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Roman Hoffmann

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Univ.-Prof. Alejandro Cunat, Ph.D.

Mitbetreut von / Co-Supervisor:

Univ.-Prof. Dipl.-Math. Karl Schlag, PhD

The Impact and Utilization of Integrated
Community Health Programs in Developing
Countries: Evidence from the Philippines

Roman Hoffmann

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Abbreviations

2SLS	Two-stage least squares
AHW	Auxiliary health worker
ATE	Average treatment effect
CHW	Community health worker
GPS	Generalized propensity score
HealthDev	Health Dev Institute
ITE	Intention to treat effect
IV	Instrumental Variable
KDCI	Kasagana-Ka Development Center Inc.
LATE	Local average treatment effect
MFI	Microfinance institution
NAMRIA	Philippines National Mapping and Resource Information Authority
NGO	Non-governmental organization
OLS	Ordinary least squares
PCA	Principal component analysis
PHC	Primary health care
Phil Health	Philippine public health insurance
PHP	Philippine Peso
PSM	Propensity score matching
PTB	Pulmonary tuberculosis
RCT	Randomized controlled trial
SO	Socio-economic officer (i.e. loan officer)
STD	Sexually transmitted diseases
TB	Tuberculosis

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Dedicated to the Nanays in the Philippines

Preface

"The biggest enemy of health in the developing world is poverty."

Kofi Annan

Health is one of the most fundamental determinants of individual well-being (Gerdtham & Johannesson 2001) and productivity (Becker 2007). Its importance is reflected in the declaration of human rights which states that every human has the right to the highest attainable standards of physical and mental health including, among others, adequate access to medical services and treatment, social protection against health risks, and healthy living conditions. Yet, in the world, substantial health inequalities both across social strata and geographical locations persist. Every year, several million people die from preventable or treatable causes with the poor in low- and middle-income countries being most severely affected (Schultz 2004; Dupas 2011b). For them, health shocks represent an existential threat which affects not only the sick person, but the entire family which has to compensate for the loss in income and medical expenditures.

In general, poverty and health are intrinsically linked. In 2013, an approximate 10.7 percent of the world's population or 767 million people lived in extreme poverty (based on a poverty line of US\$1.9 per day) with the largest share of the poor living in Sub-Saharan Africa and South Asia (World Bank 2016). Poverty can create ill health in various ways: It forces people to live in unhealthy environments which do not offer adequate access to clean water, sanitation, appropriate nutrition, or health care. Moreover, the poor are often not protected by social security nets and have to rely on their income to cover necessary health expenditures. As a consequence, many families in the developing world experience so called catastrophic health expenditures consuming a large share of their financial resources (Xu et al. 2003). As much of their income earning capacities depends on manual labor, poor households who face bad health and resulting financial burdens may potentially end up in a vicious cycle (poverty trap), in which the financial resources to reach better health states are insufficient due to previous health shocks (Dasgupta 1997).

For long time, insufficient access to financial means and services was seen as the primary barrier in the fight against poverty and its correlates, such as ill health. Following the credo that "finance is at the core of the development process" (World Bank 2008, p. 21), development researchers and practitioners have placed much hope in the microfinance movement, which started in the early 1980s in Bangladesh with the Grameen Bank and from there literally spread all over the world (Yunus 2003). Microfinance refers to the provision of small-scale financial services, such as loans, saving accounts, or insurance, to poor households. This target group is often not properly served

for by traditional banks as the poor generate only small profits and are often not able to provide sufficient collateral (Karlan & Morduch 2010). Microfinance fills the gap by giving access to financial services to a steadily growing number of families. Today, more than 200 million households are clients of microfinance institutions (MFIs) (Microcredit Summit Campaign 2015).¹

The proponents of microfinance argue that better access to financial means creates long-lasting benefits for the poor by enabling them to generate additional income from profitable investment opportunities (e.g. micro-enterprises), to diversify income sources, to accumulate assets and wealth, to smooth consumption, and to reduce vulnerabilities (Hermes & Lensink 2011). Several studies confirm that microfinance can contribute to poverty reduction and improve the livelihood for the clients (Morduch & Haley (2002) and Tedeschi (2008)). In one of the earliest empirical studies, Pitt and Khandker (1998) find substantial positive effects of the Grameen Bank on household consumption. In their identification, the authors compare individuals who are eligible to receiving a microcredit with those who are not in villages with and without access to the services of the MFI. Similarly, using panel data from Bangladesh, Khandker (2005) shows that microfinance helps reducing poverty, especially among female clients, and that this also generates positive spillovers to the wider community. Also with regard to health outcomes, studies report positive non-monetary effects: Among others, better access to financial services through microfinance has been found to make households more resilient to health shocks by offering income and consumption smoothing opportunities (Islam & Maitra 2012, Gertler et al. 2009), to reduce emotional stress (Mohindra et al. 2008), and to improve the uptake of costly health services (DeLoach & Lamanna 2011).

Despite this, microfinance has also received some criticism: In the recent years, an increasing number of studies have challenged the overly positive view of microfinance as a panacea in the fight against poverty (Morduch 1998; Morduch 2000; Littlefield et al. 2003). In particular, it was criticized that microfinance fails to reach those in greatest need, who are sometimes deliberately excluded from microfinance schemes (Hermes & Lensink 2011). Further often cited problems are related to the charging of high interest rates for microcredit, over-indebtedness from multiple sources, the crowding out of informal (i.e. community or family-based) lending, as well as unethical lending practices and the creation of stress due to (deliberately imposed) social pressure (Montgomery 1996; Morduch 1999). Because of such issues, some studies even suggested that the provision of credit to poor household may have negative effects (Hudon & Sandberg 2013; Schicks 2014; Priyadarshie & Ghalib 2012). Others have advocated the stronger use of saving accounts and microinsurance schemes arguing that these are better suited to serve the poor clients' needs in contrast to the traditionally offered micro loans, which still make up the largest share of the microfinance market worldwide (Collins et al. 2009; Microcredit Summit Campaign 2015).

The evaluation of the impact of microfinance is challenged with different econometric issues, such as self-selection problems, that make it difficult to disentangle causation from correlation and to

¹ The umbrella term MFI is used for both non-profit and for-profit organizations. Today, microfinance services are offered by different institutions, including credit unions, commercial banks, NGOs, and cooperatives.

obtain accurate estimates. Several scholars have argued that these problems may have biased the impact estimation in earlier studies, which were either based on cross-sectional or simple longitudinal data (Banerjee et al. (2015), Duflo et al. (2015)). In the recent years, randomized controlled trial (RCT) designs were increasingly employed to test for the impact of development interventions. In randomized evaluations, the participants from the target population are *randomly* assigned to a control and treatment group, whereas only the latter is exposed to a stimulus, such as an intervention. Because of the exogenously imposed random assignment and the controlled setting of the stimulus, no other factor can influence whether an individual is exposed to an intervention or not, allowing for an unbiased effect estimation.²

Summarizing the empirical results from six recent randomized evaluations on the impacts of microcredit from different locations, Banerjee et al. (2015) note a “lack of evidence of transformative effects on the average borrower” (p3). Yet, there is some heterogeneity in the treatment effects: While microcredit does seem to be beneficial for some clients, it has no or even negative effects for others (for other reviews see van Rooyen et al. (2012), Duvendack & Palmer-Jones (2012) or Banerjee (2013)). Similar ambiguous or moderate effects were reported in other (quasi-) experimental evaluations, such as by Duflo et al. (2013), Crépon et al. (2015), Karlan & Zinman (2011), or Kaboski & Townsend (2011; 2012)).³ The bottom line of the recent evaluations is that providing access to financial capital and services alone may not be sufficient to bring substantial improvements, in particular regarding some of the other pertinent factors correlated with poverty, such as weak health, low education, and poor living conditions (Roodman & Morduch 2009).

As a reaction to the criticism raised, microfinance has started to undergo a fundamental transformation in the past years. Following a more holistic development approach, an increasing number of MFIs have shifted their focus from exclusively offering financial services, such as micro-loans or insurances, to more diversified portfolios including non-financial services, such as education and business trainings (Fisher & Sriram 2002). As part of this trend, several organizations got engaged in the development and implementation of integrated health programs. Among others, these programs include services related to community health education, the financing of medical expenditures, health care and treatment, or medical support (Leatherman et al. 2012; Geissler & Leatherman 2015; Hamad et al. 2011).

² Randomized evaluations, which are often described as ‘gold standard’ in empirical research (Barrett & Carter 2010: 516), offer a powerful tool that has fundamentally transformed the field of development economics. Despite their advantages, conducting an RCT is also challenged with various potential issues, such as ethical problems, non-compliance with treatments, experimenter effects, or low generalizability (Barrett & Carter 2010; Deaton 2010).

³ A related strand in the literature studies the effects of the unconditional distribution of capital to poor households outside of microfinance schemes. For instance, de Mel et al. (2008) randomly distributed grants of about US\$100 (control) and US\$200 (treatment) either in cash or in-kind without repayment obligations to microenterprises in Sri Lanka. The authors find on average real returns to capital that significantly exceed market interest rates. Like the studies analyzing the impact of microfinance, the authors report large heterogeneity in treatment effect sizes. Surprisingly, while the positive impact of easing capital constraints is particularly strong for male owned enterprises, there is no significant effect on returns for enterprises owned by females. This challenges the standard lending practices of many MFIs, which offer loans exclusively to female borrowers (see also McKenzie & Woodruff (2006); McKenzie & Woodruff (2008), or Fafchamps et al. (2011)).

The provision of such additional services may not merely affect the clients' health, but may also result in a greater effectiveness of the traditionally offered financial services due to *complementarities* (Desai & Tarozzi 2011).⁴ In some cases, having access to microfinance may only generate a positive impact for poor clients, if constraints other than financial ones are simultaneously relaxed. Often named barriers to the effectiveness of microfinance are lacking economic capacities, a non-entrepreneurial mindset, and insufficient financial literacy (Drexler et al. 2014). However, also poor health can be a strong impediment. Health shocks or an overall bad health condition may impose additional financial and emotional burdens on affected households possibly forcing them to consume a large share of their capital or to reduce economic activities. If such complementarities exist, there is also an economic rationale for MFIs to move beyond their original microfinance core and to provide integrated health programs: By investing in health prevention and by making their clients more resilient to health shocks, MFIs can increase the effectiveness of their financial services and ultimately reduce risks in their portfolios.

The provision of essential health services through MFIs may seem challenging at first given that these services are not related to the core activities of the implementing organizations, which may face considerable capacity and human resource constraints. On the other hand, there are also unique advantages to the provision of health services through MFIs. Given their increasing number and widespread geographical presence, they can build on a well-developed grass-root infrastructure with access to remote areas beyond the reach of both private and public health facilities. Moreover, many MFIs can build on long-term relationship with their clients allowing them to learn about and address their specific health needs. Apart from the MFIs' ability to effectively reach out to underserved, poor populations, another potential advantage is the primarily female client base of most MFIs. In several studies, women have been shown to be more likely than men to reinvest their income for the bettering of the living situation of their families and children, including investments in health (Pitt et al. 2006; Duflo 2003). Improving women's access to essential health services may hence generate important external effects that benefit not only the women, but the entire household (Leatherman & Dunford 2010).

