of side effects.[19]

Main hypothesis:

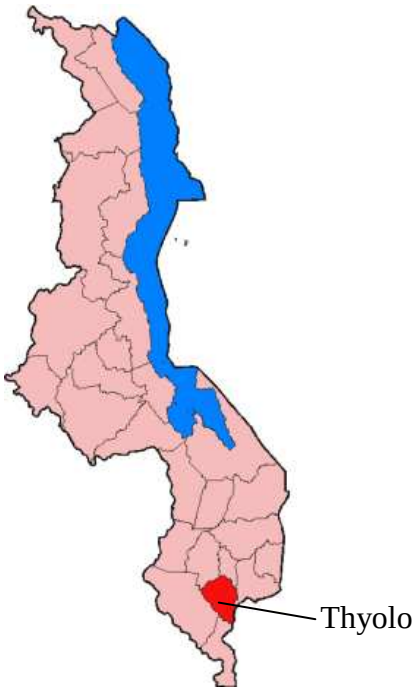
Caretakers with low cost of vaccination will demand childhood vaccinations to a larger extent than others, all other things being equal.

[19] Like noted in relation to benefits/medical effect, caretakers who score the measured costs (traveling costs, waiting time costs etc.) equally may still perceive the costs differently. Costs will depend on the value of alternative use of time. (For individuals involved in seasonal work such costs may vary largely according to seasons.)

3: Methods

3.1 Study area and population

Malawi is divided into 28 districts, and each district is further divided into traditional authorities. The present study was conducted in two out of twelve traditional authorities within one district, namely Mphuka and Bwumbve traditional authorities in Thyolo district. The study aimed at being representative for the total target population in the two traditional authorities.



The study was conducted in Thyolo since the district was assumed, based on WHO/UNICEF figures and guidance from EPI in Malawi, to be a low coverage district relatively within Malawi.[20] The two traditional authorities within Thyolo district were chosen out of convenience; feasible due to available registers and interesting due to differences in characteristics. Mphuka is a mountainous area far from the main road and without fixed government health clinics, while Bwumbve is a flat area, close to the main road and with fairly good coverage of government clinics. The total population in the study area is about 115 500; 38 500 in Mphuka and 76 500 in Bwumbve. Out of which children under five constitute about 16 percent (18 400 children).

[20] However, results from the present study indicate that the vaccination coverage in the study area was considerable higher (see 4.1.2 and 5.2.1).

3.2 Study design

The study applied a cross sectional study design – a design in which data on a sample or a "cross section" of respondents chosen to represent a target population are gathered at essentially one point in time (Singelton & Straits, 2010). The cross sectional design was selected since it is the only design that could meet both the main objectives of the study; to identify caretakers` perceptions of potential costs and benefits of vaccinating a child (prevalence of perceptions) and to identify the association between these perceptions and caretakers` decision making for childhood vaccination.[21]

3.3 Sampling

3.3.1 Sample size calculation

Statistical formulas were applied to determine the sample size needed to meet the study objectives. And, at the same time, to make sure that the sample included in the study wouldn't be larger than necessary.

The sample size needed to provide accurate overall estimates of caretakers` perceptions, beliefs, knowledge etc. was calculated by using a formula for single binary outcomes, which was further adjusted for expected intra-cluster correlation (*design effect*) and missing response:

$$N = \left(\frac{Z^2}{e} \right) * (p) * (1-p) * d * m$$

(Formula seen in Aalen et al. (2006))

Where: N= sample size, Z = Confidence interval (set at 1.96 for 95% confidence level) e = allowed error margin (set at .05 – two tailed) p = proportion of the population having a particular characteristic of interest, (assumed to be 0.5 since we in this study were interested

[21] Choice of design was influenced by the overall project. A solely quantitative approach was selected since the findings from the present study will be further examined in later qualitative research. At the time of writing – spring semester 2010 – ethnographic fieldwork is conducted in the area where the present study was conducted. Attention is, among other things, devoted to findings from the present study. The combination of thoroughly quantitative and ethnographic approaches is one of the strengths in the overall project (seldom seen applied).

in a large number of variables and since we had little prior information about caretakers perceptions, 0.5 leads to the largest possible sample size) d = design effect (assumed to be 2) m= missing response (assumed to be 1.2 (20 percent))

According to the formula, given the specified requirements and assumptions, the required sample size was 924 respondents. Since the calculation was based on a formula for binary outcomes and the study interest in relation to the overall descriptive estimates was in ordered categorical outcomes (four categories for most variables), the final sample size was adjusted down to 875. [22]

Based on prior assumptions of a 70/30 ratio in according to the dependent variable (caretakers who fully had/had not vaccinated youngest eligible child), the sample size - 875 - would be sufficient to detect approximately a 15 percent difference between the two groups, at a significant level of 5 percent and with 80 percent power, after adjustments for expected design effect and missing response (respectively 2 and 1, 2) and based on an assumption of a heterogeneous population in according to the independent variable. If the population turned out to be less heterogeneous, which was considered likely in accordance to most independent variables but not certain, it would be possible to detect considerable smaller differences between cases and controls. Thus, the sample size – 875 – was regarded as sufficient to meet the study objectives.[23]

3.3.2 Inclusion criteria

Households with children in the age 18 – 59 months were eligible for sampling. From each household the main person responsible for making decisions about childhood vaccination was targeted, referred to as *caretaker* in this paper.

3.3.3 Sampling procedures

Respondents were selected by using a two stage cluster sampling procedure. For the most part one cluster corresponded to one village. However, a few small villages were merged to ensure

[22] More precise information will always require less sample size than crude information, given that one desires the same level of precision. Thus the formula for single binary outcomes will come out with a larger sample size than required for ordered categorical outcomes, since ordered categorical outcomes provide more accurate information than binary outcomes. There is no standard (well recognized) formula for categorical outcomes, although complicated formulas exist. The binary formula works a good approximate.

[23] An online calculator was applied to determine the sample size needed for analytical purposes. (http://statpages.org/proppowr.html). Also this calculation was based on a formula for binary outcomes. Since most variables were converted into binary outcome variables in the regression analysis the binary outcome formula was (completely) appropriate in relation to the analytical part of the study.

sufficient numbers of respondents if selected. In total 72 clusters were defined in the study area; 49 in Bwumve and 23 in Mphuka.

The sampling was based on a register administered by the local district assembly in Thyolo. The register contained crude information at village level in a database (approximate population size, number of households, number of "under five households" etc.) and specific information at household level in village books (names, age etc. of people living in each household). 6731 households in the study area met the inclusion criteria; 4458 in Bwumve and 2273 in Mphuka.

In the first stage 35 clusters were selected with probability proportionate to size from the database, 12 from Mphuka and 23 from Bwumve. (Households with children under five were used as an indicator for size.) In the second stage 25 households were selected from each cluster selected in the first stage, by using simple random sampling.[24] The method ensured that the sampling was probabilistic and self weighting.

3.4 Data collection

The study applied a structured questionnaire to collect data from respondents. The questionnaire was designed specifically to measure the variables pointed out from the economic model, presented under paragraph 2.3. Previous literature served as an inspiration in the work of designing the questionnaire, in particular a study from USA and a study from Uzbekistan (Gust et al., 2006; Fowler et al., 2008) Still, most of the questions used to measure costs and benefits were either slightly modified or newly designed in relation to the present study. (No other already tested and well recognized questions to measure costs and benefits of vaccinating a child were available, as the study was the first to apply an economic approach.) Efforts were devoted to make the questions reliable (ensure that they had the same meaning to all respondents) and valid (ensure that they measured what they were intended to measure). (See next paragraph and attached questionnaire for detailed information about the questionnaire.)

The questionnaire was administrated by interviewers. Otherwise a large share of the target respondents would be excluded due to high illiteracy rates in the study area. The interview

[24] Each selected village/cluster, from the first stage, was approached to get hold of the local village books. This task was carried out by employees at the Thyolo district assembly, on behalf of the research project. Households that fulfilled the inclusion criteria – contained a child in the age 18 – 59 months - were put up on a new list. From that list 25 households/respondents were selected by random sampling, using an online randomizer (http://www.randomizer.org/).

team constituted of four interviewers, all of which had previous experience from survey studies. The team was gathered for one week of training. In particular emphasis was put on the importance of asking questions exactly in the same manner and to probe in the exact same manner, to minimize *interviewer bias*.

The questionnaire was originally prepared in English, and later translated to Chichewa. All interviews were conducted in Chichewa. The translation took place during a workshop, including the principal researcher, an experienced researcher from REACH trust, a medical expert (both on the technical terms and organizational structure of vaccination services) and the interviewers.

A pretest of the questionnaire was conducted to make sure that all the questions were easily and consistently understood by respondents. The pretest was also useful as a practical exercise for the interviewers and as a test on the planned sampling scheme. The pretest included 25 respondents in a village in Thyolo, outside the study area. A few questions were modified after the pretest.

3.5 Description of variables

3.5.1 Decision making for childhood vaccinations

Vaccination status of caretakers` youngest child in the age 18 – 59 months was used as an indicator on decision making for childhood vaccinations. To measure vaccination status a standard method used in the DHS was applied. Information about vaccination status was preferably elicited from vaccination cards. However, if a child had no vaccination card or if some vaccination were not written then we had to rely on self reported information. See Q19 in the questionnaire (appendix 1) for a thoroughly description.

3.5.2 Benefits

Perceived preventive effect of vaccinations (*vaccination efficiency)* and risk of vaccine preventable diseases - likelihood and severity - were used as indicators on *perceived benefits*. Both general and specific questions were asked to identify caretakers` perceptions of benefits. In the general questions respondents were asked about their perceptions of *vaccination efficiency* and risk of *vaccine preventable disease*. In the specific questions, respondents were asked about their perceptions of the vaccinations` ability to protect against specific diseases and the risk of specific diseases which they actually believed – reported in the survey – to be

target diseases in the vaccination program. (General questions were used mainly to ensure data fruitful for analysis, while the specific questions were used to provide more nuanced descriptive information.)

Measured in the following questions: Q7, Q8a/b/c and Q9c-e (see appendix 1)

3.5.3 Costs

Caretakers` perceptions of traveling time and waiting time and risk of side effects (likelihood and severity) were used as indicators on costs. All caretakers were asked general questions to identify perceptions of side effects. Furthermore, caretakers who reported concerns towards specific vaccinations were asked about these concerns. Caretakers were asked about their perceptions of traveling time and waiting time to/at the place most often visited for vaccinations, to measure perceived time costs.

Measured in the following questions: Q12, Q17 (see appendix 1)

In addition, information about distance to nearest fixed health facility was elicited from the village register; the register contained information about distance from each village to nearest under five health facility (not including outreach services).

3.5.4 Trust

The study attempted to measure two different aspects of trust; trust in information and trust in providers of vaccinations. The questions related to trust in information simply used the terms *trust* and *reliable*, while the questions related to trust in providers aimed at measuring different components of trust (perceptions of skills, benevolence etc.) In addition a few questions on general trust were picked from the world value survey (see http://www.worldvaluessurvey.org/).

Measured in the following questions: Q10, Q14 and Q16 and Q25 (see appendix 1)

(All questions related to costs, benefits and trust were close ended, with four answer options)

3.5.5 Knowledge

To measure caretakers` knowledge about vaccine preventable diseases, side effects and vaccination schedule caretakers were asked openly questions.

Measured in the following questions: Q9 (a-b), Q13, Q11 (see appendix 1)

3.5.6 Socio demographics

Standard questions used in other surveys in Malawi were used to measure socio demographics.

Measured in the following questions: Q1 - Q6 (caretaker) and Q18 (child)

3.6 Survey procedures

3.6.1 Study period

The fieldwork was carried out over a two months period, in the months May and June 2009.

3.6.2 Local network

All relevant local actors – local authorities and health executives in the field of preventive health - were informed about the study before it was carried out, and local acceptance was granted. The local authorities – Thyolo district assembly – granted us access to the register from which the sampling was based. The health executives served an important role as counselor on the study.

3.6.3 Contact with respondents

Selected villages were approached on prebooked days. An appointment was made with the village chief at least two days in advance of the inquiry. The chief was then informed about the selected households in his village, and asked to help in recruiting respondents. The chiefs were given a small salary and budget to employ an assistant to help them mobilize respondents. It was emphasized that respondents should be informed and not forced. Depending on the location of the village and in collaboration with the local chief, respondents were either invited to a meeting place in the village or visited in their households. At least one revisit, on a pre booked day, was made in villages where caretakers could not be reached on

the first day. (Caretakers that did not meet on assembling appointments were sought in their households when revisiting.)

3.7 Data analysis

Data were entered into SPSS 16.0, and later transported to STATA version 10.

Descriptive statistics were used to describe the variables of study. The categorical data were expressed as frequency and percentage, with 95 percent confidence intervals adjusted for intra-cluster correlation. The data were presented as measured.

Univariate and multivariate logistic regression analyses were conducted to identify the association between *decision making* for childhood vaccination as dependent variable, and *benefits, costs, trust, knowledge and socio demographics* as independent variables. Univariate regression analysis was conducted to identify the relationship between *decision making* and each independent variable, only adjusted for intra-cluster correlation. In the multivariate regression analysis all predicted explanatory variables from the economic model were included (*costs and benefits*), together with variables with p-value less than 0.30 in the univariate model. The purpose was to identify the independent effect of each explanatory variable, *controlled* for the effect of potential confounders. The strength of association was evaluated using odds ratio (OR), presented with 95 percent confidence interval (CI) and p-value. A p-value of less than 0.05 was considered as statistically significant. Collinearities among independent variables were assessed to make sure that results were not affected by multicollinearity; correlation coefficient of 0.6 was set as maximum limited.