Despite the increasing importance of integrated health programs implemented by MFIs outside the public sector, there is little rigorous empirical evidence on the impacts of these initiatives on the livelihood of the poor and the specific barriers faced by the implementing organizations (Leatherman et al. 2012; Geissler & Leatherman 2015). This dissertation aims to bridge the research gap by studying the health initiative of a social development MFI in the Philippines, a lower-middle

⁴ Banerjee (2013: 509ff) names six reasons why microcredit may only have a limited impact in some cases. Either borrowers are not credit constrained, borrow only for consumption purposes, do not want to invest (e.g. because of an S-shaped production function), feel that the terms of loan repayment are too strict, or are not particularly good at growing businesses, either because they lack the necessary capacities or are characterized by poor financial judgment. In this context, facing a bad health conditions may likewise negatively affect the impact of microfinance if complementarities exist.

income economy, and by examining its impact and outreach in poor communities. Despite its geographical focus, the results of this study have more wide-reaching applicability and implications that go beyond the specific study context.

In the past decades, the Philippine government has started several reforms to achieve universal health care. The reforms have addressed deficits in the public health sector, such as poor accessibility and insufficient financial support for medical treatments. As a consequence of these efforts, there have been significant improvements in the health situation of many Philippine families. Infant mortality (<1 year) and child mortality (<5 years) dropped between 1990 and 2012 by 58.8% and 62.8%, respectively. Maternal mortality decreased in the same time period from 209 to 120 cases (42.6%) per 100,000 live births (WHO 2013b). Despite these progresses, the Philippines were not able to fully achieve the health-related Millennium Development Goals by end of 2015 and there is still a strong need for further improvements in health care access in many impoverished communities, where a large percentage of diseases is not properly treated and sometimes not even diagnosed. According to recent studies in the Philippines, 6 out of 10 Filipinos die without being examined by a doctor (Solon et al. 2004; Republic of the Philippines Department of Health 2015). This is also reflected in the mortality statistics of the country: For the year 2011 the World Health Organization reports a mortality rate of 25.6% probability for men and 13.7% probability for women to die between the age of 15 and 60, as compared to an average of 11.8% for men and 8.1% for women in the entire Western Pacific Region (WHO 2013c). Also, health insurance coverage remains low, especially among the poorest households.

This dissertation was written in close cooperation with the Kasagana-Ka Development Center Inc. (KDCI), a Philippine non-governmental social development organization, which uses microfinance services as primary instrument in its fight against poverty. KDCI operates its offices in impoverished neighborhoods in Metro Manila and the surrounding provinces, where it supports almost 30000 mostly female clients. The majority of the poor clients operate micro-enterprises as a mean to support their families with an additional income. The clients are clustered in centers which form the administrative units in each neighborhood. In order to sustainably improve the health situation for the clients and to raise awareness about disease threats, KDCI has started an integrated health program in 2009 in cooperation with NGOs from the health sector. The program has a strong community focus and follows a participatory approach actively involving the community members in the implementation of the activities.

The health program is based on three main pillars: First, as part of the initiative, KDCI collects and monitors the clients' health records; second, the organization provides health education, laboratory test packages and routine check-ups to improve health prevention; and third, the program offers curative services to the clients including the support with health loans, cheap medicine, and organized referral to medical institutions. As supportive element of the health program, KDCI has started to train *community health workers* (CHWs) from the client population. These lay health workers are meant to fulfill different tasks in their neighborhoods related to three priority activities, namely the dissemination of information and knowledge, the improving of health monitoring, and the

raising of social support as primary contact persons. Among others, this dissertation analyzes the impact of this CHW initiative using a randomized controlled trial design.

The data for this thesis was collected in face-to-face-interviews in two survey waves in February 2014 (n=792) and April 2015 (n=1064). The research instruments used for the main follow-up survey in 2015 can be found in Appendix D. Two visits anteceded the first data collection serving as an exploration of the research field and to conduct first explorative interviews. The sample for the standardized surveys was drawn among the KDCI clients using a multi-stage sampling procedure. First, three wider geographical areas in Metro Manila and the adjacent province of Rizal were selected by my partner organizations. These areas reflect the diverse socio-demographic and geographical background (e.g. rural and urban) of the client population. Importantly, as main selection criterion, the CHW program was not yet introduced in most neighborhoods in the three areas, which hence offered a suitable environment for conducting the randomized evaluation. From the three areas, 70 centers were randomly selected as primary sampling units (PSU) in a second step. In a third step, a number of individuals were drawn from each center (relative to the size of the center) and interviewed. Apart from the main individual data, I collected a broad range of additional data on CHWs' characteristics, on the social networks in the communities, and the local public health infrastructure. As an extension of previous studies, this rich data enables me to get a deeper understanding of the underlying mechanisms that determine the health situation of the poor households and influence the uptake of the offered health services.

The collection of the quantitative data followed strict ethical guidelines. The surveys were announced to the clients prior to the data collection and informed consent was taken before every interview. Interviews were conducted by trained interviewers who either had a background in medicine (e.g. students of medicine, nurses) or were professional interviewers with experiences in conducting research in impoverished neighborhoods. All research instruments were pilot tested several times in an iterative process and approved by the KDCI board of trustees. In the analysis, I employ a broad range of estimation methods and innovative research designs. Among others, to answer my research questions, I use experimental designs, instrumental variable approaches, social network analysis, propensity score matching, spatial methods, and various data aggregation techniques, such as principal component analysis, cluster analysis, and latent class modeling. The quantitative results are complemented with findings from qualitative explorative interviews with health workers and members from their communities. Based on rigorous evidence, this thesis provides useful lessons which are of high relevance not only for academic research, but also for development organizations and policy makers.

The dissertation consists of three mainly empirical chapters, which will be presented in the following. Each of the chapters is based on a separate study. While the first and second chapter are directly linked to the KDCI health program, the last chapter studies more broadly determinants of health behaviors and lifestyles, also considering the utilization of the services offered by my partner organization. Even for those papers for which I am single author (chapter 1 and 2), I use the pronoun "we" throughout the text to improve readability. The different studies aim to answer

various research questions related to poverty, vulnerability, and health: Can integrated community health programs initiated by MFIs outside the public sector contribute to reaching health improvements in poor communities? What factors influence clients' acceptance of such programs? What are possible barriers faced by the implementing organizations? How do peers influence the utilization of the offered health services? How does education affect health behaviors and lifestyles in the studied low-income context and what is the role of health knowledge and information in explaining behavioral differences between educational strata?

Chapter 1 - When Communities Participate in Primary Health Care: A Randomized Controlled Trial of a Community Health Worker Program in the Philippines. In many developing countries, public health systems are confronted with a significant shortage in professional health workers, which is recognized as a major constraint to economic development and poverty reduction. In 2013, more than 7 million health workers were missing worldwide, based on WHO estimations (WHO 2013a). Community health workers (CHW) have been proposed as a cost-effective and inclusive solution to address the enduring shortage. CHWs are members of the underserved communities who work as support health personnel in their neighborhoods after receiving a short training. With their close relationship to the communities they serve as a bridge between their peers and the public sector allowing them to not only widen the supply of health services, but also to actively influence demand-side restrictions in health care utilization, such as informational or behavioral constraints (Ensor 2004; Dupas 2011b; Ahmed et al. 2006). In the recent years, microfinance institutions (MFIs) have increasingly implemented own small-scale integrated health programs with CHW components. So far, little is known about the impacts and implementation barriers of these initiatives. In this study, we evaluate the CHW program of our partner organization using a cluster-randomized controlled trial design. We find that the intervention had a positive impact on the dissemination of specific information about the health program and health monitoring. However, there is no evidence for a positive effect on general knowledge and social support in the communities, suggesting that the program did not achieve all of its targeted objectives. Acceptance of the program in the communities was a key driver of program success. Apart from the CHW's engagement, her social networks in the neighborhoods and the existing alternative health infrastructure played the strongest role for program awareness and take-up by the community. Respondents were more likely to make use of the CHW's services if the health worker was actively pursuing her function, if they were close friends with the CHW, if the CHW had a central position in the client network, and if public health facilities, in particular hospitals, were not easily accessible in the neighborhood. We furthermore find evidence for potential complementarities between the CHW program and the existing primary health care infrastructure. Based on our results we discuss potential extensions of the initiative and derive policy recommendations that are relevant for community health programs in similar contexts.

Chapter 2 - Following the Peers: The Role of Social Networks for Health Care Utilization in the Philippines.

Social networks can influence the acceptance and uptake of health interventions in various ways. Among others, they can provide resources, shape beliefs, and make individuals imitate each other. This chapter studies peer effects on the use of essential health care services offered by our partner organization in impoverished neighborhoods in the Philippines. We apply a novel IV identification strategy to overcome the well-known challenges in the estimation of peer effects in non-experimental, cross-sectional settings (Manski 1993, Bramoullé et al. 2009). The strategy uses structural information from social networks and the existence of overlapping peer groups for an unbiased estimation. The analysis is based on original survey data, which was collected among the KDCI clients and which contains rich sociometric information about the micro-finance group networks. We find positive and substantial peer effects in the communities. An increase in program uptake of 10% in the peer group leads to a 6.6% increase in individual health care utilization. We estimate hazard models to further explore underlying mechanisms. Peer effects are found to be strongest immediately after first exposure to the intervention and to fade out over time. While the strength of the relationship with the peer does not seem to matter for the adoption decision, the peers' structural position in the network does. Interestingly, peers with fewer connections seem to have a particularly strong influence on high status individuals with a central position in the network. This finding may be due to a motivation of high status network members to preserve their reputation as good clients in the microfinance groups making them more susceptible to external influences by their lower status peers.

Chapter 3 - The Health Knowledge Mechanism: Evidence on the Link between Education and Health Lifestyle in the Philippines

(joint work with Sebastian Lutz). Studies have found substantial differences in health-related behavior and health care usage between educational groups, which may explain part of the well-documented educational gradient in health. The allocative efficiency hypothesis offers a behavioral explanation for these reported differences (Rosenzweig & Schultz 1989; Kenkel 1991). According to this theory, the educated possess more health knowledge and information, allowing them to make better health choices. We provide an empirical test of this mechanism using original survey data from the Philippines, a lower-middle-income country. As an extension of previous studies, we construct a comprehensive index that captures different dimensions of health knowledge. The index is based on 28 openly answerable questions about various health topics, such as disease prevention, medical treatments, child health, family planning, and sexual transmittable diseases. Furthermore, as main outcome we consider an individual's health lifestyle, which we define as an aggregate expression of different health practices, such as disease prevention, eating habits, and exercising. To construct our aggregate lifestyle measure, techniques of cluster and latent class analysis are used allowing us to account for the fact that health decisions are not made in isolation, but may strongly depend on each other. Applying a generalized propensity score matching approach, we find convincing support for the allocative efficiency argument. Schooling is significantly related with health knowledge levels and, through this channel, seems to exert a positive effect on health lifestyle as an aggregate of different health behaviors. Overall, knowledge explains between 65% and 69% of the education effect, which corresponds to twice

the mediation effect of economic resources, suggesting a high relevance of this factor in the education-health lifestyle relationship. Based on our findings, we argue that education plays a particularly important role for the dissemination of information and for raising awareness about health threats in the studied low-income context, where access to knowledge and information might be more restricted than in developed countries.

Chapter 1

When Communities Participate in Primary Health Care: A Randomized Controlled Trial of a Community Health Worker Program in the Philippines

1 Introduction

Several low- and middle-income countries face a considerable shortage of human resources in health care, often leaving the poorest parts of the population underserved. According to the WHO, in 2013, more than 7 million skilled health workers were missing worldwide with countries in Sub-Saharan Africa and South- as well as Southeast Asia being particularly affected (WHO 2013a). As a result of the shortage, millions of people are disabled or die every year from preventable and/or treatable diseases (Bhutta et al. 2010; Global Health Workforce Alliance 2008). The shortage has been acknowledged as a major constraint in building resilient health systems and in achieving health-related development goals on a global scale (Anand & Bärnighausen 2004).

Community health workers (CHW) have been proposed as a cost-effective and inclusive solution to address the persistent health worker shortage. CHWs are members of the underserved communities who work as support health personnel in their neighborhoods after receiving a short health training. Among others, CHWs have been used to disseminate information, promote health care utilization and healthy lifestyles, monitor treatment compliance, and perform small routine check-ups. Because of their close relationship to the communities they can serve as a bridge between their peers and the public sector. This enables them not only to widen the supply of health services in the communities, but also to actively influence demand-side restrictions in health care utilization, such as informational or behavioral constraints (Ensor 2004; Dupas 2011b; Ahmed et al. 2006).

In the past years, an increasing number of microfinance institutions (MFIs) have entered the market for health services shifting their focus from exclusively offering financial services, such as micro-loans or insurances, to more diversified portfolios including non-financial services, such as education and business training. As part of this trend, several MFIs got engaged in the development of health programs including CHW components.⁵ Even though the implementing organization may

⁵ Apart from their social mission, there is an economic rationale for MFIs to provide health-related services: Health shocks represent a major threat for the income earning activities of poor households and can result in loan defaults. By improving the health of their clients and by making them more resilient to health shocks, MFIs can increase their clients' productivity and hence reduce risks in their portfolios. Also, by offering additional services, the MFIs increase their attractiveness for new clients.

face administrative challenges as well as capacity constraints, there are unique advantages to the provision of health services through MFIs given their increasing number and widespread geographical presence (Leatherman & Dunford 2010; Leatherman et al. 2012). MFIs serve more than 200 million borrowers of which a large share lives in severe poverty (Microcredit Summit Campaign 2015). Building on a well-developed grass-root infrastructure both in urban and rural settings with close connections to the local communities, MFIs can effectively reach out to these mostly underserved populations and address their specific health needs.

MFIs may represent a well-suited distribution channel for health services not only because of their wide outreach, but also because most of them target women as main client group. This is based on the view that women are more likely than men to reinvest their income to improve the living situation of their families in general and their children in particular, including investments in health (Pitt et al. 2006; Duflo 2003). Empowering women through microfinance and improving their access to health services and information may hence generate important spill-overs that benefit not only the women, but the entire household. Furthermore, the principles of microfinance heavily rely on group solidarity, trust, regular meetings, and common support, which matches the fundamental peer support idea of the CHW concept. Indeed, there is evidence showing that microfinance programs can create non-monetary effects on health by making households more resilient to health shocks through income smoothing opportunities (Islam and Maitra 2012), by reducing emotional stress (Mohindra et al 2008), and by improving uptake of costly health services (DeLoach and Lammanna 2011). Yet, there is little rigorous evidence on the impacts of MFI-led CHW programs and the specific barriers faced by the implementing organizations.

This study evaluates a CHW program in the Philippines using a cluster randomized controlled trial design. The program was implemented by our partner organization, the Kasagana-Ka Development Center Inc. (KDCI), a social development organization with a strong microfinance component. As part of the program, health workers are recruited among the clients from impoverished neighborhoods. After receiving a short training, the CHWs are sent back to their communities, where they are supposed to (i) disseminate information, (ii) improve health monitoring, and (iii) raise social support by serving as primary contact persons in case of an emergency or health concern. Apart from its general impact, we are interested in the mechanisms that contributed to the success or failure of the program. In particular, we study the role of program acceptance, defined as awareness and take-up of the program by the community members, which has been shown to be a critical success factor in previous health interventions (Desai & Tarozzi 2011; Prost et al. 2013; Fottrell et al. 2013; Saha & Annear 2014).

The Philippines offer an interesting case for this study. The country has seen remarkable improvements in population health in the past 40 years: Infant mortality dropped by two thirds since 1970 and life expectancy increased from an average of 56 years in 1970 to over 70 years in 2015 (WHO 2013b; Republic of the Philippines Department of Health 2015). Despite these progresses, significant challenges remain: The country lags behind most neighboring countries in terms of health outcomes and the achieved improvements often did not reach the poorest parts of the population

contributing to high levels of health inequality in the country (both along social and geographical strata). Especially in rural areas, health care capacities are low, which is partly due to the massive emigration of health workers. Annually, about 17,000 to 22,000 health professionals emigrate to work outside the country (WHO 2014) making the Philippines one of the leading exporters of human health resources worldwide (Lorenzo et al. 2007). The government in the Philippines has reacted to the situation by advancing several reforms to strengthen universal health care and to develop a decentralized primary health care sector. In this setting, MFIs can supplement the public efforts by providing essential health services, in particular in the medically most underserved areas.

The main data for this study was collected using face-to-face-interviews in two survey waves in February 2014 (n=792) and April 2015 (n=1064, including 36 CHWs), before and one year after the intervention. The sample for the interviews was drawn among the female clients of our partner organization from randomly selected communities (m=70) in three wider geographical areas in Metro Manila and the adjacent province of Rizal. Apart from the interviews with the clients, we collected a broad range of additional data on CHWs' characteristics, on the social networks in the microfinance groups, and the local public health infrastructure. Extending beyond previous studies, we use this rich data base to get a deeper understanding of the underlying mechanisms that matter for program acceptance and ultimately program success in the communities. The quantitative analysis is complemented with insights from qualitative explorative interviews with health workers and regular clients.

In our evaluation, we find evidence for positive intervention impacts. The CHWs were successful in raising clients' awareness of the health program of our partner organization and in improving health monitoring in the communities. Taking the different impacts of the program together reveals a 3.0-4.0% improvement in the evaluated outcomes caused by the CHW intervention. On the other hand, we do not find a significant intervention impact on the dissemination of general health knowledge and on the respondents' perceived social support suggesting that the program has not achieved all of its priority objectives. Furthermore, we observe substantial heterogeneity in the aggregate program impact across treatment group communities, which seems to be driven by differences in clients' acceptance of the program, i.e. their program awareness and take-up. Further exploring potential underlying mechanisms, we find acceptance to be strongly correlated with the health worker's level of engagement, her relationships to the community, and clients' access to alternative public health facilities: Respondents were more likely to make use of the CHW's services if the health worker was actively pursuing her function, if they were close friends with the CHW, if the CHW had a central position in the client network, and if public health facilities, in particular hospitals, were not easily accessible in the neighborhood. Interestingly, a greater number of primary health care (PHC) units in an area led to an increase in the uptake of the CHW program which may point towards important complementarities between the evaluated initiative and the existing primary health infrastructure in the neighborhoods.

The remainder of the paper is structured as follows. Section 2 provides additional background information on the history and development of CHW programs worldwide (2.1), on previous evidence on the effectiveness of such initiatives and the role of program acceptance (2.2), and on the evaluated KDCI health program (2.3). Section 3 discusses the research design of this study and the measurement of key variables. The findings are presented in Section 4 and discussed in Section 5. Section 6 links the findings to different policy recommendations and the final section concludes.

2 Background Information

2.1 Community Health Worker Programs

Historically, the CHW concept is not a new one. The first larger programs were implemented in the 1950s and 1960s in East- and South-East-Asia. Among these, the Chinese Barefoot Doctor or Village Doctor Program, fully established in the early 1950s, was one of the most prominent which served as a guiding concept for many other initiatives, such as in India or Indonesia that soon followed. Until the 1970s more than 1 million Barefoot Doctors were trained and worked mostly in the underserved rural areas in the western parts of the country.

In 1978 the international community acknowledged the role of community participation in primary health care (PHC) in the *Alma-Ata Declaration*, in which the participating countries agreed that the “people have the right and duty to participate individually and collectively in the planning and implementation of their health care” (WHO 1978, 2). In the aftermath of the declaration, several countries started developing own public CHW programs.⁶ Yet, only few years after the declaration in the late 1980s, negative experiences with large-scale programs and the debt-crises in several low-income countries led to a decrease in financial and political support and ultimately to a loss of momentum of the community participatory movement in PHC. Only the 1990s and 2000s brought a revival of community health programs due to the experiences with the global HIV/AIDS epidemic as well as the increasingly pressing shortage in professional health workers (Lehman & Sanders 2007). In particular, following the declaration of the Millennium Development Goals, international organizations have been actively promoting the use of lay health workers as an integral part of the PHC workforce and as a mean to achieve the health-related development goals on a global scale. The 1 Million Community Health Worker Campaign, for example, is a private-public partnership of UN agencies, civil society organizations, firms, and academia, which support the scaling-up of CHW programs worldwide.

In the past 50 years, non-governmental organizations (NGOs) played an important role in the development of the community participatory approach. In an attempt to extend health care to underprivileged populations not reached by the public sector, CHW programs were established in

⁶ CHW programs were also established in several developed countries. For example, there are major CHW programs for disadvantaged populations, such as immigrants or seasonal workers, in the US. (US Department of Health and Human Services 2011; Witmer et al. 1995)

parallel to and sometimes anteceding national programs.⁷ Increasingly in the past years, also micro-finance institutions (MFIs) got engaged in the provision of essential health services through CHWs. One of the first large-scale MFIs which started an integrated health program with a CHW component was BRAC (formerly the Bangladesh Rural Advancement Committee), a non-profit organization of Bangladeshi origin which operates in more than 11 countries today. As part of its program, BRAC has trained thousands of CHWs since the mid-1980s (Reichenbach 2011). The majority of their so called frontline CHWs are members of one of BRAC's microcredit saving groups. Unlike the BRAC program, most MFI-led CHW programs today are of small-scale with restricted access to financial and human resources making it a challenge to successfully implement and operate these initiatives (Geissler & Leatherman 2015).

The CHW concept strongly builds on the idea of peer support in health care and prevention. Being themselves part of the underserved communities, the CHWs can effectively reach out to other community members providing not only health advice and consultation, but also emotional support and practical assistance (Fisher et al. 2014). There is no uniform definition of the CHW concept and functions. It is possible, however, to distinguish the programs along several dimensions: Apart from the distinction between public and privately organized initiatives, one can distinguish specialist and generalist CHW programs, whereby the former are directed towards a single health issue in the communities, such as tuberculosis or diabetes care. Perry et al. (2014) names four tentative types of CHWs: (i) Semi-professional auxiliary health workers (AHW) with extensive training for at least one year and a strong integration in the formal public health sector; (ii) health extension workers with extensive training of up to one year, who receive like the AHW a regular salary and have a fix working schedule; (iii) regular community health volunteers with specified duties, such as regular health monitoring, but a shorter training period; and finally, (iv) intermittent community health volunteers, who receive only a short orientation training and who mostly perform health promotion, information dissemination, and community mobilization activities. According to this typology, we study a small-scale intermittent community health volunteer program in this evaluation.

2.2 Previous Evidence

2.2.1 *Impact Evaluations*

Several large-scale public CHW programs were subject to evaluation in country-case studies. For example, the Brazilian *Agente de Saúde* program, which is among the largest CHW programs in the world with about 25000 active health teams, was evaluated by Cufino Svitone et al. (2000). The authors report large-scale positive effects of the program on several observed priority activities, such as on infant and maternal health. Infant mortality, for example, dropped by 32% in the first

⁷ Longtime, CHW were not only seen as providers of health care, but also as agents of change. Based on the ideals of participation and ownership, these were supposed to empower their communities and to increase self-reliance (Perry et al. 2013).

5 years after program introduction. Other case studies on public CHW programs were conducted in India (Chatterjee 1993) or Pakistan (Douthwaite & Ward 2005), among others. The studies conclude that if CHW programs are well implemented, they can have substantial impacts on health outcomes in disadvantaged communities (Lehman & Sanders 2007).