Associations between *perceived benefits* as dependent variable, and *trust* and *knowledge* as independent variables were analyzed and presented in the same way.[25]

In the regression analyses most of the independent variables were dichotomized. This was done to facilitate fruitful analysis. Also the dependent variables were dichotomized. *Decision making for childhood vaccinations* was dichotomized into *fully* and *not fully*. *Fully* = having completely vaccinated youngest eligible child for all EPI vaccinations (BCG, DPT + Hib + Hep B 1 – 2 – 3, polio 1 – 2 – 3 and measles). *Not fully* = not having completely vaccinated

[25] Since caretakers uniformly scored the risk of vaccine preventable disease as very high, only caretakers` perception of *vaccination efficiency* was used as an indicator on perceived benefits. The original plan was to convert all the variables used to measure perceived benefits (efficiency of vaccinations and risk of vaccine preventable diseases) into one (dependent) *perceived benefits variable*. (Remember from the theoretical framework that low scoring of only one "benefit indicator" may be sufficient to turn the total perceived benefits low.)

youngest eligible child for all EPI vaccinations. *Perceived benefits* as dependent variable was dichotomized into *high perceived benefits* and *limited perceived benefits*. *High perceived benefits* = scoring the statement "I believe that a child who gets fully vaccinated will never be sick from any of the disease which the vaccines are designed to prevent" as *totally or tend to agree*. *Limited perceived benefits* = scoring the statement "I believe that a child who gets fully vaccinated will never be sick from any of the disease which the vaccines are designed to prevent" as *totally or tend to disagree.*

3.8 Ethical consideration

Ethical clearance was obtained both from the Norwegian ethical committee and from the Malawian ethical committee. In addition local authorities and health executives in Thyolo district were informed about the study, regarding purpose, methods etc. Local clearance was obtained before the fieldwork took place. Access to the village register was granted from the local authorities in Thyolo district.

All participants were informed about the objective of the study and the methods to be used. It was emphasized that participation was voluntary, and that respondents who agreed to participate were free to withdraw from the study at any time. No interview was conducted without oral consent from the respondent.

All interviews were conducted with good distance from potential listeners and no traceable information was included in the questionnaires, to keep the promise given to respondents in ensuring confidentiality.

4: Results

4.1 Characteristics of caretakers and their youngest child in the age 18 – 59 months

4.1.1 Characteristics of caretakers

72 percent of the selected respondents were interviewed, 635 in total. Caretakers were nearly synonymous with mothers, (96.1 percent). The typical caretaker had little education (78.1 percent had primary incomplete or no formal education), and was either involved in agriculture or small scale business, (respectively 63.9 and 21.4 percent). (See table1 for complete overview of baseline characteristics.)

Table 1 Characteristics of caretakers in Mphuka and Bwumve traditional authorities, Malawi

Variable	Sample Size	Percentage (95CI)*
*Age (N=611**)*		
18-23 years	152	24.9 (20–29)
24-29 years	232	38.0 (34–42)
30-35 years	154	25.2 (21–29)
35+ years	73	11.9 (9-15)
Education (N=635)		
No formal education	76	12.0 (7-16)
Primary incomplete	420	66.1 (61–71)
Primary complete	51	8.0 (6-10)
Secondary incomplete	75	11.8 (8-16)
Secondary complete	13	2.0 (1-3)
Daily activities (N=635)		
Farming	406	63.9 (60-68)
Small scale business	136	21.4 (18-25)
Casual labour	28	4.4 (3-6)
Housewife/homemaker	43	6.8 (5-9)
Other	22	3.5 (2-5)
Ethnicity(N=635)		
Lomwe	397	62.5 (54-71)
Mang`anja	105	16.5 (10-23)
Ngoni	64	10.0 (4-16)
Yao	45	7.1 (3-11)
Other	24	3.8 (2-6)
Caretaker`s relationship to child (N=635)		
Mother	610	96.1 (94-98)
Father	10	1.6 (0-3)
Grandparent	8	1.3 (0-2)
Aunt/Uncle/Brother/Sister	7	1.1 (0-2)

*adjusted for intra-cluster correlation * *24 respondents did not know their own age.

4.1.2 Characteristics of caretakers` youngest child in the age 18 – 59 months

Children were represented evenly from the age 18 – 59 months and equally according to gender, (317 boys and 318 girls). The large majority of children were completely vaccinated, (96.1 percent).[26](See table 2 for complete overview of baseline characteristics of child.)

Table 2 Characteristics of caretakers` youngest child in the age 18 – 59 months

Variable	N	Percentage (95 CI)*
Child`s vaccination status(N=635)		
Not fully vaccinated	25	3.9 (2-6)
Fully vaccinated	610	96.1 (94-98)
Birth place(N=635)		
Health clinic	299	47.1 (36-57)
Traditional birth attendance	175	27.6 (17-36)
Hospital	82	12.9 (9-16)
Home	74	11.7 (8-16)
On the way to the hospital	4	0.6 (-)
At the church	1	0.1 (-)
Gender(N=635)		
Boy	317	49.9 (44-55)
Girl	318	50.1 (45-56)
Number in sibling line(N=628)		
1	148	23.6 (20-27)
2	165	26.3(23-29)
3	125	19.9 (17-23)
4	104	16.6 (13-20)
5	45	7.2 (5-10)
6	41	6.5 (4-9)
Age(N=635)		
18-23 months	52	8.2 (5-11)
24-35 months	204	32.1 (28-36)
36-47 months	194	30.6 (27-34)
48-59 months	185	29.1 (24-34)

*adjusted for intra-cluster correlation

[26] In other words; 96, 1 percent (N=610) of the respondents included in the study had fully vaccinated youngest child, while 3, 9 percent (N=25) hadn't fully vaccinated youngest child.

4.2 Caretakers` perceptions of preventive effect of vaccinations and risk of vaccine preventable disease (benefits)

Table 3-6 show caretakers` response to the questions used to measure perceived benefits of childhood vaccinations. The results show that most caretakers recognized the protective effect of vaccinations, and that an even larger share scored the risk of vaccine preventable diseases as high – both likelihood and severity. (The general and specific questions show the same pattern.) Few caretakers recognized the community preventive effect of vaccinations.

Table 3 Caretakers` perceptions of preventive effect of vaccinations and risk of vaccine preventable disease, information elicited from general questions.

Variable	N	Percentage (95 CI)*
Please tell me how much you personally agree or disagree with the following statement: I believe that a child who gets fully vaccinated will NEVER be sick from any of the diseases that the vaccinations are designed to prevent. (N=635)		
Strongly agree	509	80.2 (76-85)
Tend to agree	76	12.0 (8-16)
Tend to disagree	42	6.6 (5-9)
Strongly disagree	7	1,1 (0-2)
Don't know	1	0.1(-)
If a child doesn't get vaccinated at all; how likely do you think it is that the child will catch disease which could have been prevented by the vaccinations? (N=632)		
Definitely get disease	589	93.2 (91-95)
Probably get disease	40	6.3 (4-9)
Probably not get disease	1	0.2(-)
Definitely not get disease	1	0.2(-)
Don't know	1	0.2(-)
If a child catches disease which could have been prevented by vaccinations, in a worst case scenario, do you think it would be very serious, fairly serious, not very serious or not all serious? (N=632)		
Very serious	617	97.6 (96-99)
Fairly serious	12	1.9 (1-3)
Not very serious	1	0.2(-)
Not at all serious	1	0.2(-)
Don't know	1	0.2(-)
Do you think that vaccination provides protection for disease for other children in the community? (N=635)		
No	582	91.7 (89-94)
Yes	45	7.1(5-9)
Don't know	8	1.3(0-2)

*adjusted for intra-cluster correlation

Table4 Caretakers` perception of preventive effect of vaccinations in relations to specific diseases, among those who reported these diseases as vaccine preventable

Do you think that vaccinations will reduce the risk for _____- not at all, a small amount, a large amount or eliminate the risk?	**Not at all (N/% row)**	**A small amount (N/% row)**	**A large amount (N/% row)**	**Eliminate (N/% row)**	**Don't know (N/% row)**
Measles (N=507)	4/0.8	31/6.1	210/41.4	258/50.9	4/0.8
Polio (N=464)	4/0.9	13/2.8	147/31.7	299/64.4	1/0.2
Tetanus (N=247)	4/1.6	9/3.6	89/36.0	143/57.9	2/0.8
Tuberculosis (N=127)	1/0.8	15/11.8	58/45.7	53/41.7	0/0.0
Pertusiss/Whooping Cough (N=77)	0/0.0	5/6.5	30/39.0	42/54.5	0/0.0

Table5 Caretakers` perception of likelihood for specific diseases, among those who reported these diseases as vaccine preventable

If a child doesn't get vaccinated against ____, do you think that the child would definitely get the disease, probably get the disease, probably not get the disease or definitely not get the disease?	**Definitely get disease (N/% row)**	**Probably get disease (N/% row)**	**Probably not get disease (N/% row)**	**Definitely not get disease (N/% row)**	**Don't know (N/% row)**
Measles (N=507)	473/93.3	22/4.3	3/0.6	5/1.0	4/0.8
Polio (N=459)	418/91.0	33/7.2	3/0.7	4/0.9	1/0.2
Tetanus (N=246)	233/94.7	12/4.9	0/0.0	0/0.0	1/0.4
Tuberculosis (N=125)	117/93.6	5/4.0	3/2.4	0/0.0	0/0.0
Pertusiss/Whooping Cough (N=76)	73/96.1	2/2.6	0/0.0	1/1.3	0/0.0

Table 6 Caretakers` perception of severity of specific diseases, among those who reported these diseases as vaccine preventable

If a child catches _____, do you think it would be very serious, fairly serious, not very serious or not at all serious?	**Very serious (N/% row)**	**Fairly serious (N/% row)**	**Not very serious (N/% row)**	**Not at all serious (N/% row)**	**Don't know (N/% row)**
Measles (N=503)	476/94.6	22/4.4	3/0.6	1/0.2	1/0.2
Polio (N=458)	440/96.1	15/3.3	1/0.2	1/0.2	1/0.2
Tetanus (N=245)	231/94.3	11/4.5	2/0.8	0/0	1/0.4
Tuberculosis (N=124)	120/96.8	4/3.2	0/0	0/0	0/0
Pertusiss/Whooping Cough (N=76)	75/98.7	1/1.3	0/0	0/0	0/0

4.3 Caretakers` perceptions of side effects (costs)

Fever, swollen injection area and weeping were the side effects most commonly reported by caretakers. The large majority scored the risk of side effects as low, both likelihood and severity. Still, a small share scored both likelihood and severity of side effects as high; 12.3 percent of the caretakers who scored the likelihood above *not at all likely* scored the severity of side effects as *fairly* or *very severe* (12.3 percent = 44 caretakers). Less than 10 percent of the respondents who to some extent recognized the risk of side effects (scored the likelihood above *not at all likely* and the severity above *not at all sever*) connected side effects to specific vaccinations. (See table 7)

Table 7 Caretakers` knowledge and perceptions of side effects

Variable	N	Percentage(95 CI)*
A side effect is any health problem or adverse effect occurring after vaccination as a result of vaccination. How likely do you think it is that vaccinations will cause side effects - very likely, fairly likely, not very likely or not at all likely?(N=631)		
Very likely	60	9.5 (7-12)
Fairly likely	45	7.1 (5-9)
Not very likely	247	39.1 (36-43)
Not at all likely	272	43.1 (39-47)
Don't know	7	1.1 (0-2)
*If a child experiences side effects due to vaccinations, in a worst case scenario, do you think it would be very serious, fairly serious, not very serious or not all serious?(N=359**)*		
Very serious	33	9.2 (6-13)
Fairly serious	11	3.1 (2-5)
Not very serious	231	64.3 (57-71)
Not at all serious	81	22.6 (15-28)
Don't know	3	0.8(-)
*Do you think that some vaccinations are less safe than others? (N=281**)*		
No	244	86.8 (83-91)
Yes	26	9.3 (6-13)
Don't know	11	3.9 (1-6)
*Which vaccination or vaccinations do you consider to be less safe?*** (N=27**)*		
Measles	15	55.6 (-)
BCG	7	25.9 (-)
DPT (Hib + Hep B)	3	11.1 (-)
Polio	2	7.4 (-)
*Side effects reported by respondents***(N=635)*		
Fever	314	49.4 (46-55)
Swollen injection area	293	46.1 (42-50)
Weeping	260	40.9 (37-45)
Disease	28	4.4 (3-6)
Others	22	3.5 (2-5)

*Adjusted for intra-cluster correlation** Respondents who scored the likelihood for side effects as *not at all likely* were not asked further questions about severity and risk of specific vaccinations, and respondents who scored the severity of side effects were not asked about specific vaccinations. ***Since question allowed for multiple response, each percentage is based on the total N.

4.4 Access to vaccination (costs)

Most caretakers reported either government health center or outreach clinic as the place most often visited for childhood vaccinations.[27] More than half of the respondents (53.3 percent) had to walk more than 7 km to nearest fixed health facility, the average distance was about 8.8 km. Since outreach services were provided in the study area, that does not imply that caretakers had to walk 8, 8 km in average to reach vaccinations. The average distance was 7.6 km among caretakers who reported fixed health facilities as the place most often visited for vaccinations (N=379).[28] Caretakers were to a large extent divided in their perceptions of traveling and waiting time to/at the place most often visited for childhood vaccinations.

Table 8 Caretakers` perceptions of traveling and waiting time

Variable	N	Percentage(95 CI)*
Place most often visited for vaccination (N=632)		
Government clinic	313	49.5 (46-53)
Outreach clinic/health post	250	39.6 (36-43)
Private clinic	56	8.9 (7-11)
Government or mission hospital	10	1.6 (1-3)
Never seek vaccinations	3	0.4(-)
*Means of getting to vaccination station** (N=632)*		
Walk	616	97.5 (96-99)
Bus	7	1.1 (0-2)
Bike	9	1.4 (0-2)
Distance to nearest under five fixed health facility(635)		
Mean distance=8,8 km		
0-7km	297	46.8 (28-65)
7+	338	53.2 (35-72)
Distance to nearest under five fixed health facility, among caretakers who most often bring children to fixed facilities (379)		
Mean distance=7,6 km		
0-7km	202	53.3 (36-71)
7+	177	46.7 (29-64)
*Perception of traveling time**(N=632)*		
Isn`t a problem at all	263	41.6 (36-71)
Not very long	201	31.8 (27-37)
Fairly long	65	10.3 (8-13)
Very long	103	16.3 (11-22)
*Perception of waiting time**(N=632)*		
Isn`t a problem at all	173	27.4 (23-32)
Not very long	175	27.7 (24-32)
Fairly long	85	13.4 (10-17)
Very long	199	31.5 26-37)

*Adjusted for intra-cluster correlation **To/at the vaccination station most often visited

[27] There were large regional differences in regard to the place most often visited for vaccinations; about 70 percent in Mphuka reported outreach clinic as the place most often visited, while 70 percent reported government clinic in Bvumwe. (Analyses were run to see if there were differences between caretakers in the two authorities: No significant difference was discovered between caretakers from Mphuka and Bvumbwe, in accordance to their perceptions of traveling and waiting time for vaccinations. Neither were differences in accordance to decision making, perceived benefits or trust discovered.)

[28] There is no accurate data available on distances to outreach services. However, providers in the area reported that the distance to outreach services in Mphuka (where the majority depends on outreach services) was substantial for many caretakers.

4.5 Caretakers` knowledge and beliefs about vaccinations and vaccine preventable diseases

The majority of caretakers knew – were able to account for – a few specific target diseases in the vaccination program, mainly measles and polio.[29] 87.8 percent knew approximately when the last vaccination in the vaccination program is supposed to be given. (See table 9)

Table 9 Caretakers knowledge and beliefs about vaccine preventable diseases

Variable	N	Percentage(95 CI)*
*Knowledge of vaccine preventable diseases (diseases reported as vaccine preventable diseases)(N=635)***		
Measles	508	80.0 (77-83)
Polio	466	73.4 (69-77)
Tetanus	249	39.2 (34-44)
Tuberculosis	127	20.0 (16-24)
Pertusiss/Whooping Cough	79	12.4 (9-16)
Diphtheria	7	1.1 (0-2)
Hib	5	0.8 (0-2)
Hep B	4	0.6 (0-1)
Others (Malaria diarrhea, worms, cholera)	32	5.0 (3-5)
Knowledge of vaccine preventable diseases (number of correct diseases reported by each caretaker (N=635)		
0	8	1.3 (0.1-2)
1	123	19.4 (16-23)
2	271	42.7 (38-47)
3	174	27.4 (23-32)
4	47	7.4 (5-9)
5+	12	1.9 (1-3)
Knowledge about when last vaccination should be given (N=635)		
Not correct knowledge	78	12.2 (8-16)
Correct (9 months and 10 months)	557	87.8 (84-92)
Do you feel that you understand the timing of when vaccinations should be given? (N=634)		
Yes	561	88.5 (86-91)
No	71	11.2 (9-14)
Don't know	2	0.3(-)

*Adjusted for intra-cluster correlation **Since questions allowed for multiple responses, each percentage is based on the total N (635)

[29] When asked (qualitatively), caretakers typically replied that they knew that vaccinations protect against other diseases as well, without being able to account for them in specific.

4.6 Information sources on childhood vaccination and trust in information

Health workers were reported to be the principal information source on childhood vaccination in the study area, in addition personal experience was frequently reported as an information source. The study found that the large majority of caretakers had a large degree of trust in the information provided on childhood vaccinations. (See table 10 and 11)

Table 10 Information sources on childhood vaccination and general trust in provided information

Variable	N	Percentage(95 CI)*
*Information sources reported by respondents***(N=635)*		
Health workers	565	89.0 (86-92)
Personal experience	237	37.3 (33-41)
Media (Newspapers, radio, TV, etc.)	116	18.3 (15-22)
Local leaders	103	16.2 (12-20)
Religious leaders	39	6.1 (4-8)
Others (School, friends and family)	22	3.5 (2-5)
Generally speaking, would you say that you trust the information you have received about vaccination - completely, somewhat, not very much or not at all? (N=635)		
Completely	619	97.5 (96-99)
Somewhat	9	1.4 (0-2)
Not very much	3	0.4(-)
Not at all	3	0.4(-)
Don't know	1	0.1(-)

*Adjusted for intra-cluster correlation **Since question allowed for multiple response, each percentage is based on the total N (635)

Table 11 Caretakers` trust in specific information sources, among the respondents who reported these sources as information sources on childhood vaccinations

When you think of the information provided by _____ how reliable do you consider this information to be – very reliable, fairly reliable, not very reliable, not at all reliable?	Very reliable (N/%row)	Fairly reliable (N/% row)	Not very reliable (N/% row)	Not at all reliable (N/% row)	Don't know (N/% row)
Health workers (N=564)	520/92.2	35/6.2	7/1.2	1/0.2	1/0.2
Media (N=115)	106/92.2	6/5.2	1/0.9	2/1.7	0/0
Local leaders (N=103)	95/92.2	3/2.9	4/3.9	0/0	1/1
Religious leaders (N=39)	33/84.6	4/10.3	2/5.1	0/0	0/0

4.7 Trust in health workers` performance

Table 12 shows caretakers` response to the questions used to measure trust in vaccinators. The results indicate that the large majority of caretakers completely trusted the vaccinators.[30]

Table 12 Caretakers` perceptions of vaccinators at the place most often visited for childhood vaccinations

	Strongly agree (N/% row)	Tend to agree (N/% row)	Tend to disagree (N/% row)	Strongly disagree (N/% row)	Don't know (N/% row)
I believe that most of the vaccinators in the _____ have good knowledge about how vaccinations should be provided. (N=632)	601/95.0	20/3.2	6/0.9	2/0.3	3/0.5
I believe that most of the vaccinators in the _____ provide vaccinations as they should be provided. (N=632)	599/94.8	21/3.3	6/0.9	3/0.5	3/0.5
I feel that the most of the vaccinators in the _____ care very sincerely for me and my family. (N=632)	573/90.7	31/4.9	19/3.0	9/1.4	0/0.0
I feel that the most of vaccinators in the _____ respects me(N=632)	546/86.4	29/4.6	43/6.8	14/2.2	0/0

[_____= the vaccination station reported by the caretaker to be most frequently visited when bringing a child for vaccination]

[30] No differences were found between different groups of vaccinators – HSAs, health centre personnel or private vaccinators.

4.8 Self reported reasons for not seeking childhood vaccinations

Table 13 presents influencing reasons, reported by caretakers, for why their youngest child in the age 18 – 59 months missed one or more vaccinations. *Lack of vaccinations at the vaccination station when arriving for vaccination* and *sickness in family* a*t the scheduled time for vaccination* were the most frequently reported reasons for why caretakers had not completely vaccinated a child. (See table 13 for complete overview of reported reasons)

Table 13 Influencing reasons for why caretakers had not completely vaccinated their youngest child in the age 18 – 59 months*

Total N = 25	**N - Open**	**N-Probe**	**N -Total**
Lack of vaccinations at the vaccination station when arriving for vaccination	10	0	10
Sickness in family at scheduled time for vaccinations	6	1	7
Work or other responsibilities at scheduled time for vaccination	2	3	5
Advised not to vaccinate by Religious Leaders	3	0	3
Didn't really reflect upon the decision, just didn't vaccinate	0	3	3
Laziness	1	1	2
Child wouldn't catch vaccine preventable disease anyway	1	0	1
Diseases vaccination prevent aren't serious	1	0	1
Most people I know don't vaccinate their children	1	0	1
Difficult to keep vaccination appointments	1	N/A	1
Don't know	2	N/A	2

*Each respondent was allowed to mention several reasons, thus one respondent may contribute to several reasons.

4.9 Self reported reasons (motivation) for seeking childhood vaccinations

Table 14 presents influencing reasons, reported by caretakers, for why they had vaccinated their youngest child in the age 18 – 59 months for at least one vaccination. *To protect child against disease* and *advised to vaccinate by health workers* were the most frequently reported reasons. (See table 14 for complete overview of reported reasons)

Table 14 Influencing reasons for why caretakers had vaccinated their youngest child in the age 18 – 59 months*

N = 628	N – Open	N -Probe	N/%-Total
Protect child against disease	578	43	621/98.9
Advised to vaccinate by health workers	79	399	478/76.1
To follow social norms/rules	76	119	195/31.1
Advised to vaccinate by journalists	3	153	156/24.8
Advised to vaccinate by family	4	94	98/15.6
Most people I know vaccinate their children	15	75	90/14.3
Advised to vaccinate by local leaders	1	84	85/13.5
Advised to vaccinate by friends	0	84	84/13.4
To get access to other health services/avoid trouble from health workers	30	N/A**	30/4.8
Advised to vaccinate by religious leaders	0	24	24/3.8
Advised to vaccinate by teachers	1	47	48/7.7
Didn`t really reflect upon the decision	2	10	12/1.9
Advised to vaccinate by traditional healers	0	1	1/0.2
Others (Child gets happy, I feel good, afraid of being beaten by husband, government law, advised by traditional healer and CBO, reduce eye problems, to get access to other health services)	20	N/A	20/3.2

*Each respondent was allowed to mention several reasons, thus one respondent may contribute to several reasons. **The intention was to probe. However, due to a translation error made when the questionnaire was finalized after the pilot test that did not happen.

4.10 Factors associated with decision making for childhood vaccinations

To identify the association between *decision making* and potential influencing variables pointed out from the economic model, caretakers who scored various *benefits* as high were compared with caretakers who scored *benefits* as low, and caretakers who scored *costs* as high were compared with caretakers who scored *costs* as low in accordance to their likelihood of not having fully vaccinated youngest child in the age 18 – 59 months (likelihood of *default).* In addition the association between *decision making* and *knowledge, trust* and *socio demographics* was examined.[31]

4. 10. 1 Results from univariate regression analysis

Univariate regression analysis was conducted to identify the relationship between each independent variable and *decision making*, only adjusted for intra cluster correlation**.**

4.10.1.1 Decision making for childhood vaccinations in relation to access (costs)

Results showed no significant difference between caretakers who scored the time costs of vaccinating a child (traveling or waiting time) as *fairly* or *very* long and caretakers who scored the time costs as *not very* or *not at all* long in according to decision making for childhood vaccination. Neither was significant differences detected in accordance to distance to nearest fixed health facility. Although results indicate that caretakers who lived more than 7 km from a fixed health facility were more likely than those who lived closer to not fully have vaccinated their youngest child in the age 18-59 months, when only caretakers who reported to most often vaccinate their children at fixed health facilities were included the analysis. (See table 15)

Table 15 Association between decision making for childhood vaccinations (not fully having vaccinated youngest child) and access

Variable	N	% defaulted(N)	OR (95 CI) *	P-value
Perception of traveling time (N=632)				
Isn`t a problem/Not very long	464	3.2 (15)	1	
Fairly/Very long	168	4.2 (7)	1.30 (0.50-3.39)	0.59
Perception of waiting time (N=632)				
Isn`t a problem/Not very long	348	3.2 (11)	1	
Fairly/Very long	284	3.9(11)	1.23 (0.55-2.80)	0.61
Distance to nearest under five fixed health facility (635)				
0-7km	297	3.7(11)	1	
7+	338	4.1(14)	1.12 (0.43-2.91)	0.81
Distance to nearest under five fixed health facility, among caretakers who most often vaccinate children at fixed facilities (379)				
0-7km	202	2.5(5)	1	
7+	177	4.5(8)	1.8 (0.58-5.66)	0.33

*Adjusted for intra-cluster correlation

[31] A number of variables were not included since caretakers scored them uniformly; *perceived risk of vaccine preventable diseases (likelihood and severity) and trust in the competence of providers of vaccinators* were not included due to this reason. Caretakers uniformly scoring tell us that differences in according to these variables do not explain differences in decision making in the study area.