More rigorous empirical micro-level studies from low- and middle-income countries provide further insights on the impact of CHW programs on various outcome measures also reflecting the diversity of program scopes (for an overview see Perry et al. (2014)): For instance, Davis et al. (2013) find a one-third reduction of childhood undernutrition in Mozambique after the introduction of a CHW program (similar evidence for Vietnam by Sternin (1999) and Sternin et al. (1996)). Hall (2011) reports a 5.6 time increase in the odds of exclusive breastfeeding in communities with a CHW. Similarly, positive effects of CHW programs have, among others, been found for the distribution of oral rehydration salts and nutrients (Taylor & Greenough 1989), the promotion of hand-washing and clean environments (Luby et al. 2004; Luby et al. 2005), community education about the risks of Malaria, and the promotion and monitoring of antiretroviral therapies and tuberculosis treatments (Farmer et al. 2001; Wringe et al. 2010; Chowdhury et al. 1997).

While most evaluations are focused on large-scale public programs, there is little evidence on CHW programs which are implemented by MFIs outside the public sector (for an overview of evaluations on integrated health programs, see Leatherman et al. (2012)). One of the first empirical studies by Armin et al. (2001) is focused on a program on reproductive health offered to microfinance clients in Bangladesh. Selected clients were trained to promote family planning among their neighbors. Few months after program implementation, the authors find a significant increase in contraceptive use and a decline in fertility in the surveyed communities. Another study from Bangladesh by Ahmed et al. (2006) evaluate a BRAC community volunteer program for ultra-poor households using a difference-in-difference approach. Two years after the baseline survey, the authors find the program to have large-scale positive effects on poverty and health-seeking behavior at formal institutions (aligned with a reduction in self-care/self-treatment).⁸

Desai & Tarozzi (2011) represent one of the few rigorous studies on MFI-led CHW programs outside Bangladesh. The authors conducted a randomized controlled trial on the impact of micro-credit and family planning services provided by CHWs in rural areas of Ethiopia. Interestingly, extending previous research, the authors also study complementarities between the provision of microcredit and the health intervention (see also Dohn et al. 2004). They do neither find evidence for a positive effect of the two isolated interventions on contraceptive use, nor do they find evidence for potential complementarities. Women's preference for contraceptive methods other than the ones offered by the CHWs may have contributed to an attenuation of the impact of the family

⁸ See also Hadi (2002) for evidence on a BRAC community volunteer initiative on knowledge about acute respiratory diseases, one of the leading causes of morbidity and mortality in childhood in many low-income countries. The authors report more ambiguous results than the other BRAC study.

planning program further highlighting the importance of tailoring interventions to local habits and contexts.

2.2.2 Program Acceptance

All relevant studies, except one, use non-experimental approaches in their evaluations of MFI-initiated CHW programs leaving some uncertainty on the causal impact of the initiatives on health outcomes in the communities. Also, based on the previous studies, little is known about the actual mechanisms that have led to program success or failure. Tentatively, evaluations of health interventions point towards the important role of program acceptance by the community (Desai & Tarozzi 2011; Prost et al. 2013; Fottrell et al. 2013; Saha & Annear 2014). Indeed, as experiences with CHW programs in other countries show, mistrust towards health workers and insufficient program anchoring in the communities can lead to program failure (Lehman & Sanders 2007).⁹ Despite its importance, only few studies have empirically addressed this topic so far. Apart from analyzing the overall impact of the intervention, we study determinants of program acceptance, which we define as awareness and program take-up among its main target group, the clients of our partner organization.

Several factors may influence program acceptance (Ensor 2004; Jacobs et al. 2012). We focus in our analysis on three categories which appear to be particularly relevant for the research topic at hand: (i) the quality of the services delivered by the health worker, i.e. her motivation, engagement and competence as well as the promotion of the program in the communities (*quality aspect*); (ii) her relationship to the target group of KDCI clients (*relationship aspect*); (iii) and the availability of alternative public health services in the communities (*infrastructural aspect*).

We consider program quality as first central aspect. The underlying hypothesis is that the community members are more likely to make use of the program, if the CHW is motivated and engaged in her activities, if she has good skills and knowledge, and if the program is continuously promoted. Previous research has identified health worker motivation as a critical factor for health worker retention and the successful provision of health services in poor communities (Tremblay et al. 2009; Ludwick et al. 2014). Apart from general work motivation and engagement, we analyze the effects of CHWs' initial motivation to start their work. The explorative interviews with health workers in the field revealed that there is a stark discrepancy between volunteers who participated in the trainings to support the community (as intended by KDCI) and volunteers who participated in the training for an individual rationale, for example to support sick members of their own families. Those who express stronger pro-social motives in pursuing their activities are expected to be more engaged and hence more successful in raising program acceptance.

As second aspect, we study the role of social networks and relationships among the clients of our partner organization (Fisher et al. 2014; Perkins et al. 2014). Peers have been shown to be relevant

⁹ Low levels of awareness and take-up rates are a general challenge for the implementation of health programs and the introduction of new health products in developing countries (Dupas 2011).

for the utilization of health services in other contexts (Deri 2005; Devillanova 2008). For instance, they can be a valuable source of information and serve as role models influencing individual health decisions (Jackson 2011). In our study, we analyze the health worker's relationship to the other community members using social network data. We expect our respondents to be more likely to be aware of and make use of the CHW program if they have a direct relationship with the health worker; and that this effect is more pronounced, if the relationship is strong (e.g. close friends). Health is an intimate topic and people with a closer relationship to the health worker are likely to have better access to her services and more trust in her abilities and discretion, raising their acceptance levels. Indeed, studies have found close ties to be more influential than weak ties in influencing health-related decisions (Putnam 2000; Shakya et al. 2014; Perkins et al. 2014). Furthermore, we consider the role of the position of the CHW in the microfinance groups. A central position in the network, i.e. several ties to other network members, is often interpreted as a sign of social prestige, popularity, and status (Marsden 2002). We expect acceptance levels to be higher in those networks, in which the CHW takes an overall more central position.

As final aspect, we consider the role of alternative public health facilities in the neighborhoods, which can serve as substitutes to the services provided by the CHWs. Physical accessibility has long been recognized as one of the major determinants of health care utilization. Bad transportation conditions and long distances to health facilities raise the pecuniary and non-pecuniary costs of care-seeking and may reduce an individual's willingness to seek help (Yao et al. 2013; Higgs 2009; Joseph & Phillips 1984). In this study, we focus on the accessibility of the public health infrastructure in the communities, which is complemented by the CHW services. We expect greater demand for the CHW services in areas with a less developed infrastructure, where respondents have otherwise little access to public health facilities, such as hospitals or primary health care units.

2.3 Institutional Framework: The KDCI Health Program

This project was conducted in cooperation with the Kasagana-Ka Development Center Inc. (KDCI), a Philippine nongovernmental development organization. KDCI operates in impoverished neighborhoods in Metro Manila and the surrounding provinces, where it uses microfinance services as primary instrument in its fight against poverty. The organization supports almost 30000 mostly female clients in 23 field offices with microcredits using a co-maker-lending model. The majority of the poor clients run micro-enterprises to support their families with an additional income. Clients are clustered in centers, which represent the KDCI administrative units in the neighborhoods. Each center has a size of up to 42 members and is supervised by a so called socio-economic officer (SO) who manages the center activities and maintains records. Clients of each center convene once a week to settle loan repayments and to discuss personal matters.

Besides microfinance services, KDCI provides non-financial services to its members, including benefits related to education, shelter, access to social protection, and assistance during calamity and periods of distress. As a reaction to deficits in the public health system and to better serve the

clients' needs, KDCI started a health program in 2009 in cooperation with the Healthdev Institute (<http://www.healthdev-institute.org/>), a Manila based NGO with focus on health support, education, and capacity building. The KDCI health program consists of three components: First, the collection and monitoring of clients' health records; second, prevention through health education, the provision of laboratory test packages and routine check-ups; and third, curative services, such as financial support with health loans, the provision of cheap medicine, and organized referral to medical institutions.

As supportive element of the health program, KDCI trains CHWs in a four-day training, during which participants obtain basic knowledge about medical conditions, treatments, and prevention strategies.¹⁰ Furthermore, they learn how to perform routine examinations, such as blood pressure measurement. The trainings are conducted by professionals together with experienced CHWs. For each neighborhood center, a maximum of one member is trained as CHW. Participants are charged with a small training fee of PHP 1500 (~\$31.5).¹¹ With this fee KDCI wants to ensure that only motivated clients become CHWs and that the program is financially self-sustainable. After the training, the participants return to their communities where they are introduced to the other KDCI members in their new function as health workers.

The program has three *main objectives*, which form the focus of this evaluation: The program aims at (i) disseminating information among clients both specific to the KDCI health program (e.g. information about check-ups) and in general (e.g. information about disease prevention and treatments); (ii) improving health monitoring by encouraging members to undergo check-ups (either provided by KDCI or another organization), having regular vital sign checks-ups (in particular blood pressure), having a personal health care provider, and by promoting the uptake of health insurance; and (iii) raising social support by establishing the CHWs as primary contact persons in case of an emergency or a health concern. All of these objectives can be described as intermediate outcomes in our partner's logical framework. As long term goal, the aim is to improve the overall health situation of the poor by increasing monitoring activities and disease prevention, which are still underdeveloped in the communities. It is worth noting that the different evaluated outcomes are closely related and may influence each other. For instance, by providing additional information about disease threats, CHWs can motivate their peers to undergo a check-up.

The main target group of the intervention are the KDCI clients and their families. In principle, however, the health workers are also allowed to serve other households in the communities. The services are provided free of charge and the CHWs usually live in walking distance to all center

¹⁰ The training sessions consist of 6 modules which cover the following topics: Functions and conduct of CHWs, the importance of good health for well-being, infection channels, the health system and primary health care in the Philippines, referral channels, the importance of a clean environment for healthy living, blood pressure measurement, right nutrition and its impact on health, the human body, vital signs, common diseases and their symptoms, disease prevention, antibiotics and the risks of self-medication, reproductive health and sexual transmittable diseases, ageing and female health, infant and child health, legal aspects of health, and female empowerment.

¹¹ For the purpose of this evaluation, the training fee was reduced to PHP 750 to ensure high compliance with the intervention in the treatment group centers.

members. As of now, the CHW are not incentivized for their engagement. However, there are plans by the organization to introduce a compensation scheme (e.g. in form of loan repayment reductions) in the near future. KDCI encourages their health workers to take an active role, but there is only little monitoring and supervision of CHW's activities. The weekly center meetings play a key role for the activities of the health workers as they offer a well-suited platform for disseminating information, for performing small routine check-ups, and for giving advices and consultation to other center members.

After the announcement of the training, potential candidates for the CHW position are approached by the responsible SO. Commonly, before approaching candidates, the SOs discuss the matter with the center chief who represents the community and provides an insight view on who of the other center members may be interested in and suitable for the position. Usually, only very few clients volunteer to become a health worker, which often restricts the set of potential candidates. CHWs are trained only in larger centers (with a size of 20 clients and more), but this guideline is not strictly followed. The candidates are required to be KDCI clients for a sufficiently long amount of time (usually at least one year), to be in good standing with the organization, and respected by the other center members. Other than that, there are no pre-defined criteria for the selection of candidates and the selection process is not following systematic rules. Since its implementation in 2011, more than 400 KDCI clients have been trained as CHWs (as of December 2015).