4.10.1.2 Decision making for childhood vaccinations in relation to caretakers` perceptions of vaccinations (benefits and costs)

The study found no significant association between caretakers` perceptions of vaccination efficiency or risk of side effects, and decision making for childhood vaccinations. Results, however, strongly indicate that caretakers who scored the severity of side effects as *fairly* or *very serious* were more likely than caretakers who scored the severity of side effects as *not very* or *not at all serious* to not fully have vaccinated their youngest child (OR= 3.80 P=0.07). Same relationship was found between caretakers` perception of likelihood of side effect and their decision to vaccinate but with less significant strength (OR= 1.79 P= 0.31). Results also indicate that caretakers who scored the statement "I believe that a child who gets fully vaccinated will never be sick from any of the disease which the vaccines are designed to prevent" as *totally* or *tend to disagree* were more likely to not fully have vaccinated their youngest eligible child, compared to those who scored the statement as *strongly* or *tend to agree* (OR=2.39 P= 0.22). (See table 16)

Table 16 Association between decision making for childhood vaccination (not fully having vaccinated child) and caretakers` perception of vaccination efficiency and risk of side effect

Variable	N	% default (N)	OR (95 CI)*	P-value
"I believe that a child who gets fully vaccinated will NEVER be sick from any of the diseases that the vaccinations are designed to prevent"(N=634)				
Strongly/Tend to agree	585	3.6 (21)	1	
Strongly/tend to disagree	49	8.2 (4)	2.39 (0.60-9.49)	0.22
How likely do you think it is that vaccinations will cause side effects - very likely, fairly likely, not very likely or not at all likely? (N=624)				
Not very/ Not at all likely	519	3.3 (17)	1	
Very/ Fairly likely	105	5.7 (6)	1.79 (0.58-5.50)	0.31
*If a child experiences side effects due to vaccinations, in a worst case scenario, do you think it would be very serious, fairly serious, not very serious or not at all serious? (N=356**)*				
Not very/ Not at all serious	312	2.6 (8)	1	
Very/ Fairly serious	44	9.1(4)	3.80 (0.89-16.17)	0.07
Do you think that vaccination provides protection for disease for other children in the community (N=627)				
No	582	3.6 (21)	-	-
Yes	45	2.2 (1)	-	-

*Adjusted for intra-cluster correlation** Large number of missing due to questionnaire instructions; those who scored likelihood of SE as *not at all/not very likely* were not asked further questions about severity - Not enough cases in each category for analysis.

4.10.1.3 Decision making for childhood vaccinations in relation to caretakers` knowledge and trust

The study found that caretakers with incorrect knowledge about when the last vaccination is supposed to be given, were more likely than caretakers with correct knowledge about when the last vaccination is supposed to be given, to not fully have vaccinated their youngest eligible child (OR=2.95 P=0.06). Among the very few respondents (only 6) who reported to doubt received information on vaccinations 50 percent had not fully vaccinated their youngest eligible child, compared to only 3.6 percent among those who reported to trust received information. Caretakers` knowledge of specific side effects and vaccine preventable diseases was not found to be significantly associated with decision making for childhood vaccinations. (See table 17)

Table 17 Association between decision making for childhood vaccinations (not fully having vaccinated youngest child) and caretakers` knowledge, belief and trust

Variable	N	% defaulted (N)	OR (95 CI)*	P value
Knowledge about when last vaccination is given(N=635)				
Correct	557	3.2 (18)	1	
Not correct	78	9.0 (7)	2,95 (0.97-8.99)	0.06
Do you feel that you understand the timing of when vaccinations should be given? (N=635)				
Yes	561	3.6(20)	1	
No/Don't know	74	6.8 (5)	1.96 (0.64-6.00)	0.24
Number of SE reported(N=635)				
0-1	314	3.5 (11)	1	
2+	321	4.4 (14)	1.26 (0.55-2.87)	0.59
Number of correct vaccine preventable diseases reported by each caretaker(N=635)				
0-1	131	5.3 (7)	1	
2+	504	3.6 (18)	0.66 (0.28-1.54)	0.33
Generally speaking, would you say that you trust the information you have received about vaccination - completely, somewhat, not very much or not at all?				
Completely/Somewhat	628	3.5 (22)	1	
Not very much/Not at all	6	50.0 (3)	27.55 (5-149)	0.000

*Adjusted for intra cluster-correlation

4. 10. 1.4 Decision making for childhood vaccinations in relation to socio demographic factors

Caretakers who gave birth at home (without assistant from health workers or traditional birth attends were found to be significantly more likely to not have fully vaccinated their youngest eligible child than caretakers who delivered outside their home (government health centre/traditional birth attendance/hospital). Results also indicate, but not significantly, that the likelihood of being fully vaccinated increase with the age of caretakers youngest eligible child and that girls have an increased chance of not being fully vaccinated compared to boys. (See table 18)

Table 18 Association between decision making for childhood vaccinations (not having fully vaccinated youngest child) and socio demographics

Variable	N	% defaulted(N)	OR (95 CI)*	P – value
Caretaker				
Age (N=611)				
18-29	384	3.6 (14)	1	
30+	227	4.4 (10)	1.22 (0.51-2.93)	0.66
Education(N=635)				
No education	76	1.3 (1)	-	-
Primary incomplete/complete	470	4.9 (23)	-	-
Secondary+	88	1.1 (1)	-	-
Child				
Gender(N=635)				
Boy	317	3.2 (10)	1	
Girl	318	4.7 (15)	1.52 (0.67-3.47)	0.32
Age *(N=634)*				
18-35	255	5.1 (13)	1	
36-59	379	3.2 (12)	1.64 (0.68-3.98)	0.27
Place of birth(N=635)				
Not Home	561	3.4 (19)	1	
Home	74	8.1 (6)	2,52 (1.18-5.39)	0.02
Number in sibling line*(N=628)*				
0-1	313	3.5 (11)	1	
2-3	229	3.9 (9)	1.11 (0.48-2.56)	0.81
4+	86	5.8 (5)	1.71 (0.59-4.95)	0.32

*Adjusted for intra cluster correlation - Not sufficient number of cases in each category for analysis.

4. 10. 2 Results from multivariate regression analysis

All predicted explanatory variables from economic theory were included in the multivariate regression analysis - *perceived traveling and waiting time, distance to nearest health facility, perceived likelihood of side effects and perceived preventive effect of vaccinations*, together with variables with p-value of less than 0.30 in the univariate analysis - *knowledge of schedule, age of child and place of birth.*[32] The purpose was to identify the independent effect of each explanatory variable, controlled for confounding. None of the independent variables included in the multivariate analysis were highly correlated.

No significant association was detected between any of the predicted explanatory variables from economic theory and *decision making* for childhood vaccinations in the multivariate regression analysis. Results, however, indicate that caretakers who did not know when the last vaccination is supposed to be given were more likely than caretakers who knew when the last vaccination is supposed to be given, to not have fully vaccinated their youngest eligible child (OR=2.41 (CI=0.70-8.34) P=0.16). The results also indicate that children in the age 18-35 months were less likely than children in the age 36-59 months to be fully vaccinated (OR= 0.51 (CI=0.19-1.38) P=0, 19). The association between *decision making* and the variables related to *costs* and *benefits* were not found to be even close to statistical significant in the multivariate analysis. The odds ratio, however, points in the expected directions. Caretakers who scored the statement "I believe that a child who gets fully vaccinated will never be sick from any of the disease which the vaccines are designed to prevent" as *totally* or *tend to disagree agree* were 1.79 times more likely to not have fully vaccinated their youngest eligible child, compared to those who scored the statement as *strongly or tend to agree*. The odds ratio also point in the expected direction in regard to *costs (likelihood of side effects, traveling* and *waiting time)* and *decision making* but with smaller differences. (See paragraph 5.3.1 for further discussion concerning the strength of the analytical results, and how these results should be interpreted. See table 19 for a complete overview of results from the multivariate regression analysis.)

[32] *Severity of side effect* was not included in the model, despite being a predicted explanatory variable in the economic model and being identified as board line significant in the univariate analysis, due to large number of missing respondents. (When severity was included in the model the OR was found to be 2.38 (0.52-10.85), with P value 0.26.) Neither was *trust in information* included in the model due to missing response. Missing response related to several variables in the model would have reduced the number of respondents with *distrust in information*, even further. Since several variables contributed to the reduction it was decided to not include *information trust.*

Table 19 Association between decision making for childhood vaccinations and potential explanatory variables, multivariate model

Variable - total N= 622	OR (95 CI)*	P- value
Age of child		
18-35 months	1	
36-59 months	0.51 (0.19-1.38)	0.19
Place of birth		
Not Home	1	
Home	1.64 (0.68-3.95)	0.27
Knowledge about when last vaccination is given		
Correct	1	
Not correct	2.41 (0.70-8.34)	0.16
Distance to nearest under five health facility		
0-7km	1	
7+	1.11 (0.40-3.12)	0.84
Believe that a child who gets fully vaccinated will NEVER be sick from any of the diseases that the vaccinations are designed to prevent		
Strongly/Tend to agree	1	
Strongly/Tend to disagree	1.79 (0.22-14.42)	0.59
How likely do you think it is that vaccinations will cause side effects - very likely, fairly likely, not very likely or not at all likely?		
Not very/ Not at likely	1	
Very/ Fairly likely	1.51 (0.53-4.33)	0.44
Perception of traveling time		
Isn`t a problem/Not very long	1	
Fairly/Very long	1.33 (0.47-3.79)	0.60
Perception of waiting time		
Isn`t a problem/Not very long	1	
Fairly/Very long	1.32 (0.55-3.17)	0.53

* Adjusted for intra cluster correlation, and controlled for other variables in the table.

4.11 Association between perceived benefits and knowledge, trust

To identify the association between *perceived benefits* and potential influencing variables pointed out from the economic model, caretakers who scored various trust indicators positively were compared with caretakers who scored trust indicators negatively in accordance to their likelihood of scoring the *perceived benefits* as limited.[33] In addition the association between *perceived benefits* and *knowledge of side effects* and *knowledge of vaccine preventable diseases* was examined.

4.11.1 Results from univariate regression analysis

Results show that caretakers who knew less than two side effects were more likely than caretakers who knew two side effects or more, to score the *perceived benefits* as limited (OR=2.25 P=0.01). No difference was discovered in accordance to level of education. Very few caretakers reported distrust in received information. Those who did were considerably more likely than caretakers who reported to trust received information, to score the *perceived benefits* as limited (OR=25.91 P=0.00). No clearly pattern was detected in accordance to *performance trust*.

Table 20 Association between perceived benefits (scoring perceived benefits as limited) and caretakers` knowledge, education and trust)

Variable	N	% scoring perceived benefits as low (N)	OR(95 CI)*	P value
Knowledge of specific side effects (number reported)				
2+	321	5.0 (16)	1	
0-1	313	10.5 (33)	2.25 (1.24- 4.16)	0.01
Knowledge of vaccine preventable diseases (number reported)				
2+	503	8.0 (40)	1	
0-1	131	6.9 (9)	0.85 (0.34-2.17)	0.74
Education(N=635)				
No education	76	6.6 (5)	1	
Primary incomplete/ Primary complete	470	8.1 (38)	1.25 (0.48-3.28)	0.65
Secondary+	88	6.8 (6)	1.04 (0.30-3.36)	0.95
Generally speaking, would you say that you trust the information you have received about vaccination?				
Completely /Somewhat	628	7.2(45)	1	
Not very much/ Not at all	6	66.2 (4)	25.91 (4 – 155)	0.00
I feel that the most of the vaccinators in the _____ care very sincerely for me and my family. (N=632)				
Strongly/Tend to agree	603	7.1(43)	1	
Strongly/tend to disagree	28	10.7(3)	1.56 (0.36 – 6.80)	0.55
I feel that the most of vaccinators in the _____ respects me(N=632)				
Strongly/Tend to agree	574	7.5 (43)	1	
Strongly/tend to disagree	57	5.1(3)	0.69 (0.21-2.29)	0.54

*****Adjusted for intra-cluster correlation

[33] *Limited perceived benefits* = scoring the statement "I believe that a child who gets fully vaccinated will never be sick from any of the disease which the vaccines are designed to prevent" as totally or tend to disagree.

4.11.1 Results from multivariate regression analysis

Knowledge of side effects, knowledge of vaccine preventable diseases, education and trust in information were included in the multivariate regression analysis, to identify the independent effect of each variable controlled for confounding.[34] Like in the univariate model, caretakers who knew less than two side effects were found to be significantly more likely to score the *perceived benefits* (vaccination efficiency*)* as limited, compared to caretakers who knew two or more side effects (OR=2.32 CI (1.15-4.68) P=0.019). Also the association between *perceived benefits* and *trust* in information remained statistical significant (OR=27.52 CI (6-131) P=0.00). None of the variables included in the multivariate analysis were highly correlated.

Table 21 Association between perceived benefits (scoring perceived benefits as limited) and caretakers` knowledge, education and trust

Variable – total N= 634	OR(95 CI)*	P value
Knowledge of specific side effects (number reported)		
2+	1	
0-1	2.32 (1.15- 4.68)	0.019
Knowledge of vaccine preventable diseases (number reported)		
0-1	1	
2+	0.68 (0.27-1.75)	0.43
Education(N=635)		
No education	1	
Primary incomplete/ Primary complete	1.57 (0.48-3.28)	0.40
Secondary+	1.48 (0.30-3.36)	0.55
Generally speaking, would you say that you trust the information you have received about vaccination?		
Completely /Somewhat	1	
Not very much/ Not at all	27.52 (6 – 131)	0.000

* Adjusted for intra cluster correlation, and controlled for other variables in the table.

[34] Since no significant association was found between *perceived benefits* and *performance trust* (caretakers` perceptions of vaccinators in regard to *respect* and *caring)* in the univariate analysis, the variables related to *performance trust* were not included in the multivariate analysis. Mainly because an inclusion of these variables would have reduced the very limited number of respondents with distrust in information, even further.

5: Discussion

5.1 Results in relation to theoretical predictions, (an economic explanation of the success of the vaccination program in the study area)

5.1.1 Benefits

The study found that the overwhelming majority of caretakers scored the measured benefits of childhood vaccination (*vaccination efficiency* and *risk of vaccine preventable diseases*) to be high. Seen in light of the results on decision making (96.1 percent had completely vaccinated youngest eligible child), this was, indeed, in line with predictions from the economic model. The match suggests that positive perceived benefits may be an explanatory factor on the success of the vaccinations program in the study area. The two descriptive findings do, however, not prove an association; one cannot conclude that caretakers would demand vaccinations to a less extent if the large majority of the population instead had been scoring the benefits as low.

Results from the analytical analyses show that caretakers in the sample who scored the vaccination efficiency (*perceived benefits)* as *limited* actually were more likely than caretakers who scored the vaccination efficiency as *high*, to have not fully vaccinated their youngest eligible child (OR = 2.39 in the univariate model and OR=1.79 in the multivariate model). The association was however not found to be statistical significant (P= 0.22 in the univariate model and P = 0.59 in the multivariate model).[35]

5.1.2 Trust

Caretakers scored, nearly homogenously, all trust indicators examined in the present study positively. Considering caretakers nearly homogenously positive scoring of benefits (and the finding on decision making), also the descriptive findings on trust were in line with predictions from the economic model. The finding suggests that trust – both *information* and *performance trust*, may be a key explanatory factor on the success of the vaccination program in the study area; in the way that trust facilitates positive perceived benefits which again influence caretakers to demand childhood vaccinations. However, as discussed in relation to benefits, the separate descriptive findings do not prove a statistical significant association.

[35] See paragraph 5.3.1 for further discussion concerning the strength of the analytical results, and how they should be interpreted.

The very few caretakers who reported distrust in information were considerably more likely than caretakers who trusted information to score the vaccination efficiency (*perceived benefits*) as low and to not fully have vaccinated their youngest eligible child. Since few caretakers reported distrust in information there are large uncertainties attached to the statistical relationship (see later discussion 5.3.1). Still, despite large statistical uncertainty about the accurate quantitative impact, the finding strongly indicates that trust in information may be an important influencing factor on demand for childhood vaccinations.

5.1.3 Knowledge

The study found that most caretakers in the study area had good knowledge about the vaccination schedule (knew when the last vaccination is supposed to be given). The results were in line with theory; we expected knowledge of vaccinations, and knowledge about when and where to get them as minimum requirement for demand.

An association between knowledge of schedule and decision making were also indicated in the analytical analyses; caretakers who did not know when the last vaccination is supposed to be given were found to be more likely than caretakers who knew when the last vaccination is supposed to be given, to not have fully vaccinated their youngest eligible child (OR=2.41 P=0.16 in the multivariate regression analysis).

No significant relationship was discovered between decision making and knowledge of side effects or disease. Neither was education and decision making found to be associated in the present study.

Concerning the relationship between *perceived benefits* and *knowledge*, the analytical results show that caretakers who knew less than two side effects were more likely than caretakers who knew two or more side effects, to score the *perceived benefits* (vaccination efficiency) of vaccinations as *limited* (OR=2.32 P=0.019 in multivariate regression analysis). From theory we had no clear idea about how *knowledge of side effects* would influence *perceived benefits*. A potential explanation may be that those with good knowledge of side effects had received information from a source which also signaled that the benefits (vaccination efficiency) of vaccinating a child would be very high, and that those with limited knowledge of side effects had not been exposed to this information source and therefore had lower expectation about the benefits of vaccinations – (*differences in access to information*). At a scientific level, however, we have no clear understanding of the relationship.

5.1.4 Costs

The study found that many caretakers scored the measured costs of vaccinating a child as high; 26.6 percent scored the traveling time as fairly/very long, 44.9 percent scored the waiting time as fairly/very long and 16.6 percent scored the likelihood of side effects as very likely/not very likely. Seen in light of the finding on decision making (96.1 percent had fully vaccinated youngest eligible child), the results show that a large share of the caretakers who had fully vaccinated their youngest child also scored the costs of vaccinating a child as high.

The economic explanation of the finding would be that caretakers fully had vaccinated their youngest eligible child, despite perceiving the costs as high, because they perceived the benefits to exceed the costs – *positive net benefits*. Given caretakers homogenously positive scoring of benefits the economic explanation may definitely apply. One can, however, not conclude on an explanation from the combination of descriptive findings.

Findings from the univariate analysis indicate that caretakers who *feared* side effects, severity in particular, were more likely than those who did not *fear* side effects to not have fully vaccinated their youngest child. The study found hardly any difference between caretakers whose youngest child was fully vaccinated and caretakers whose youngest child was not fully vaccinated, in regard to their perceptions of traveling and waiting time. Neither was significant differences detected in according to actual distance to health facilities. Seen from an economic perspective, the analytical findings suggest that fear of side effects constitute a considerable cost (increased the likelihood of turning net benefits negative); while traveling and waiting time seemed to constitute only minor costs (did not increase the likelihood of turning net benefits negative).

5.1.5 Motivation

The study identified *individual protection* for the vaccinated child as the dominating motivation for why caretakers did seek childhood vaccinations, while the *community protection* argument was not even known: 98.9 percent (including probing) reported *individual protection* as an influencing reason for seeking vaccinations for youngest child, while no one reported without probing that protection for other children influenced their decision. When asked specifically whether vaccination provides protection for other children in the community only seven percent replied yes. (The results do not reveal why caretakers value individual protection, neither does the results revile whether or not caretakers would value the community protection if they knew about the community effect.) In addition some

caretakers reported to vaccinate their children in order to avoid trouble from vaccinators and/or to get access to other services, rather than for the direct health benefits of vaccinating a child.

The most commonly quoted reasons for why caretakers had not vaccinated their youngest eligible child (*lack of vaccination station and/or sickness in family*) were related to practical issues, rather than low perceived benefits or direct costs of vaccinating a child. [36]

5.2 Results in relation to current information/literature

5.2.1Vaccination coverage data

More caretakers reported to have fully vaccinated their youngest eligible child than what was expected from WHO/UNICEF estimates on vaccination coverage in the district, and EPI guidance. WHO/UNICEF figures report a steady 80 coverage in average for each routine EPI vaccination, from 2005-2008 in Thyolo district (unpublished WHO/UNICEF data).

There are two likely explanations for the deviation: 1) errors in study results (desirability bias and sampling errors– see 5.3.3 and 5.3.4), or 2) errors in WHO/UNICEF estimates (erroneously reporting from vaccination providers and/or errors in estimates of the target population), or may be most likely a combination of both. [37]

An indication that supports the study results is that, also, the latest DHS estimates exceed WHO/UNICEF estimates; 90 percent of children in Thyolo district in the age 12-23 months were found to be completely vaccinated in 2004 (Phoya & Kang'oma, 2004). (The present study is based on the same methods as the DHS).

[36] One should note that although caretakers do not quote low vaccination efficiency, long traveling /waiting time and fear of side effects directly, their actions may still be understood within an economic framework, and these factors may still influence their actions. For instance, to be turned down due to lack of vaccinations when arriving at a clinic may be interpreted as an increase in the costs of vaccinating a child. To be rejected due to lack of vaccination when arriving at a clinic would in fact double the traveling costs of vaccinating a child, since a caretaker then would have to travel back and forth to the clinic once more to vaccinate her child. In addition, to be turned down once may make a caretaker more suspicious about the possibility of being turned down again the next time; in economic terms that may lead her to adjust the expected benefits of bringing her child for vaccinations downward. Whether or not a caretaker will be willing to come back may be related to how she perceives the expected benefits and costs measured in the present study. For instance, a caretaker who perceives the benefits of vaccinating a child as very high at the outset ("most likely life saving") may be willing to come back even though she once again has to travel back and forth for the same vaccination and despite that she acknowledges that she may be turned down again, while a rejection due to lack of vaccination may be sufficient to turn the net benefits negative for a caretaker who only has more moderate expectations about the benefits at the outset.

[37] To estimate WHO/UNICEF percentages the number of vaccination doses administered in an area is divided by the total target population in the same area, (country, district etc.) Thus if providers of vaccination report erroneously (over or under) or if the estimates of total target population is wrong, the estimate will be wrong.

Another explanation may be that the two traditional authorities addressed in the present study were "high performers" within Thyolo district, and that other authorities pulled the average district coverage down. (The study did not aim at being representative for the total district, and coverage data on authority level was not available). That does, however, not explain the difference between DHS and WHO/UNICEF estimates. Neither was it expected by policy makers ((i.e. EPI Unit, District Hospital, District assembly), in particular not in Mphuka.[38]

5.2.2 Perceptions of vaccination and vaccinators

The study findings related to caretakers perceptions of vaccinations and vaccinators resembles findings from most other survey studies conducted in developing areas, in the way that they all have found that most caretakers hold positive perceptions towards vaccination and vaccinators (Mapato et al. 2008; Fowler et al., 2008; Cassel et al., 2006) No survey-study has, to the best of my knowledge, identified negative attitudes towards vaccination to be a large problem. (Neither have many survey-studies been conducted in areas with low coverage).

The study findings on trust were also in line with a previous study from Malawi (Kadzandira & Chilowa, 2001). The study looked at the role of HSAs and found that most people had nearly complete trust in their competence in regard to vaccinations. Similar findings were reported in the Malawi part of the Streefland et al. (1999) study. (No other study has, to the best of my knowledge, attempted to measure trust in information on vaccination in particular.)

The analytical results were in line with findings from a number of qualitative studies in the way that they indicate that at least some mothers do not vaccinate their children due to negative perceptions of vaccinations and vaccinators (Renne, 2006; Streefland et al., 1999; Nitcher, 1995). Due to large uncertainties attached to the analytical results the present study does not, like the qualitative studies, provide sound judgments on the accurate quantitative impact.

Unlike numerous other studies the present study does not find that differences in access seem to explain why some choose to vaccinate their children and others do not.

[38] The reason for why the present study leaned to WHO/UNICEF figures was principally due to lack of updated DHS data; (latest DHS 2004, latest WHO/UNICEF 2008). The deviation between WHO/UNICEF and household survey estimates (the present study/DHS) points to the importance of examining the reliability of coverage data in the district more thoroughly. There are weaknesses connected to both methods. However, studies which have looked into the reliability issue have found that DHS data tend to be more precise than WHO/UNICEF data (Murray, 2003).

5.3 Strengths and limitations of the study

5.3.1 "The challenge of dealing with success"

The descriptive results constitute the strong part of the study; the study provides accurate overall estimates on caretakers` perceptions of vaccinations, vaccine preventable diseases, vaccinators, access to vaccinations etc. The analytical results, however, should be interpreted with great caution.

What we can conclude, in relation to theory, is that the combinations of descriptive findings - (*high demand for childhood vaccination: positive scoring of benefits* and *positive scoring of benefits: large degree of trust*) - to a large extent were in line with theoretical predictions. In that way the empirical results support the hypotheses in the study. The data, however, do not prove the hypotheses in the study; it is not possible to conclude on associations and nevertheless on causal relationships from the combination of descriptive findings.

Due to the, apparent, success of the vaccination program in the study area, the study failed to strongly fulfill the objective of identifying associations; to compare caretakers who had fully vaccinated their youngest eligible child with caretakers who had not fully vaccinated their youngest eligible child. In technical terms, the lack of variation in decision making (dependent variable) and the little variation in accordance to benefits and trust (independent variables) is the main reason for why most of the analytical results presented in this paper are attached with wide confidence intervals. Due to the limited data foundation for analytical analysis we cannot, from the present study, conclude whether or not there is a relationship between decision making and the predicted explanatory variables from the economic model. Still we may get some indications.

Although the analytical results are attached with large uncertainties, it is interesting to note that the results, for the most part, point in the expected direction in accordance to theory. The odds ratio is high for several expected explanatory factors. What we can conclude is that the results from the *sample population* largely support the hypotheses of the study. What we cannot conclude is that differences observed in the sample population reflect differences in the overall population; one should be very careful to draw statistical inferences from the analytical results.

On the other hand, caretakers` nearly complete homogenously response to the questions related to benefits and trust indicate that these factors (as measured in the present study) only to a limited extent explain differences in decision making within the study area; most of the (few) caretakers who had not completely vaccinated their youngest eligible child did, still, score the benefits positively.[39]

Further, the study results have to be interpreted with caution due to potential distortion from confounding factors, reporting bias, selection bias, and other design limitations.

5.3.2 Confounding

Confounding is a phenomenon when the association between an independent and dependent variable is partially or totally explained by a third variable, which is associated with both the independent and the dependent variable (Singleton & Straits, 2010). Like in all survey studies there is a possibility that confounding variables influence the study results. The purpose of conducting multivariate analysis was to reduce the problem of confounding. However, even though multivariate analysis was conducted we cannot conclude that all relevant variables were included in the model.

5.3.3 Reporting bias

The study is based on self reported information, collected through face to face (structured) interviews. A major concern, always, attached to self reported information is that the reported information not necessarily is truthful. Reporting bias may derive from two sources; recall bias or desirability bias. Recall bias may have influenced the information elicited from the questions related to actual decision making. Also desirability bias – that respondents provide answers which they expect to be "correct" – may have influenced the study. In particular if respondents feared consequences depending on how they answered the questions. If they did there is a risk that respondents reported more positive attitudes and higher demand for childhood vaccination than what is true. To reduce the problem respondents were ensured complete confidentiality.