3 Methods

3.1 Research Design and Data Collection

3.1.1 Selection of Study Areas

Three broad geographical areas in the north to north-east of Metro Manila were chosen as study areas. The selection was done by KDCI based on two criteria: First, the selected study areas had to represent the diverse social and geographical background of the organization; and second, it was required that the CHW program was not yet implemented in most neighborhoods. One of the selected areas, Batasan, is located in Quezon City, one of the municipalities in Metro Manila. It can be described as an urban district with a well-developed infrastructure and high population density. The second and third study area, Masinag and Montalban, are located at the outskirts of Metro Manila in Rizal Province. In particular the latter area, Montalban, represents a more rural, peri-urban population with little access to health facilities. In total, the three study areas encompass a population of more than 3000 KDCI clients in 142 centers. From within the three areas 70 KDCI centers with about 1500 clients were randomly drawn for the study.

3.1.2 Collection of Main Data and Intervention

Figure 1 illustrates the intervention process and gives an overview of the employed research instruments. The data was collected in two survey waves in February 2014 and April 2015 covering a time span of more than a year. The *baseline survey* was conducted with a subsample of 792 respondents. It included sections on the respondent's utilization of KDCI services, her health constitution, health behavior, health knowledge, and different socio-demographic and household characteristics.

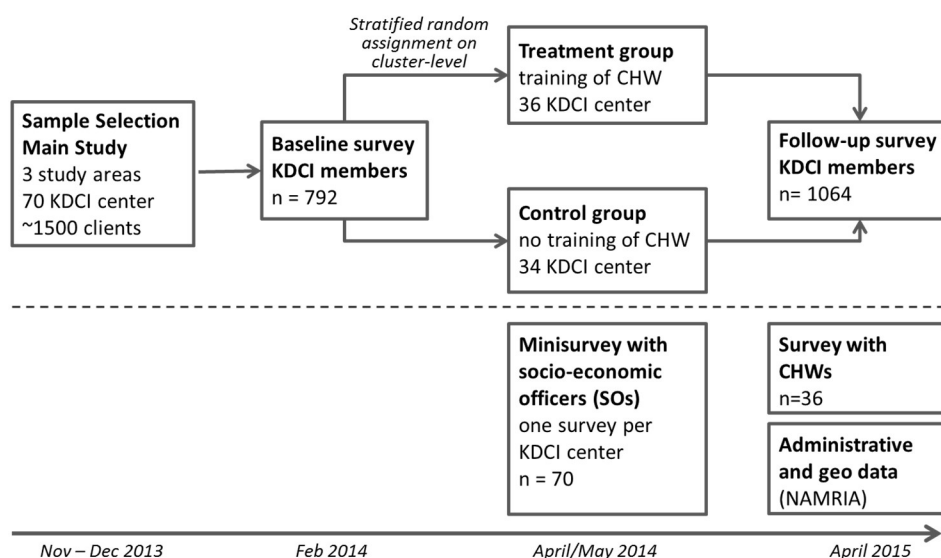


Figure 1 - Research process and instruments

The *experimental assignment* to the intervention took place after the baseline survey in February 2014. The 70 KDCI centers in the sample represent the cluster units that were randomly assigned either to treatment or control group. The cluster randomization was stratified within the three study areas with half of the centers in each area being assigned to each treatment arm. Especially in smaller samples, stratification is preferable to simple cluster randomization as it helps improving the treatment-control group balance and hence the power of the estimation (Duflo et al. 2007). The CHW intervention took place in April and May 2014. It followed the regular KDCI procedures: (i) The CHW training was publicly announced to the center members. (ii) An interested member from each center was selected for the training. The selected person had to be a KDCI client for more than one year and had to be reliable, in good standing, and respected by the other center members. (iii) After the first contact the selected person was given time to discuss the matter with her family. (iv) Upon agreement the client was invited to the training¹². In total, 37 new CHWs (36 after accounting for one drop-out) were trained and started working in their communities.

¹² In two cases, the selected client refused to be trained as CHW. Following the regular procedures, the SOs selected another member as substitute, who later got trained as CHW in the center.

One year after the intervention, in April 2015, a *follow-up survey* was conducted to evaluate the impact of the CHW program.¹³ We were able to increase the sample size by about 250 respondents, i.e. in total 1064 persons participated in the follow-up survey (research instruments in Appendix D). The sample was restricted to persons who were KDCI clients at the time of the intervention or who had become clients within three months after the start of the intervention. This ensures that all respondents were exposed to the intervention for a sufficiently long time. Respondents were randomly drawn among the eligible clients from the 70 selected centers. The final sample also includes the community health workers to measure direct effects of the program on their health outcomes. The follow-up survey was focused on the measurement of the main target outcomes. Figure 2 shows the location of respondents' homes and of public health facilities (PHC units and hospitals) in the study areas. Data about the locations of health facilities was provided to us by the National Mapping and Resource Information Authority (NAMRIA) in the Philippines.

We used additional research instruments to analyze program acceptance and to identify barriers to program implementation. To capture the social networks of KDCI members in the centers, respondents answered to a social network questionnaire with four questions about their relationship to all other center members. The resulting *sociometric data* provides not only information about individual relationships, but also about the structural position of clients in the entire microfinance group network (Marsden 2002; Jackson 2011). Besides the main surveys, the health workers were interviewed with a special standardized questionnaire (n=36). The personalized interviews were exclusively conducted by interviewers with a medical background (e.g. medical students or nurses) to account for the more demanding interview situation. Validated instruments were used to measure CHW's experiences with the program, her engagement in the communities, her work motivation, and the perceived quality of her services (Gagné et al. 2015; Mathauer & Imhoff 2006).

¹³ Prior to the survey, a power analysis was performed to determine the required sample size for the follow-up survey. As the randomization was not performed on the individual, but the cluster level, we took additional factors into consideration that may potentially affect the statistical power: First, the intra-cluster correlation (ICC = 0.05) was calculated based on 6 baseline characteristics that were meaningful with regard to selected evaluation outcomes (subjective health, possession of personal health insurance, utilization of check-up in past 12 months, use of hospital services, felt social support, and health knowledge). Second, the number of clusters (k=70) was pre-determined. Third, the coefficient of variation of cluster sizes (0.4) was calculated based on the standard deviation in size divided by the average size of the actual KDCI centers. We used the user-written Stata `clustersampsi` command for the power calculation yielding for a detectable difference of 10%, a significance-level of 5%, and a power-level of at least 80% (Batistatou & Roberts 2014). Standard deviation was assumed to be 0.5 in treatment and control group which is reasonable as most outcomes are binary. The power analysis resulted in a minimum required sample size of 420 respondents per treatment arm and a minimum average cluster size of 6. Both conditions were fulfilled in the sampling.

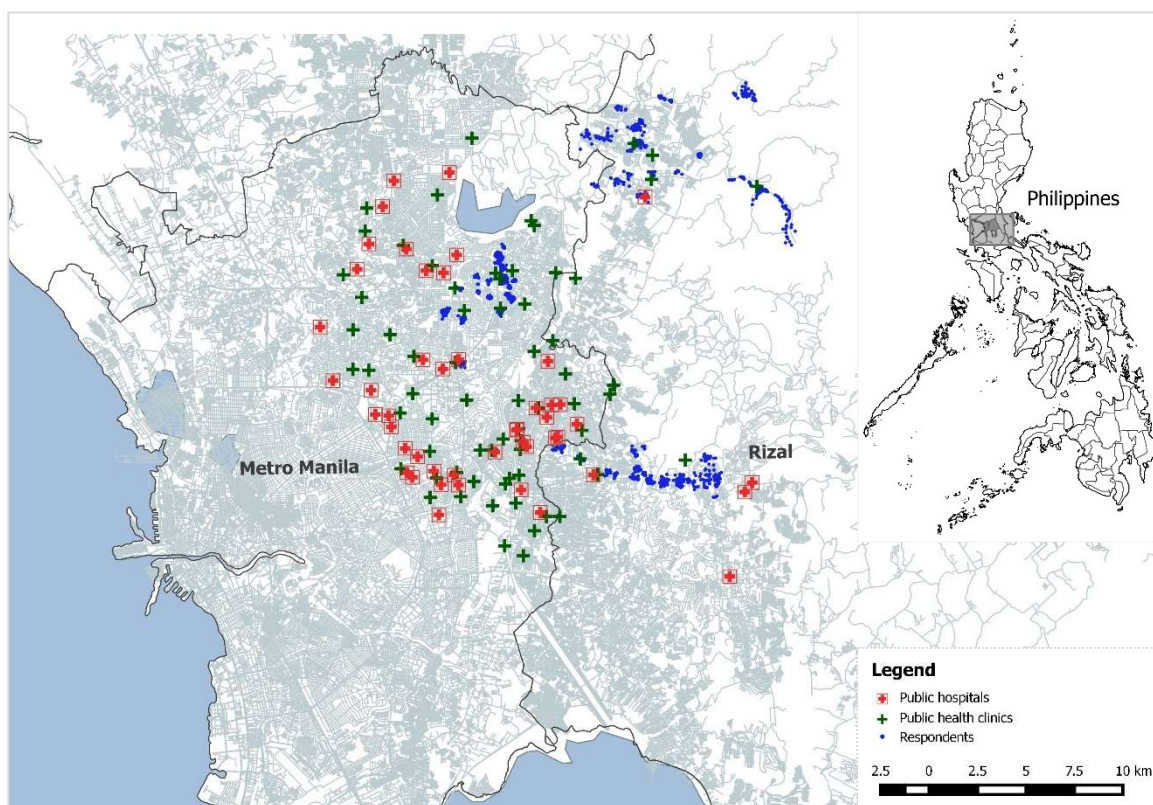


Figure 2 - Map of study areas with locations of respondents' homes and health facilities

3.1.3 Ethical Considerations

The experimental procedure of randomly excluding communities from the potential benefits of the CHW intervention may appear questionable from an ethical standpoint (Duflo et al. 2007; Deaton 2010; Barrett & Carter 2010). We believe that in our case the chosen research strategy is justified for several reasons: First, the considered CHW intervention was in an early implementation phase and had not yet been proven to be beneficial. Lessons learned from the evaluation can support program improvements and hence benefit the entire KDCI client population in the future. Second, due to capacity constraints, it was not planned by KDCI to introduce the program in any of the selected treatment group centers. Only because of the evaluation, KDCI decided to extend the program and to conduct additional trainings in the treatment centers on top of the regular training schedule. The intervention was hence not unnecessarily refused to communities which would have otherwise benefited from it. After the follow-up survey in April 2015, the program was gradually phased-in in all control group centers.

The training itself and the implementation of the program were conducted following the regular KDCI procedures, which were, like this study, approved by the *KDCI board of trustees* (including clients of the organization). At no time did the researchers interfere with these procedures. It is worth mentioning that the use of the CHW services by the community members was fully voluntary and clients were able to refuse the services. The evaluation followed common guidelines in

social science research (Social Research Association 2003; Duflo et al. 2007). Respondents were informed about the content of the study, but they were not informed about the RCT and its purpose to avoid adaptation effects. Prior to each interview, individual informed consent was taken (consent form in Figure A1 in the appendix).

3.2 Measurement

3.2.1 Evaluation Outcomes and Aggregated Impact Measures

We evaluate the impact of the CHW intervention along 3 outcome dimensions, which are based on the priority activities performed by the CHWs: (i) Dissemination of knowledge and information, (ii) improvement of health monitoring, and the (iii) raising of social support as primary contact persons. Each of the three categories was assessed with different binary coded indicators.

Table 1 - Overview of outcome indicators

Knowledge and information dissemination (indicators binary)	Health monitoring (indicators binary)	Social support (indicators binary)
▪ Informed about CHW program ▪ Informed about KDCI health program ▪ General health knowledge ▪ Learning about disease threats	▪ Underwent KDCI check-up ▪ Underwent other check-up ▪ BP measurement ▪ Personal health care provider ▪ Personal health insurance	▪ Contact person in social network ▪ Contact person in center ▪ Encouragement by peers
Aggregate outcome measures (range from 0/1) ▪ Additive: Single indicators summed up directly ▪ Weighted: Indicators were weighted using PCA and summed up		

The transfer of health knowledge and information was measured with four indicators. The first two indicators capture whether respondents were informed about the services offered as part of the KDCI health program in general and of the CHW program in particular. Note that both respondents in control and treatment group centers received general information about the CHW program as part of the broad promotion of the KDCI health program. The third indicator is a health knowledge index which is based on 28 questions about various health topics (see chapter 3 for a more detailed description of the index). The measure was dichotomized at the median to make it comparable to the other binary measures. The final indicator measures if respondents learned new information about disease threats in the past 6 months.

As second category, we consider changes in health monitoring, which was assessed with five indicators. We measure if the respondents underwent a routine medical examination (Including laboratory tests) in the last 12 months either offered as part of the health program of our partner organization or by another provider, if they had their blood pressure measured in the past 3 months (an

activity which can be performed by the CHWs), if they had a personal health care provider, i.e. a health professional who knows them and their disease history well, and if they had a personal health insurance at the time of the survey.

The final outcome category considers the level of social support in the communities, which was measured with three indicators. The first and second indicators capture if the respondent knew a contact person in her general social network (circle of family, friends, and acquaintances) or within her KDCI center to ask for advice or help if she had a health concern. For the third indicator, respondents were subsequently asked if someone among their friends or acquaintances criticizes them or gives them advices on their health behavior, actively shares information about health-related topics with them, encourages them to regularly undergo a routine check-up, and encourages them to seek help from a health professional if they are sick (encouragement by peers). The indicator was coded one if respondents replied yes to at least 2 of the 4 sub-questions.

All indicators were aggregated over the different dimensions using two procedures: Indicators were either summed up directly (additive approach) or weighted based on empirical weights calculated by employing principal component analysis (Vyas & Kumaranayake 2006). Both the additive and weighted outcome measures were normalized to a range from 0 to 1. The aggregations allow us to gain an intuition of the overall impact of the intervention and to perform heterogeneity analyses.¹⁴

3.2.2 Determinants of Program Acceptance

Apart from the general program impact, we are interested in determinants of program acceptance in treatment group centers (n=541), which we operationalize with two binary indicators. First, we follow a narrow definition of acceptance considering only clients' program uptake. We extend the analysis to a wider definition by considering not only take-up, but also awareness of the program. For this wider definition, the acceptance outcome takes the value one either if the respondent has used the program's services or if she was able to identify the CHW by name.

We consider the program's quality as first potential explanatory category which possibly influences program acceptance. Most indicators capturing the quality aspect were measured in the additional interviews with the CHWs using a special questionnaire. First, we measured how actively the health worker was pursuing her tasks as an expression of her level of engagement. For this we construct an index based on several activities performed by the CHW. The index ranges from 1 (never performs activities) to 5 (always performs activities). Next, the health worker's motivation level as latent construct was assessed with a question on how motivated she was in pursuing her function. Answer categories ranged from 1 (not at all motivated) to 4 (highly motivated).¹⁵ Furthermore, we

¹⁴ Please note that both aggregation forms are arbitrary and not guided by theoretical considerations (e.g. if the weights were to depend on the impact of the single indicators on a greater outcome, such as a person's health condition). Therefore, caution in the interpretation of the aggregated outcome measures is warranted.

¹⁵ We also measured motivation levels with more complex work motivation scales (Sjoberg 2007). However, potentially due to translation problems, the resulting answers did not result in a consistent pattern, so we decided to rely on the simpler, more direct measure instead.

asked the CHWs for their initial motivation to take-up the position. The dummy variable was coded one, if the health worker mentioned a will to help her community or microfinance group as initial motivation. Knowledge was measured with an additive knowledge index which is based on the CHW's number of correct answers to 58 questions about health care, prevention, and diseases (an extension of the general knowledge measure that was derived from the interviews with all clients). Finally, we use a dummy variable measuring if the program was continuously promoted in the center by KDCI staff, center officers, and the CHW.

The relationship aspect was measured using techniques of *social network analysis*. Each respondent was asked about her relationship to all other members of the center. In particular, they were asked who of the other members they considered to be a personal friend, who they met at least once every week besides the regular center meetings, who they considered to be one of their five best friends, and to who they spoke about their personal, intimate problems. Based on this information, we are able to determine whether the respondent had a relationship with the CHW at the time of the survey. The relationships were classified in three categories: no relationship, weak relationship (personal friend or regular meeting), and strong relationship (best friends or speaking about personal, intimate problems). A relationship was assumed also for those connections which were not reciprocated by the CHW, or vice versa (asymmetric ties). In addition, we calculated the indegree centrality of the CHW based on her number of weak relationships in the community (Marsden 2002; Jackson 2011). The measure, which was standardized by dividing it by the total center size, can be considered as an indicator for the CHW's popularity or status in the center.

As final aspect, we are interested in the role of the public health infrastructure in the neighborhoods. Based on the geographical information on the location of respondents' homes and public health facilities in the neighborhoods, we calculated a linear distance measure to the closest health facility. Additionally, we generated 4 count measures summarizing the number of small-scale public primary health care units (e.g. clinics, health centers, rural health units, etc.) and public hospitals within 2 and 5 km range around respondents' homes. The count measures provide us with a more differentiated picture of the infrastructure in the neighborhoods.

3.2.3 Control Variables

To increase precision in the estimation, additional control variables are included in all models. We selected such control variables that cannot be influenced by the treatment to avoid estimation biases due to '*bad controls*' (Angrist & Pischke 2009, p64-68). As additional socio-demographic variables we control for personal education measured in years of education, age, household size, and marital status. Finally, we include dummies for the three wider geographical areas in the models.

3.3 Randomization and Balance Check

Compliance with the experimental procedures, such as the randomized assignment, is critical for the unbiased estimation of intervention effects. In most social science applications a deterministic

assignment of an intervention is impossible as participants' behavior cannot be fully controlled for (Barrett & Carter 2010). In this section, we test if systematic deviations from the experimental protocol occurred. We check for contamination of the treatment and control group, imbalances in the covariate distribution between treatment and control group, spill-over effects, and sample attrition.

Contamination refers to unplanned changes of cluster units between treatment and control group because of non-compliance with the experimental protocol. In four treatment group center, CHWs resigned from KDCI and their CHW function within the one-year evaluation period leaving their centers only partly treated. Fortunately, all drop-outs occurred either shortly after the training or shortly before the follow-up survey in April 2015 allowing us to make a clear separation: In three centers CHWs dropped out later than February 2015. These centers were considered as fully treated in the evaluation. In one center, the CHW resigned 3 months after the training and never actively pursued her activities as health worker. We decided to consider this center as untreated in the empirical analysis. On the other hand, also few shifts from the control to treatment group occurred: In two control group centers clients attended the CHW training sessions and hence contaminated the treatment group. We account for these deviations in our estimation strategy, which will be presented in the next sub-section. Overall, changes in treatment status occurred in less than 5% of all centers.

Second, we check for *imbalances* in the distribution of covariates and outcome variables between treatment arms, which may confound the impact evaluation. Imbalances can either occur initially if the original randomization did not create balanced treatment arms, for example because of a too small numbers of cluster units, or due to systematic changes in treatment status (contamination) after the assignment. To test if the initial randomization created a balanced sample we regress 16 outcome and background characteristics measured in the baseline survey on the *original treatment status*. If the sample was balanced, we expect no major differences between the treatment arms. After this, we repeat the test described above using the *actual treatment status* instead of the original status on the right-hand side of the equation to account for the consequences of the contamination. Results of the estimation are reported in Table A1 in Appendix A. We do not observe any significant differences ($\alpha=5\%$) between treatment and control group neither for the original nor for the actual treatment status suggesting that the balance property is fulfilled in our sample.

Spill-overs between treatment and control group are another threat for the identification of treatment effects. Spill-overs can occur for example if KDCI clients from control group centers benefited of the existence of a CHW in a neighboring center. We test for spill-overs in the main models by including a dummy variable indicating if a center is located in close distance ($<1\text{km}$) to a treatment group center. The coefficient of this variable is not significant in any of the considered models. Furthermore, we directly asked CHWs in the additional interviews if they were consulted by a member from another center, which happened only in one single case. Although with this approach we may not perfectly capture all possible transmission channels, the findings suggest that spill-overs from treatment to control group centers were not a major issue in this evaluation, especially

given that exchanges between clients from different centers are rather rare as most centers are not located in close proximity.

About 30% of the baseline sample resigned from Kasagana-Ka in the period between the baseline and follow-up survey. Such *attrition* can be harmful for the identification, if it happens in a systematic way, i.e. if the drop-out is related to the treatment status, which may cause a self-selection bias in the estimation (Lee 2009). To test for systematic attrition, we regressed drop-out from the organization on original and actual treatment status. None of the models indicate a significant correlation between resignation and treatment status indicating that attrition did not occur because of the intervention. Still, the observed drop-out may be correlated with other client characteristics and hence leave us with a different sample than in the baseline survey. We restricted our sample selection in the follow-up to individuals who were clients of KDCI at least for 9 months at the time of the survey. This ensures that the respondents were exposed to the intervention for a sufficiently long period of time. The majority of our respondents in the follow-up belong to the more stable, long-term core client population of KDCI (average membership duration in the follow-up is 45 months).

3.4 Identification Strategy

We first analyze the impact of the CHW intervention on health outcomes in the communities. Following the potential outcome framework introduced by Rubin (1974), we are interested in the individual treatment effects, i.e. the difference in individual outcomes between the single treatment arms (T,C): $E[Y_i^T - Y_i^C]$. As we are unable to observe an individual i in both the treated and the non-treated state at the same time, it is impossible to estimate individual treatment effects. Each individual has two potential outcomes, but only one is observed (Duflo et al. 2007). To overcome this '*fundamental problem of causal inference*' (Holland 1986), we do not consider individual, but average differences between individuals in the treatment and control group. Because of the random assignment no other factor influences the selection process allowing us to derive an unbiased estimate of the causal treatment effect.

Even in treatment group centers not all community members made use of the CHW services resulting in incomplete treatment for some individuals. Hence, in our estimation we derive the *intention to treat effects* (ITE), i.e. the effects of the intervention on all KDCI clients in the treatment group neighborhood, regardless of whether they made use of the CHW's services or not.¹⁶ For our partner organization the ITE estimate is the parameter of interest taking into consideration that there may always be some clients who do not make use of the services provided by the CHWs. In the second part of our evaluation, we are concerned with the actual mechanism that influence program uptake among the community members.

¹⁶ The average treatment effect (ATE), in contrast, captures the effect of an intervention given that all clients of the treatment group complied with the treatment.