[39] Since the economic theory is concerned about average behavior and tendencies rather than each individual, a few exceptions – caretakers who have not fully vaccinated a child even though scoring measured benefits and trust as high – does not necessarily "shoot down" the economic model in accordance to the main overall findings.

5.3.4 Selection bias

The study aimed at being representative for all caretakers in the study area. To be completely representative the sampling needs to be done probabilistic and the sampling frame needs to be complete. Concerning the first requirement the study is on safe ground. Whether or not the register does include absolutely all eligible respondents in the study area is less certain. The main question is whether there is a difference between caretakers in the register and caretakers not in the register in accordance to perceptions and decision making for childhood vaccinations.

The village register (the village books) used for sampling in this study is maintained by responsible contacts in each village, who continuously update new births/deaths etc. Since the register is maintained within each village and not in relation to health institutions - usually small villages where people know each other, an association between decision making and being on the list is not likely; we encountered people far off the main track and people that did not seek any medical services.

A second potential source of selection bias is related to missing response. 72 percent of the selected respondents were interviewed. Out of the missing respondents about 1/3 of them were reached but excluded due to wrong age, 1/3 were not reached because the respondents on the list couldn't be traced and 1/3 were identified to live in the village but not available at the time of study.[40]

Again, the crucial question is whether there is a systematic difference between the respondents who were reached and those who were not reached in accordance to perceptions and decision making. Concerning the 1/3 that were excluded due to wrong age that is not likely, concerning the 2/3 excluded due to difficulties in tracing there may be a difference. Anyway, missing response is not likely to represent a big problem given the relatively high response rate (above 70 percent); it is without doubt that most caretakers in the study area *report* to have fully vaccinated youngest eligible child and that they *report* positive perceptions toward vaccinations.

[40] The lists received from a few of the villages included all children from 0-5 – due to communication misunderstandings. The target group was children in the age 18 - 59 months.

5.3.5 Other limitations

5.3.5.1 Causality

Given the cross sectional design we cannot conclude on any causal relationships. For instance that that caretakers did choose to vaccinate *because* they perceived the benefits to be high, only that there is an association. (No matter if discovered differences turn out significant or not)

5.3.5.2 Changing perceptions

Perceptions may be rapidly changing. Thus, one should be careful to conclude that respondents` perceptions at the time of the survey were the same as respondents` perceptions at the time when they decided for childhood vaccinations. In the analytical analyses perceptions at the time of the survey is assumed to be consistent with the perceptions at the time of decision making.[41]

5.4 Study implications

The study findings show that it is possible to achieve high vaccination coverage even in areas where caretakers need to walk long distances to reach vaccinations and where a large number of caretakers perceive the traveling and waiting time as long. (No matter if the reason is counterbalancing benefits or other explanations.) The finding is encouraging. Considering the settlement patterns in rural developing areas, like in the area where the present study was conducted, the only possible, at least sustainable, solution to maintain high vaccination coverage is through active demand.[42]

Results from the study and the economic perspective - in its emphasis on net benefits, helps us to see that increased availability (reductions in costs) is not the only solution to achieve and maintain high vaccination coverage. To generate active demand (increase perceived benefits) may, in some situations, represent a more fruitful approach.

[41] This problem could have been reduced if respondents instead were asked about their perception at the time when their children were eligible for vaccinations. There is, however disadvantages related to that approach as well. It may be difficult for respondents to recall their perceptions at a given point in time. A likely prospect is that many respondents still would account for their perceptions at present. To ask retrospective questions about perceptions would, in addition, reduce the value of the descriptive part of the study. Another solution would be to limit the target population. For instance only include caretakers with children in the age 18 – 36 months. That would, however, have made sampling more difficult and required more resources.

[42] The claim "*only possible*" is based on the need for keeping vaccinations cold (electricity), structural challenges and economic constraints that will unable the achievement of "doorstep like services" in near future.

The point is, obviously, not that availability is without relevance; to improve availability - decrease costs - will in most situations increase demand (the effect will depend on the outset situation) and a certain threshold limit needs to be ensured. The point is that increased availability, in particular in rural developing countries, often will not represent a feasible alternative.

As simple as this conclusion may sound, this point has to a large extent been neglected both in policy debates and research literature. [43]

Further research, both qualitative and quantitative, is needed to identify, with certainty, which factors that influence caretakers to bring their children relatively long distances for vaccinations. In addition further research is needed to understand the mechanisms behind the factors which determine demand.

Results from the present study suggest trust – both in information and vaccinators, as a key explanatory factor for the success in the study area; in the way that trust facilitates positive perceived benefits which, again, make caretakers seek vaccinations despite considerable costs.

(To fully understand how trust is achieved requires further research. Without having scrutinized the mechanisms behind trust, the quality of vaccination services stands out as the most obvious explanatory factor on trust. Trust is likely to be achieved through respectful behavior, by keeping time schedules, adequate level of skills, honest and clear information etc. Other factors such as concurrent health services, colonial history, attitudes toward western world and modern medicine in general may also influence trust, on a more profound level.)

5.5 Potential threats to the "success" of the vaccination program and potential counteracting efforts if demand drops, seen from an economic perspective

5.5.1 Decreasing demand as a consequence of the "success"

The picture today - caretakers who demand childhood vaccinations - may not look the same tomorrow.

[43] Studies that reveal access factors as determinants on decision making for childhood vaccinations tend to emphasis the need of improving access; bring vaccinations closer. Also policy makers have been accused of putting too much emphasis on availability in an effort to reach short term numerical target; expecting demand to follow automatically once the public have been introduced to vaccinations (Nitcher, 1995).

A distinct feature of the vaccination program, seen from an economic perspective, is that the benefits of vaccinating a child is inversely related to the success of the vaccination program; an increase in vaccination coverage will lead to a decrease in the benefits of vaccinating a child, since the transmission risk will decrease as the coverage increase.

Due to the inverse relationship it may be difficult to maintain high demand for vaccinations in the study area. Empirical findings from other studies have found that high coverage areas struggle to maintain achieved coverage rates. For instance in Malawi; in according to DHS estimates 82 percent of children in the age 12 – 23 months had received all routine vaccinations, compared to 64 percent in 2004 (Phoya & Kang'oma, 2004).

5.5.2 Potential negative impact of information

The predicted decrease in demand is based on an assumption of rational caretakers who manage to form somehow accurate estimates of risk.

Results from the study indicate that caretakers severely miscalculated the risk of disease (the benefits of vaccinating a child): Caretakers scored the likelihood of attracting vaccine preventable disease to be very high, while statistics on disease burden from the study area show that few of the target diseases in the vaccination program have occurred in the study areas for years. (Given the nature of infectious disease – like the disease addressed in the EPI - that implies that the risk of attracting disease is close to zero.)[44]

One likely explanation for the deviation between perceived risk and objective risk may be that the information provided on vaccinations in the study area today exaggerates the risks. Another, complementary, explanation may be that it takes time to capture the change in risk through experience, and that the decrease will occur later, as the awareness of diseases like polio and measles slowly fades out.

An interesting point, in relation to vaccination policy seen from an economic perspective, is that dissemination of more precise information may result in decreasing demand for childhood vaccinations rather than increasing demand, given caretakers` beliefs at the moment. This claim challenges a contrasting view, that accurate information about the link between diseases and vaccinations is a key factor in high demand for vaccinations (Nitcher, 1995)

[44] Note that actions carried out on false beliefs, due to information constrains, still may be interpreted as perfectly rational decisions.

That being said it is, obviously, important to inform caretakers sufficiently to generate demand. For instance, it is important to inform caretakers sufficiently to avoid false expectation and disappointments. To avoid false expectation it is important to inform caretakers about normal side effects and that children still are likely to catch a number of other childhood diseases after being vaccinated. (If caretakers form overoptimistic beliefs that is likely to decrease demand in the long run, in the way that people lose trust in information and vaccinators.)

Another point is that it may be wishful from a normative standpoint to ensure, as far as possible, enlightened decision making. In particular it would be an ethical issue if providers of information exaggerate the risk of diseases in order to generate demand, spreading groundless fear of serious diseases.

5.5.3 Potential counteracting efforts if demand drops

Before considering potential counteracting efforts, a core question needs to be answered: Why do we want caretakers to continue to vaccinate their children when the risk of attracting disease, rightly, is extremely low?

Basically there are two health outcomes of vaccinating a child; reduction in the risk of disease for the vaccinated child and reduction in the risk of disease for other children through the reduction of transmission risk (*community preventive effect*).

In a choice situation with low risk of disease, *protection for the vaccinated child* does not really represent a strong argument. Unless caretakers are extremely risk averse (value the microscopic reductions in risk provided by vaccinations when the likelihood of disease is low). In choice situations with low risk of disease the *community preventive outcome* represents a stronger argument, at least from a social point of view. To eliminate or minimize disease - reach the overall goal in the EPI – depends on continued demand for vaccinations when the risk of disease starts to fall. Not primarily for the sake of the vaccinated child but for the community as a whole; unless caretakers vaccinate their children in choice situations with low risk, the diseases will keep coming back. (From a social standpoint it is in particular desirable to avoid “reoccurrence waves” in relation to diseases which can be totally eradicated.)

Whether or not caretakers value any of these outcomes is not obvious. From a classical economic point of view the community preventive outcome is assumed not to be valued

(incorporated) in relation to private decision making - *positive externalities*. If the assumption is correct – caretakers do not value the community preventive outcome – it may be impossible to achieve and maintain sufficient coverage to minimize or eradicate vaccine preventable diseases, without introducing incentives.

5.5.3.1 Incentives

The purpose of an incentive is to motivate people to behave in line with what is wishful from a social standpoint, when the private motivation leads individuals in other directions**.** The community preventive outcome of vaccinating a child (positive externalities) is the main reason why vaccinations are provided free of charge in most countries. To provide vaccination free of charge represents an incentive. However, since not only money costs represents costs of vaccinating a child, *free of charge* vaccinations may still not be enough to ensure sufficient demand to reach the EPI goal.

Thus, other incentives may be necessary. In Malawi mosquito nets are already provided along side with vaccination. If the nets are perceived as a good this may work as an incentive.[45] Other suggestions would, for instance, be to provide basic goods along side with vaccinations (soaps, beans etc.) and/or to offer snacks and soft drinks at the vaccination sessions. Alternatively coercive incentives can be used. In some countries, for instance Uzbekistan, it has been made obligatory to vaccinate children. Complete vaccination status as a requirement to get access to other health services and to get enrolled in school, are other examples on coercive incentives to make caretakers vaccinate their children.

Motivating incentives tend to be a very effective mean to alter individual behavior. However, given the financial situation - the vaccination program is heavily depending on external donors who already are concerned about costs and who in time plan to pull out - introduction of cost raising incentives is probably not a feasible alternative. Considering coercive incentives they will be attached with less costs, but with larger moral concerns. Would it be right to force caretakers, many of whom are struggling with issues such as nutrition insufficiency, to spend hours walking and waiting in line for vaccinations which most likely will have no direct impact on their children`s health?

[45] Vaccinators who we met in field did report that some caretakers were trying to vaccinate children several times in order to receive nets. The report indicates two things; that vaccination nets work as an incentive, and that incentives easily may lead to unintended effects.

5.5.3.2 Community preventive effect

That caretakers only value the protective benefits for their own children is not obvious. As emphasized in the theoretical chapter, caretakers may hold altruistic preferences, meaning that they take the community preventive effect into account when making decisions for childhood vaccinations. In a sense even the decision to vaccinate one own child is an altruistic motivated decision (unless the future egoistic instrumental value of a healthy child is the only driving factor).

Considering the findings on motivation – only seven percent knew about the community preventive effect - an alternative or complementary counter effort to incentives would be to emphasis the community preventive effect. To inform caretakers in that continued demand for vaccinations is important even when the risk of disease is low, may prevent a decrease in vaccination coverage due to reductions in private benefits, if caretakers value the community preventive argument – (incorporate the social benefits when calculating net benefits).

6: Conclusion

The study sought to explain demand for childhood vaccinations within two traditional authorities – Mphuka and Bwumve - from an economic perspective; (as it turned out) to explain why nearly all caretakers fully had vaccinated their youngest eligible child.

The empirical findings were, to a large extent, in line with predictions from theory, without providing solid evidence on the hypotheses generated from the economic model. The match between study results and theoretical predictions suggests that vaccination seeking behavior has sufficiently large rational components to be explained and understood from an economic perspective. The data, however, do not prove that caretakers are completely rational in relation to vaccination seeking behavior. Nor is it likely. The study has to large extent neglected non rational elements of human behavior, and is only concerned about average behavior and central tendencies.

Principally, the study documents and points to the possibility and necessity of achieving high vaccination coverage in areas where many caretakers need to travel long distances to reach vaccinations, and where a large number of caretakers perceive the traveling and waiting time as long. The study suggests that high level of trust in information and in vaccinators may be an essential explanatory factor; in the way that trust facilitates positive perceived benefits which again make caretakers seek childhood vaccinations even though there are considerable costs involved. The study, however, does not provide the final explanation for why caretakers in the study area vaccinate their children, and nevertheless for why caretakers vaccinate or do not vaccinate their children in other areas. More emphasis should be devoted to demand for childhood vaccinations, both in research and in policy making.