In the empirical identification, we estimate in a first step the ITE by regressing the outcomes Y on actual treatment status T using ordinary least squares (OLS) estimation. Since the CHWs are also part of our sample, we include a dummy in the models which indicates if the respondent is herself a CHW to control for differences in the outcome for the health workers. Furthermore, in the estimation we include the set of pre-treatment controls C as described above.

$$Y_i = \beta_0 + T_i' \beta_1 + CHW_i' \beta_2 + C_i' \beta_3 + \varepsilon_i \quad (1.1)$$

$$\widehat{ITE} = \frac{1}{n} \sum_{i=1}^N T_i' \widehat{\beta}_1 \quad (1.2)$$

During the experiment, unplanned changes between treatment and control group occurred, which may have led to biases in the estimation. Two-stage-least-squares (2SLS) instrumental variable (IV) estimation is employed to account for these deviations in the experimental procedure. The potentially endogenous actual treatment status T is instrumented with the strictly exogenous original random assignment A in a two-step procedure. Note that this procedure only accounts for non-compliance on center level, the basic unit for our randomization, but does not account for non-compliance on the individual client level.

$$T_i = \alpha_0 + A_i' \alpha_1 + CHW_i' \alpha_2 + C_i' \alpha_3 + \theta_i \quad (2.1)$$

$$Y_i = \gamma_0 + \widehat{T}_i' \gamma_1 + CHW_i' \gamma_2 + C_i' \gamma_3 + \varepsilon_i \quad (2.2)$$

Where the estimate of T from the first-stage equation is included in the second-stage, structural equation yielding unbiased estimates of the effect of T on Y . The errors are adjusted for the two-stage estimation procedure. We present both results from the OLS and IV specification in our analysis, even though the IV approach represents our preferred specification as it takes deviations from the experimental protocol into account.¹⁷

For the analysis of program acceptance by the community members, we use logit models. In these, the binary acceptance measure is regressed on explanatory variables that are related to the quality of the program, the relationships among the clients, and the public health infrastructure in the communities. Again, we include the set of background variables C as additional controls in the models.

¹⁷ Strictly speaking, the results derived from the IV estimation represent local average treatment effects (LATE) given that compliance with the treatment was not guaranteed (comparable to an encouragement design) and given that the CHW's decision to comply or not may at the same time be correlated with the potential intervention outcome. However, non-compliance occurred only in very few cases (<5% of all centers) and the IV estimates strongly resemble the OLS estimates. We hence believe that our estimates are generalizable to the wider population of centers from which our sample was drawn.

4 Results

4.1 Descriptive Statistics

We begin our empirical analysis with descriptive results about the experimental procedure and the distribution of outcome measures. The intervention started in April 2015 in 37 centers (36 centers after accounting for contamination). The assignment was stratified across the three main geographical areas resulting in an almost equal distribution of respondents across the neighborhoods ranging from 49% in Montalban to 58.4% in Batasan. In total, 570 respondents (including CHWs) or 53.6% of the sample were members of original treatment group centers (577 or 54.2% after accounting for contamination).

Table 2 - Original treatment status by study areas

Original assignment	Study area			Total
	Montalban	Masinag	Batasan	
Control	203	154	137	494
	51.0%	45.7%	41.6%	46.4%
Treatment	195	183	192	570
	49%	54.3%	58.4%	53.6%
Total	398	337	329	1064
	100%	100%	100%	100%

Table 3 shows summary statistics of the main outcome indicators across treatment and control group centers after accounting for contamination. The first set of indicators captures knowledge and information, the second health monitoring, and the third social support measures. All indicators are binary coded. The last two rows report the aggregated impact measures that were normalized to a range from zero to one. For most outcome dimensions, higher levels can be observed in treatment as compared to control group centers. Note that the percentage of clients who were informed about the CHW program was high, even in control group centers (0.53). This is because the program was promoted by the SOs in all centers irrespective of their treatment status. Despite this, we observe a higher share of respondents who were informed about the program in neighborhoods with a CHW as compared to the control group.

Table 3 - Summary statistics of outcome indicators by treatment status

Outcomes	Actual treatment status				Total	
	Control		Treatment			
Knowledge/information dissemination						
Informed about CHW program	0.53	[0.50]	0.65	[0.48]	0.59	[0.49]
Informed about KDCI health program	0.61	[0.49]	0.69	[0.46]	0.65	[0.48]
General health knowledge	0.54	[0.50]	0.53	[0.50]	0.54	[0.50]
Learning about disease threats	0.41	[0.49]	0.41	[0.49]	0.41	[0.49]
Health monitoring						
Underwent KDCI check-up	0.20	[0.40]	0.22	[0.42]	0.21	[0.41]
Underwent other check-up	0.40	[0.49]	0.48	[0.50]	0.44	[0.50]
BP measurement	0.30	[0.46]	0.36	[0.48]	0.34	[0.47]
Personal health care provider	0.57	[0.50]	0.65	[0.48]	0.61	[0.49]
Personal health insurance	0.20	[0.40]	0.22	[0.41]	0.21	[0.41]
Social support						
Contact person in social network	0.78	[0.41]	0.79	[0.41]	0.78	[0.41]
Contact person in center	0.86	[0.34]	0.88	[0.33]	0.87	[0.34]
Encouragement by peers	0.36	[0.48]	0.36	[0.48]	0.36	[0.48]
Aggregate Outcomes						
Additive	0.48	[0.17]	0.52	[0.17]	0.50	[0.17]
Weighted	0.44	[0.21]	0.48	[0.21]	0.47	[0.21]

Notes: Table displays the mean summary statistics for the outcome indicators used in the program evaluation. Standard deviations are displayed in brackets.

We analyze clients' program acceptance as an important precondition for the intervention to have an effect. The acceptance was rather limited in the KDCI client population: Only 44.8% of all clients in treatment group centers were able to give the correct name of the health worker (program awareness) and only 23.3% said that they made use of the CHW services, e.g. in form of consultations or small treatments (program uptake). When asked how satisfied they were with the CHW's services (scale from 0-10), the majority of users evaluated the CHW program with good grades (6-10). However, we find considerable variation across centers. In 8 centers (22% of treatment group) respondents reported on average a satisfaction level below 5. In the second part of the study we are interested in factors that may have influenced the program acceptance among KDCI clients in treatment group centers. Table 4 shows summary statistics of the main explanatory variables included in this analysis. These are related to the quality of the CHW program, the relationships of the CHWs to the clients, and the public health infrastructure in the communities.

Table 4 - Summary statistics for main determinants of program acceptance

Explanatory variables	Range	Mean	Standard deviation	Min	Max	N
Quality aspect ^a						
CHW engagement	1-5	3.31	0.85	1	4.67	541
CHW motivation	1-4	2.38	0.74	1	4	541
CHW initial community motivation	0/1	0.35	0.48	0	1	541
CHW health knowledge/competence	0-58	33.48	5.88	0	42	541
Continued promotion of program	0/1	0.47	0.50	0	1	541
Relationship aspect						541
Weak relationship with CHW	0/1	0.21	0.41	0	1	541
Strong relationship with CHW	0/1	0.20	0.40	0	1	541
Indegree centrality of CHW	0-1	0.39	0.21	0	0.88	541
Infrastructural aspect ^b						
km to closest health facility	0 -∞	0.85	0.66	0.03	3.46	541
# hospitals within 2 km	0 -∞	1.01	2.21	0	13	541
# health center within 2 km	0 -∞	3.57	2.77	0	11	541
# hospitals within 5 km	0 -∞	9.12	7.00	0	22	541
# health center within 5 km	0 -∞	15.41	10.58	1	38	541

Notes: ^a Measures were obtained in additional interviews with CHWs and merged with the main client data.

^b Information on the locations of respondents' homes and of public health facilities in neighborhoods was used to calculate the distance and count measures.

4.2 General Program Impact

Table 5 shows the OLS and 2SLS estimates using the additive and weighted aggregate outcome measures, which represent an aggregation of the single outcome dimensions (information dissemination, health monitoring, social support) and their specific indicators. We find the intervention to have a statistically significant positive effect on both aggregate outcome measures. According to the IV estimation, the intervention led to an increase in the simple additive and weighted outcome by 3.6% and 4.0%, respectively. The original treatment status is a highly relevant instrument for the actual treatment status as can be inferred from the first stage regression results in Table A2 in the appendix.

Compared to regular clients, also the CHWs have on average a higher value on both outcome measures, which could represent a direct effect of the intervention on the health workers. However, as we are lacking a baseline comparison for the cadres, we cannot interpret these effects as causal as they may stem from pre-intervention differences between the CHWs and other KDCI clients. Among the control variables, respondents' age and education are associated with higher levels of the aggregate health outcomes.

Table 5 - OLS and 2SLS estimation: Overall impact of the CHW intervention on aggregate outcome measures

	Additive outcome measure		Weighted outcome measure	
	OLS	2SLS	OLS	2SLS
Treatment group dummy	0.033*** [0.012]	0.036*** [0.013]	0.032** [0.015]	0.040** [0.016]
CHW dummy (direct effect)	0.091*** [0.029]	0.089*** [0.029]	0.138*** [0.038]	0.134*** [0.037]
Neighborhood: Masinag	-0.026* [0.014]	-0.025* [0.014]	-0.053*** [0.018]	-0.051*** [0.017]
Neighborhood: Batasan	-0.012 [0.017]	-0.012 [0.017]	-0.025 [0.023]	-0.025 [0.023]
Years of education	0.011*** [0.002]	0.011*** [0.002]	0.015*** [0.002]	0.015*** [0.002]
Age	0.002*** [0.001]	0.002*** [0.001]	0.003*** [0.001]	0.004*** [0.001]
Household size	0.003 [0.002]	0.003 [0.002]	0.006** [0.003]	0.006** [0.003]
Married	0.014 [0.011]	0.015 [0.011]	0.014 [0.014]	0.014 [0.014]
Constant	0.280*** [0.035]	0.278*** [0.035]	0.128*** [0.039]	0.122*** [0.039]
Observations	1057	1057	1057	1057
Adjusted R ²	0.057	0.057	0.081	0.081
AIC	-744.996	-744.89	-331.817	-331.413

Notes: OLS and 2SLS regression coefficients in cells, standard errors in brackets. Standard errors are clustered on center level (m=70). P-value: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table 6 reports the intervention effects separately for the different outcome categories. The outcome indicators of each dimension are listed in the rows. For the interpretation, we focus on the 2SLS models, but all results are robust to the use of OLS. Pre-treatment control variables are included in the models, but not displayed.

We find the CHW intervention to have a significant positive effect on clients' awareness of the KDCI health program in general and the CHW program in particular. According to the IV estimates, respondents from treatment group centers had a 7.5% higher probability of being informed about the CHW program and a 7.8% higher probability of being aware of the KDCI health program. General health knowledge as well as the probability of obtaining new information about disease threats – the more substantial outcomes from this category –, on the other hand, do not seem to be positively influenced by the intervention. For the CHWs, we observe higher levels of knowledge for both knowledge about the organization's program and the general knowledge index, but not for learning about disease threats in the past 6 months.