Recommendation for further research:

Qualitative research is needed to gain a more profound understanding on vaccination seeking behavior. In addition, further quantitative research is needed to determine the effect of the factors suggested in this study, in areas with larger variation in decision making/vaccination coverage. Also other factors, informed from qualitative research, should be addressed in quantitative research.

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Appendix 1

STUDY ON DIFFERENTIAL COVERAGE OF IMMUNIZATION

Vaccination Questionnaire – Malawi

Cluster: _____ Date of Interview: _____

Survey ID Number: _____ Interviewer name: _____

Consent to participate in the study

My name is ……. I work with REACH Trust, a health research institution based in Lilongwe. We are currently conducting a study concerning vaccination in collaboration with University of Oslo, Norway. You are one of the people selected from your village to participate in this study. We would be very glad if you have some time to talk to us about your views on vaccinations, health workers and vaccine preventable diseases. Information from this study may be used to improve the vaccination services in Malawi in the future. Before you deicide, please let me emphasise that participation is voluntary. Your participation in any government programs, now or in the future, will not be affected by your decision to either participate or not participate. Everything you tell me will be kept strictly confidentially, information in the questioner will not contain any information that is retraceable to you. You can skip questions you don't want to answer. The interview is expected to last for about 40 minutes; however you are free to withdraw from the interview at any time. If you have any questions about the study, feel free to ask before you decide.

I will be very grateful if you have time, and I am sure that your participation will be of great value for the study.

May I please continue?

If respondent accepts:
Start the interview.

If respondent can't participate due to time constraints or other current obstacles:
Try to reschedule to another time we will be in the village.

☐ Not available - rescheduled: _____

If respondent refuse to participate:

☐ Refused

SOCIO DEMOGRAPHIC/ECONOMIC STATUS

To begin with I would like to ask some questions about you and your household.

Q1a How many children in the age 0 - 5 years, for whom you are responsible, live in this house?

_____

Q1b What is your relationship with (this/these) child(ren)? [*If the respondent holds more than one role please specify in other*]

- ☐ Mother (mayi) (1)
- ☐ Father (bamboo) (2)
- ☐ Grandparent (agogo) (3)
- ☐ Aunt/uncle/brother/sister (4)
- ☐ Guardian/caretaker (5)
- ☐ Don't know (48)
- ☐ Other [*Specify*]

_____

Q1c (**Don't ask respondent)**
Note sex of respondent.

- ☐ Female (1)
- ☐ Male (2)

Q2How old are you?

Years _____
☐ Don't know (48)

Q3 What is your ethnicity?

- ☐ Chewa (1)
- ☐ Tumbuka (2)
- ☐ Lomwe (3)
- ☐ Tonga (4)
- ☐ Yao (5)
- ☐ Sena (6)
- ☐ Nkonde (7)
- ☐ Mang'anja (8)
- ☐ Ngoni (9)
- ☐ Don't know (48)
- ☐ Other [*Specify*]

_____

Q4 What is your religion?

- ☐ Catholic (1)
- ☐ Muslim (2)
- ☐ Anglican (3)
- ☐ Seventh day adventist/Baptist (4)
- ☐ CCAP (5)
- ☐ No religion (6)
- ☐ Traditional [Chamakolo] (7)
- ☐ Don't know (48)
- ☐ Other [*Specify*]

_____

Q5 What is the highest schooling that you have attended? [*If not clearly stated, **probe:** have you completed (primary/secondary)?*]

- ☐ No formal education (1)
- ☐ Primary incomplete (2)
- ☐ Primary complete (3)
- ☐ Secondary incomplete (4)
- ☐ Secondary complete (5)
- ☐ Post secondary or higher (6)
- ☐ Other [*Specify*]

_____

Q6 What kind of work do you mainly do, or what kind of activities keep you busy during an average day whether you get money from them or not? [*If no clear match specify in other*]

- ☐ Agriculture/Farming (1)
- ☐ Teacher (2)
- ❑ Small scale business (geni) (3)
- ❑ Artisan (carpenter, tailor, welder) (4)
- ❑ Tea Plucking (5)
- ❑ Ganyu (casual labour) (6)
- ☐ Housewife/homemaker (7)
- ☐ Unemployed (8)
- ☐ Other [*Specify*]

_____

PERCEPTIONS OF VACCINATIONS AND VACCINE PREVENTABLE DISEASES

In the next section I want to ask you some questions about vaccinations and diseases.

Q7 How important do you think vaccinations are for children's ability to grow strong – very important, fairly important, not very important or not important at all?

- ☐ Very important (1)
- ☐ Fairly important (2)
- ☐ Not very important (3)
- ☐ Not at all important (4)
- ☐ Don't know (48)

Q8a Please tell me how much you personally agree or disagree with the following statement: I believe that a child who gets fully vaccinated will NEVER be sick from any of the diseases that the vaccinations are designed to prevent. Do you strongly agree, tend to agree, tend to disagree, or strongly disagree?

- ☐ Strongly agree (1)
- ☐ Tend to agree (2)
- ☐ Tend to disagree (3)
- ☐ Strongly disagree (4) **Skip to Q9**
- ☐ Don't know (48)

Q8b If a child doesn't get vaccinated at all; how likely do you think it is that the child will catch disease which could have been prevented by the vaccinations - very likely, fairly likely, not very likely or not at all likely?

- ☐ Very likely (1)
- ☐ Fairly likely (2)
- ☐ Not very likely (3)
- ☐ Not at all likely (4) **Skip to Q9**
- ☐ Don't know (48)

Q8c If a child catches disease which could have been prevented by vaccinations, in a worst case scenario, do you think it would be very serious, fairly serious, not very serious or not all serious?

- ☐ Very serious (1)
- ☐ Fairly serious (2)
- ☐ Not very serious (3)
- ☐ Not at all serious (4)
- ☐ Don't know (48)

Q9 Do you know which specific diseases that the vaccination programme in your district is trying to prevent? [*If yes**, probe*:** which diseases? Do you know about any other diseases? *If no*, ***probe*:** Are you sure you don't know any specific diseases]

Q9a ☐Don't know any specific disease (1) **Skip to Q10**
Q9b1 ☐Measles [Chikuku] (1)
Q9b2 ☐Polio [Kupuwala ziwalo] (1)
Q9b3 ☐Diphtheria (1)
Q9b4 ☐Tetanus [Kafumbata/kalongolongo] (1)
Q9b5 ☐Pertusiss/Whooping Cough [Chifuwa chokoka mtima] (1)
Q9b6 ☐Tuberculosis [Chifuwa chachikulu] (1)
Q9b7 ☐Hib (1)
Q9b8 ☐HepB (1)
☐Other [*Specify*]

_____

	Q9c **(Ask specifically for each VPD mentioned in Q9b**) Do you think that vaccinations will reduce the risk for _____, not at all, a small amount, a large amount or eliminate the risk?					Q9d (**Ask specifically for each VPD mentioned in Q9b. Skip for diseases rated in Q9c as Not at all)** If a child doesn't get vaccinated against ____, do you think that the child would definitely get the disease, probably get the disease, probably not get the disease or definitely not get the disease?					Q9e (**Ask specifically for each VPD mentioned in Q9b. Skip for diseases rated in Q9d as definitely not get)** If a child catches _____, do you think it would be very serious, fairly serious, not very serious or not at all serious?				
	Not at all (1)	A small amount(2)	A large amount (3)	Eliminate (4)	Don`t know (48)	Definitely get (1)	Probably get (2)	Probably not get (3)	Definitely not get (4)	Don`t know (48)	Very serious (1)	Fairly serious (2)	Not very serious (3)	Not at all serious (4)	Don`t know (48)
Q9c/d/e 1 Measles															
Q9c/d/e 2 Polio															
Q9c/d/e 3 Diphtheria															
Q9c/d/e 4 Tetanus															
Q9c/d/e 5 Pertussis															
Q9c/d/e 6 Tuberculosis															
Q9c/d/e 7 Hib															
Q9c/d/e 8 HepB															

KNOWLEDGE OF VACCINATION

Now I want to ask you a few questions about information on childhood vaccination.

Q10a Generally speaking, would you say that you trust the information you have received about vaccination - completely, somewhat, not very much or not at all?

- ☐ Completely (1)
- ☐ Somewhat (2)
- ☐ Not very much (3)
- ☐ Not at all (4)
- ☐Don't know (48)

	Q10b What are your sources of information on childhood vaccination? **[*Probe:*** Please think carefully, are you sure you haven't forgotten any sources of information?]	Q10c **(Ask only for sources that are mentioned in Q10b)** When you think of the information provided by _____, how reliable do you consider this information to be – very reliable, fairly reliable, not very reliable, not at all reliable?					Q10d (**Ask only for sources that are mentioned in Q10b)** When you think of the information you have received about childhood vaccination from _____, did this encourage you to seek vaccination, was it neutral or did it encourage you to not seek vaccinations?			
		Very reliable (1)	Fairly reliable (2)	Not very reliable (3)	Not at all reliable (4)	Don't know (48)	Encourage (1)	Neutral (2)	Encourage to not (3)	Don't know (48)
Q10b/c/d1 Personal experience										
Q10 b/c/d2 Health workers										
Q10 b/c/d3 Local leaders										
Q10 b/c/d4 Media/Journalists										
Q10 b/c/d5 Family										
Q10 b/c/d6 Friends										
Q10 b/c/d7 School/Teachers										
Q10 b/c/d8 Traditional healers										
Q10 b/c/d9 Religious leaders										
Other sources [*specify*] _____										
Other sources [*specify*] _____										

Q11a Do you feel that you understand the timing of when vaccinations should be given?

☐ Yes (1)
☐ No (0)
☐ Don't know (48)

Q11b Do you know approximately at what age the last vaccination is given to a child according to the vaccination schedule in your district?

Years_____ Months_____
☐Don't know (48)

PERCEPTIONS OF SIDE EFFECTS

Q12a A side effect is any health problem or adverse effect occurring after vaccination as a result of vaccination.
How likely do you think it is that vaccinations will cause side effects - very likely, fairly likely, not very likely or not at all likely?

☐ Very likely (1)
☐ Fairly likely (2)
☐ Not very likely (3)
☐ Not at all likely (4) **skip to 13**
☐ Don't know (48)

Q12b If a child experiences side effects due to vaccinations, in a worst case scenario, do you think it would be very serious, fairly serious, not very serious or not all serious?

☐ Very serious (1)
☐ Fairly serious (2)
☐ Not very serious (3)
☐ Not at all serious (4) **skip to 13**
☐ Don't know (48)

Q12c Do you think that some vaccinations are less safe than others?

☐ Yes (1)
☐ No (0) **skip to 13**
☐ Don't know (48) **skip to 13**

	Q12d Which vaccination or vaccinations do you consider to be less safe than others?	Q12e (**Ask specifically for each vaccination mentioned in Q12d**) How likely do you think it is that the _____ vaccination(s) will cause side effects - very likely, fairly likely, not very likely or not at all likely?					Q12f(**Skip for vaccinations rated in Q12e as Not at all likely)** If a child experiences side effects due to the ____ vaccination(s), do you think it would be very serious, fairly serious, not very serious or not all serious?				
		Very likely (1)	Fairly likely (2)	Not very likely (3)	Not at all likely(4)	Don't know (48)	Very serious (1)	Fairly serious (2)	Not very serious (3)	Not at all serious (4)	Don't know (48)
Q12d/e/f1 DPT+Hib+HepB/ [vaccination supposed to prevent any of the target diseases]											
Q12 d/e/f 2 Polio											
Q12 d/e/f 3 Measles											
Q12 d/e/f 4 BCG/tuberculosis											

Q13 Do you know about any specific side effects from vaccinations? [*If yes, **probe**:* Please tell me about the side effects that you know. *If no, **probe:*** Please think carefully, are you sure you don't know any side effects?]

Q13a ☐ Don't know any side effects
Q13b1 ☐ Fever
Q13b2 ☐ Swollen injection area
Q13b3 ☐ Nausea
Q13b4 ☐ General discomfort
Q13b5 ☐ Cause weeping
Q13b6 ☐ Cause disease
Q13b7 ☐ Cause barren when child grow up
Q13b8 ☐ Kills children
☐ Other [*Specify*]

_____

PERCEPTION OF VACCINATORS/ ACCESS TO VACCINATIONS

In the following section I want to ask you some questions about access to vaccinations and your thoughts of the vaccinators in your district.

Q14 Please tell me how much you personally agree or disagree with each of the following statements. Do you strongly agree, tend to agree, tend to disagree, or strongly disagree? [*Repeat the scale for each statement*]

	Strongly agree (1)	Tend to agree (2)	Tend to disagree (3)	Strongly disagree (4)	Don't know (48)
Q14a I believe that most of the vaccinators in my district have good knowledge about how vaccinations should be provided.					
Q14b **(Ask only if Q14a1 = Strongly agree or Tend to agree)** I believe that most of the vaccinators in my district provide vaccinations as they should be provided.					
Q14c I feel that most of the vaccinators in my district care very sincerely for me and my family.					
Q14d I feel that most of the vaccinators in my district respects me.					

Q15 Where do you usually go to get vaccinations for a child? [*Allow only one answer. If necessary,* ***probe*****:** we are only interested in the place that you go to most often, please specify? *If clinic or hospital is mentioned in general,* ***probe***: do you know if it is a mission (clinic/hospital), private (clinic/hospital) or government (clinic/hospital)?]

- ☐ CHAM/Mission clinic (1)
- ☐ Government health centre (2)
- ☐ Private clinic (3)
- ☐ Outreach clinic (4)
- ☐ National campaign days (5)
- ☐ CHAM/Mission Hospital (6)
- ☐ Government Hospital (7)
- ☐ Private Hospital (8)
- ☐ Receives vaccinations at home by mobile teams (9)
- ☐ Don’t go – never seek vaccinations (10) **skip Q16 and Q17 (a-c)**
- ☐ Don’t know (48) **skip Q16 and Q17 (a-c)**
- ☐ Other location or event [*Specify*]

_____

Q16 **(Ask for place mentioned in Q15)**
What do you think about the vaccinators working in the _____? Again, please tell me how much you agree or disagree with each of the following statements. Do you strongly agree, tend to agree, tend to disagree, or strongly disagree? [*Repeat the scale for each statement.*]

	Strongly agree (1)	Tend to agree (2)	Tend to disagree (3)	Strongly disagree (4)	Don't know (48)
Q16a I believe that most of the vaccinators in the _____ have good knowledge about how vaccinations should be provided.					
Q16b **(Ask only if Q16a1 = Strongly agree or Tend to agree)** I believe that most of the vaccinators in the _____ provide vaccinations as they should be provided.					
Q16c I feel that the most of the vaccinators in the _____ care very sincerely for me and my family.					
Q16d I feel that the most of vaccinators in the _____ respects me.					

[If Q15 = at home by mobile teams skip Q17 (a-c)]

Q17a **(Ask for place mentioned in Q15)**
What do you think about the travelling time to the _____; do you think that the travelling time isn't a problem at all, that the travelling time is not very long, that the travelling time is fairly long or that the travelling time is very long?

- ☐ Isn't a problem at all (1)
- ☐ Not very long (2)
- ☐ Fairly long (3)
- ☐ Very long (4)
- ☐ Don't know (48)

Q17b **(Ask for place mentioned in Q15)**
How do you get to the _____?

- ☐ Walk (1)
- ☐ Bus (2)
- ☐ Car (3)
- ☐ Bike (4)
- ☐ Other [**Probe**: please specify]

_____

Q17c **(Ask for place mentioned in Q15)**
What do you think about the waiting time at the _____ when you bring a child for vaccination; do you think that the waiting time isn't a problem at all, that the waiting time is not very long, that the waiting time is fairly long or that the waiting time is very long?

- ☐ Isn't a problem at all (1)
- ☐ Not very long (2)
- ☐ Fairly long (3)
- ☐ Very long (4)
- ☐ Don't know (48)

In the following I want to ask you some specific questions concerning your decisions about vaccinations for your youngest child in the age 18-59 months for whom you are responsible

Vaccination status

First I would like to know the vaccination status for this child.

Q18a
Is it a boy or a girl?

- ☐ Boy (1)
- ☐ Girl (2)

What is (his/her) name?

Recall for following questions, _____

Q18b How old is (name)? [*Probe for years and months*]

Years _____ Months _____

Q18c Where was (name) born - at home, in a health clinic, in a hospital or another place?

- ☐ Home (1)
- ☐ Health clinic (2)
- ☐ Hospital (3)
- ☐ Traditional birth attendance (4)
- ☐ Another place [**Probe**: please specify]

_____

Q18d Does (name) have any older siblings?

☐ Yes (1)
☐ No (0) **skip to Q18f**

Q18e How many older siblings? [*Specify*]

_____

Q18f **(Ask only if Q1b=several different relationship)**
What is your relation to (name)?

☐ Mother (1)
☐ Father (2)
☐ Grandparent (3)
☐ Guardian / caretaker (4)
☐ Aunt, uncle, brother, sister (5)
☐ Other [**Probe**: please specify]

_____

Q19a Do you have a card or booklet where (name`s) vaccinations are written down? [*If yes, probe*: May I please see it?]

☐ Yes - seen (2)
☐ Yes - not seen (1) **skip to Q19d**
☐ No (0) **skip to Q19d**

Q19b Can I please write of this information?
[*Tick off in table -next page]*

[**If child is fully vaccinated according to card, skip to Q20**]

Q19c Have (name) received any vaccinations that are not recorded on this card?

☐ Yes (1) **skip to 19e**
☐ No (0) **skip to Q20**
☐ Don't know (48) **skip to Q20**

Q19d Have (name) ever received any vaccinations?

☐ Yes (1)
☐ No (0) **skip to Q21a**
☐ Don't know **skip to Q21a**

Q19e Have (name) ever received ____? [*Skip for vaccinations already seen in card – according to Q19b. Tick off in table -next page*]

A BCG vaccination against tuberculosis [***Probe:*** That is an injection given in the arm or shoulder usually leaving a scar]

A polio vaccination [***Probe:*** That is drops in the mouth. *If yes*, ***probe*:** How many times was the polio vaccination received?

A DPT vaccination [***Probe:*** That is an injection given in the thigh or buttocks, sometimes given at the same time as polio drops. *If yes*, **probe:** How many times was DPT vaccination received?]

Measles vaccination [***Probe:*** That is a shot in the arm given at 9 months or older]

	Received - seen in card (1)	Received - based on memory (2)
Q19b/e1 BCG		
Q19b/e2 Polio0		
Q19b/e3 Polio1		
Q19b/e4 Polio2		
Q19b/e5 Polio3		
Q19b/e6 DPT+Hib+HepB 1		
Q19b/e7 DPT+Hib+HepB 2		
Q19b/e8 DPT+Hib+HepB 3		
Q19b/e9 Measles		

Q20 When you had (name) vaccinated where did you take (him/her) for vaccinations, if you took (name) to several places please tell me about each of them? [*After respondent end his/her answer*, ***probe:*** Please think carefully are sure you didn't take (name) to any other places for vaccination? *If clinic or hospital is mentioned in general*, ***probe***: do you remember if the (clinic/hospital) was a mission (clinic/hospital) or government (clinic/hospital)?]

Q20a ☐ CHAM/Mission clinic
Q20b ☐ Government health centre
Q20c ☐ Private clinic
Q20d ☐ Outreach clinic
Q20e ☐ National campaign days
Q20f ☐ CHAM/Mission Hospital
Q20g ☐ Government Hospital
Q20h ☐ Private Hospital
Q20i ☐ Received vaccinations at home by mobile teams
☐ Others [Specify]

_____

DECISION MAKING

Q21a **(If youngest child is fully vaccinated – according to Q19, skip to Q23a)** According to the information you gave me about (name`s) vaccination status, (she/he) has not received all the vaccinations provided to children in your district. Why have you not completely vaccinated (name)? [*Tick off for each answer that clearly corresponds to reasons listed, if no clear match specify in other*. ***Probe:*** Any other reasons? **If respondent doesn't state whether the reason apply to specific vaccination(s),* ***probe****:* Did this reason apply to specific vaccinations? *If only applicable for specific vaccination****, probe***: which vaccination or vaccinations?]	Vaccinations(1)	DPT+Hib + HepB (1)	Polio 1/2/3 (1)	Measles (1)	BCG (1)
*Child wouldn't catch vaccine preventable disease anyway					
* Diseases vaccinations prevent aren't serious					
* Advised not to vaccinate by:					
Traditional Healers					
Local Leaders					
Religious leaders					
Family					
Friends					
Journalists					
Teacher					
Health workers					
*Most people don't vaccinate their children					
Didn't really reflect upon the decision, just didn't vaccinate					
Due to laziness					

...Q21a continues	Vaccinations(1)	DPT+Hib + HepB (1)	Polio 1/2/3 (1)	Measles (1)	BCG (1)
Vaccinators would provide vaccination in an inadequate manner					
Vaccinators would behave disrespectfully					
Lack of vaccinations at the vaccination station when arriving for vaccination					
Nearest place offering vaccinations was too far away					
Waiting time at vaccine centre too long					
Difficulties in reaching vaccination during rainy season					
Sickness in family at scheduled time for vaccinations					
Work or other responsibilities at scheduled time for vaccination					
To follow rules/social norms					
Thought child had received all vaccinations provided – (**If only reason mentioned skip to Q23a)**					
Don't know					
Other _____					

Q21b I will now read some potential reasons for why some people don't vaccinate their children. In addition to what you just told me, did any of the following reasons influence you to not completely vaccinate (name)? [*Exclude reasons that match response given in Q21a.Read all other reasons.* ***Probe***: Did this potential reason influence you to not completely vaccinate (name)? **If respondent agree on a reason and doesn't state whether the reason apply to specific vaccination(s)* ***probe***: Did this reason apply to specific vaccinations? *If only applicable for specific vaccination,* ***probe***: Which vaccination or vaccinations?]	Vaccinations(1)	DPT+Hib + HepB (1)	Polio 1/2/3 (1)	Measles (1)	BCG (1)
* Thought child wouldn't catch vaccine preventable diseases anyway					
* Thought that the disease vaccinations protect against aren't serious enough to bother					
* Thought that vaccination would cause side effects					
* Advised not to vaccinate by:					
Traditional Healers					
Local Leaders					
Religious leaders					
Family					
Friends					
Journalists					
Teacher					
Health workers					
* Because most people don't vaccinate their children					

...Q21b continues	Vaccinations(1)	DPT+Hib + HepB (1)	Polio 1/2/3 (1)	Measles (1)	BCG (1)
You didn't really reflect upon the decision, just didn't vaccinate					
Due to laziness					
Thought that vaccinators would provide vaccination in an inadequate manner					
Thought that vaccinators would behave disrespectfully					
Due to lack of vaccinations at the vaccination station when arriving for vaccination)					
(Thought nearest place offering vaccinations was too far away)					
(Thought waiting time at vaccine centres was to long)					
(Due to difficulties in reaching vaccination during rainy season					
Due to Sickness in family at scheduled time for vaccinations					
Due to work or other responsibilities at scheduled time for vaccination To follow rules/social norms					

Q22 Do you plan to complete all vaccinations for (name) in the future?

- ☐ Yes (1)
- ☐ No (0)
- ☐ Don't know (48)

	Q23a **(If child is NOT AT ALL vaccinated skip to Q24a)** In respect to the vaccination(s) (name) have received. Why did you choose to vaccinate (name)? [*Tick off for each answer that clearly corresponds to reasons listed, if no clear match specify in other]*	Q23b I will now list some potential reasons for why some people choose to vaccinate children. In addition to what you just told me, did any of the following reasons influence you to vaccinate (name)? [*Exclude reasons that clearly match response given in Q23a. Read all other reasons* ***Probe***: Did this potential reason influence you to vaccinate (name)?*]*	
		Yes (1)	No (0)
To protect child against disease			
Vaccination is required to get access to other health services			
To get access to other health services/avoid trouble from health workers			
Advised to vaccinate by:			
Traditional Healers			
Local Leaders			
Religious Leaders			
Family			
Friends			
Journalists			
Teacher			
Health workers			
Because most people I know vaccinate their children			
Didn't really reflect upon the decision, just did it			
To follow rules/social norms			
Other___			

SOCIAL BENEFITS

Q24a Do you think that vaccination provides protection for disease for other children in the community?

☐ Yes (1)
☐ No (0) **Skip to Q25**
☐Don't know (48) **Skip Q25**

Q24b (**Skip to Q25 if not at all vaccinated**)
Did you think of the benefits to other children when you had your last child vaccinated?

☐Yes (1)
☐No (0)

GENERAL TRUST

Q25a Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?

☐ Most people can be trusted (1)
☐ Need to be very careful. (0)

	Q25b I'd now like to ask how much you trust people from various groups. Please tell me for each group whether you trust people from this group completely, somewhat, not very much or not at all. ____, do you trust people from this group completely, somewhat, not very much or not at all? [*Read out and repeat the scale for each group*]				
	Completely (1)	Trust them (2)	Trust them a little (3)	Not at all (4)	Don't know (48)
Q25b1 Health workers					
Q25b2 Local leaders					
Q25b3 Journalists (media)					
Q25b4 Family					
Q25b5 Friends					
Q25b6 Teachers (school)					
Q25b7 Traditional healers					
Q25b8 Religious leaders					

SOCIO ECONOMIC STATUS

Finally I would like to ask you a few more questions about your household **(Pomaliza ndikufunsani mafunso ochepa okhudzana ndi pakhomo panu)**

Q26 Do you or anyone in your household own any of the following means for transportation? [*Read each option listed, tick off]*

	Yes (1)	No (0)	Dont know(48)
Q26a Car			
Q26b Bicycle			
Q26c Scooter or motorcycle			
Any other kind of transportation [**Probe**: please specify]			

Q27 Does your house have any of the following? [*Read each option listed, tick off]*

	Yes(1)	No (0)	Dont know(48)
Q27a Electricity			
Q27b Television			
Q27c Radio			
Q27d Telephone (incl. Mobile)			
Q27e Land that you own			
Q27f Animals that you keep			

Q28 What is the main building material for your house?

☐Burnt bricks (1)
☐Unburnt bricks (2)
☐Mud (3)
☐Poles (4)
☐ Don't know (48)
☐Other [*Specify]*

_____

Q29 How often in the past month have you had problems getting the food you need – Never, Sometimes, Often or Always?

☐ Never (1)
☐ Sometimes (2)
☐ Often (3)
☐ Everyday (4)
☐ Don't know (48)

[Interview is finished. Thank the respondent for his/her time]