Table 6 - 2SLS estimation: Intervention impact on separate outcome categories

Outcome categories	Treatment group dummy		CHW dummy		N	Adj. R ²
Knowledge						
Awareness of CHW program	0.075**	[0.033]	0.386***	[0.023]	1060	0.028
Awareness of KDCI health program	0.078**	[0.038]	0.149**	[0.063]	1060	0.031
General health knowledge	-0.016	[0.034]	0.135*	[0.074]	1060	0.114
Learning about disease threats	-0.016	[0.033]	0.053	[0.087]	1059	0.004
Health monitoring						
Underwent KDCI check-up	0.009	[0.031]	0.338***	[0.080]	1060	0.059
Underwent other check-up	0.103***	[0.030]	-0.125*	[0.068]	1060	0.01
BP measurement	0.092***	[0.033]	-0.074	[0.075]	1060	0.012
Personal health care provider	0.066**	[0.033]	0.012	[0.080]	1060	0.02
Personal health insurance	0.022	[0.028]	-0.015	[0.065]	1060	0.003
Social support						
Contact person in social network	0.01	[0.030]	-0.023	[0.074]	1060	-0.001
Contact person in center	0.002	[0.029]	0.019	[0.054]	1060	0.008
Encouragement by peers	-0.012	[0.022]	0.023	[0.055]	1058	-0.003

Notes: 2SLS regression coefficients in cells, standard errors in brackets. Standard errors are clustered on center level (m=70). All controls included in the models, but not displayed: years of education, age household size, marital status, neighborhood dummies. P-value: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Although there is no evidence for changes in general health knowledge due to the intervention, we find a positive effect on several of the considered health monitoring indicators. Respondents living in treatment group centers have a 10.3% higher probability of having used a routine check-up offered by another organization in the past year and a 9.2% higher probability of having had their blood pressure checked. Surprisingly, we do not observe a statistical difference in the utilization of KDCI laboratory check-ups between the treatment and control group, even though the effect is positive, as expected. One explanation for this finding may be that the routine check-ups of our partner organization were offered only once in the one-year long evaluation period leaving too few opportunities for the clients to make use of the additional services. Extending the evaluation period could reveal an effect for this outcome indicator. In contrast to regular clients, the CHWs show an overall higher uptake of the KDCI services and a reduced utilization of health services offered by other organizations. On average, they are 33.8% ($p \leq 0.01$) more likely to undergo a check-up offered by our partner organization. Besides this, we find that KDCI clients from treatment group centers are by 6.6 % ($p \leq 0.05$) more likely to have a personal health care provider who knows them and their disease history well. Given the high disease prevalence in the neighborhoods and low levels of monitoring, these improvements are expected to lead to substantial health gains. Regarding the possession of a personal health insurance, we do not find a statistically significant difference between treatment and control group centers.

Apart from disseminating information and promoting health monitoring, the CHWs are meant to serve as contact persons in their communities and to raise social support there. We test for treatment effects on this final outcome category with three indicators which assess whether respondents have a contact person outside and inside the center and whether they were encouraged by their

peers in the network. Surprisingly, we do not find an effect of the intervention on any of the considered social support indicators. Respondents in treatment group centers are neither more likely to know someone in their circle of family, friends and acquaintances, nor among their peers in the KDCI center who they could ask for advice or help if a problem occurs. Also, they are not more likely to be encouraged by their peers to improve their health behavior. Even though the program had an effect on specific behaviors and knowledge about the organization, this does not seem to have translated into higher (perceived) social support among the community members.

4.3 Heterogeneity Analysis: The Important Role of Program Acceptance

Overall, we find a positive impact of the intervention: The CHWs were able to significantly raise awareness about the services offered by our partner organization and to promote health monitoring. On the other hand, we do not observe an impact on broader outcomes, such as general health knowledge and social support, which suggests that the CHW program has not yet achieved all its target objectives. One reason for the restricted impact may be the overall low level of program utilization and awareness. Also, we observe great variation in program acceptance across neighborhoods. While in some centers none of the clients made use of the health workers services (4 centers in total), in one center almost all members (83.3%) said that they consulted the CHW in the past 12 months. It seems as if the initiative was successful in attracting clients' interest only in some areas.

If we look at the aggregate outcome measures separately for the different treatment group centers, we can observe a substantial heterogeneity. While some centers perform exceptionally well, others show much lower levels on the aggregate outcome suggesting that some centers may have benefited over-proportionally from the program. Figure 3a depicts differences in the additive aggregate outcome between treatment group centers compared to the control group level (red bar). The figure distinguishes further between treatment group neighborhoods with high and low levels of acceptance based on the overall awareness and uptake of CHW services in the community (wider acceptance definition). In centers with high acceptance, the majority of interviewed center members either knew the name of the local health worker or made use of her services.

Linking acceptance and the aggregate program outcome reveals a clear relationship. Centers with higher acceptance score on average higher on the aggregate outcome. Although this evidence cannot be interpreted as causal, it is intuitively plausible: For the intervention to have an impact it is necessary to raise community members' awareness of it and to encourage uptake. This conclusion is supported if we consider differences in the aggregate outcome on individual level. Figure 3b compares the distribution of the aggregate outcome measure between individuals in the control group and individuals in treatment group centers who express low and high acceptance levels according to the wider acceptance definition. Clients from treatment group centers who have either used the CHW services or are at least aware of her activities show on average a higher aggregate outcome compared to clients with low acceptance or clients living in control group centers ($p \leq$

0.01, t-test). In contrast, respondents with low levels of acceptance, although exposed to the intervention, do not show significantly higher health outcome levels as compared to respondents living in control group centers ($p > 0.1$, t-test, assuming identical distributions for both tests). The results suggest that sufficient anchoring in the communities is a key condition for the program to have a positive impact. In the following section, we analyze different factors that may have influenced the program acceptance among the community members.

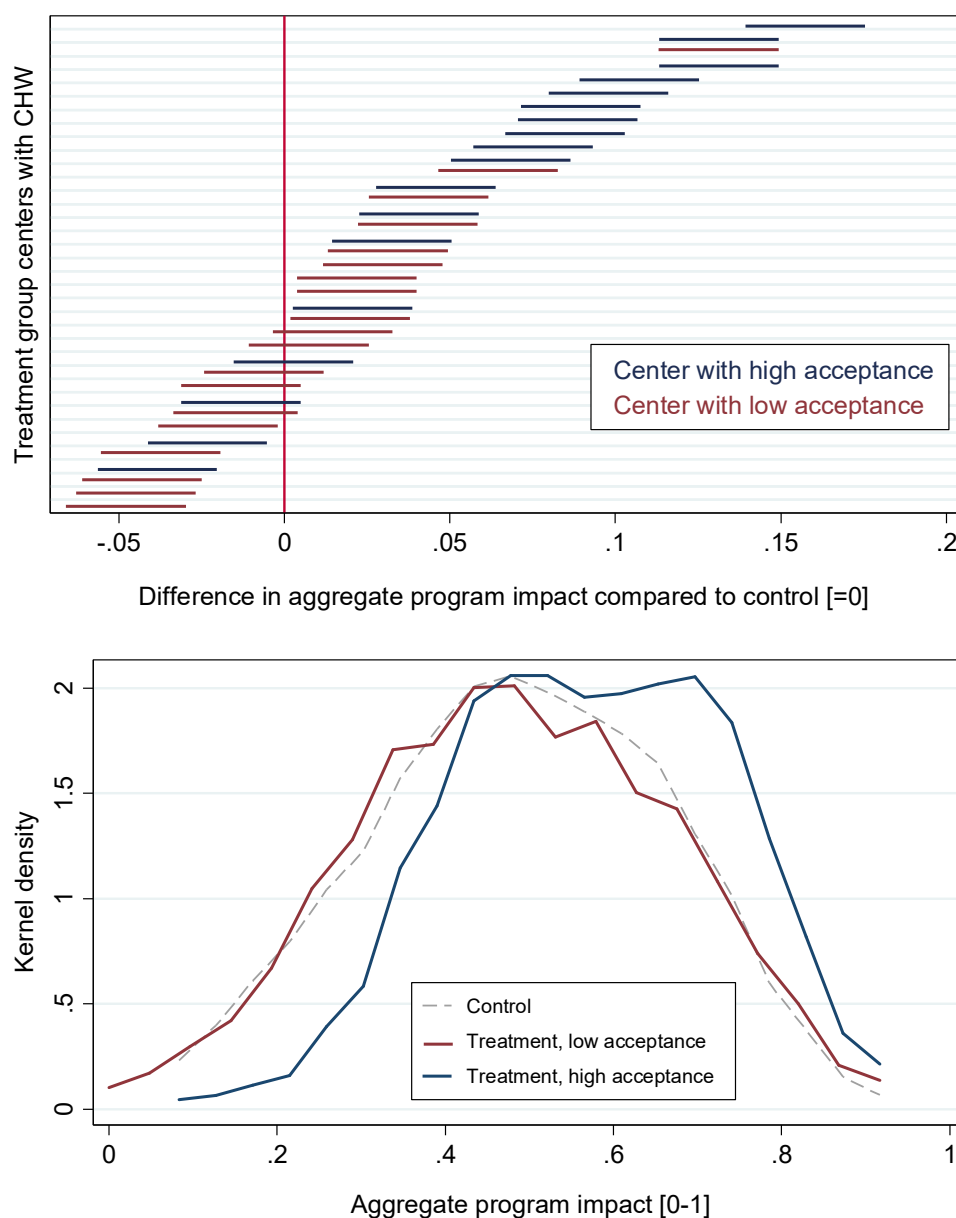


Figure 3 a&b - Heterogeneity in program impacts across neighborhoods and individuals

4.4 Determinants of Program Acceptance

We analyze the role of three factors on clients' program acceptance in treatment group centers (n=541): The quality of the CHW program in the neighborhood, the health worker's relationships

to the other clients, and the local public health infrastructure which may serve as a substitute to the CHW's services. Note that while we focus on these three dimensions in this explorative analysis, it is worth mentioning that other omitted factors, such as environmental conditions in the neighborhoods, may likewise influence program acceptance and confound our estimation. Table 7 shows the results of the logit models using the binary acceptance measures as outcomes. All coefficients are presented as marginal effects calculated at the mean of the covariates to facilitate the interpretation. The models are gradually extended in several steps to capture the isolated as well as the joint effects of the different categories. The clients' decision to make use of health worker services is considered as narrow acceptance measure in the first four models (program take-up). The wider acceptance measure is used in model five, which additionally considers clients who have not used the program, but were able to identify the CHW in their center (program awareness).

Table 7 - Logit estimation: Determinants of KDCI clients' program acceptance

Explanatory Variables	<u>Take-up</u>				<u>Take up & awareness</u>
	1	2	3	4	5
Quality aspect					
CHW engagement	0.062** [0.031]			0.041* [0.021]	0.007 [0.029]
CHW motivation	-0.028 [0.032]			0.010 [0.019]	-0.009 [0.032]
CHW initial community motivation	0.072 [0.059]			0.064* [0.033]	0.057 [0.050]
CHW health knowledge/competence	0.001 [0.005]			0.002 [0.003]	0.007 [0.005]
Continued promotion of program	0.134** [0.059]			0.006 [0.044]	-0.008 [0.060]
Relationship aspect					
Weak relationship with CHW		0.063 [0.052]		0.061 [0.051]	0.113** [0.044]
Strong relationship with CHW		0.274*** [0.036]		0.279*** [0.034]	0.305*** [0.054]
Indegree centrality of CHW		0.291*** [0.001]		0.229*** [0.068]	0.217** [0.100]
Infrastructural aspect					
km to closest health facility			0.125*** [0.047]	0.100*** [0.027]	0.107** [0.053]
# hospitals within 2 km			-0.042** [0.017]	-0.034*** [0.012]	-0.030** [0.015]
# PHC units within 2 km			0.033** [0.015]	0.009 [0.012]	0.021 [0.013]
# hospitals within 5 km			-0.027* [0.015]	-0.024** [0.011]	-0.042** [0.017]
# PHC units within 5 km			0.026*** [0.010]	0.022** [0.007]	0.025** [0.010]
Observations	526	526	526	526	526
Pseudo R ²	0.047	0.142	0.052	0.189	0.106
AIC	577.956	518.666	575.077	511.863	691.715

Notes: Marginal effects in cells, standard errors in brackets. Standard errors are clustered on center level (m=70). All controls included in the models, but not displayed: years of education, age household size, marital status, neighborhood dummies. P-value: * p≤0.1, ** p≤0.05, *** p≤0.01

According to the first model, which considers the role of the quality aspect, community members in treatment group centers were more likely to make use of the CHW services if the CHW was more active in pursuing her job. An increase of one point on the 5-point engagement index is associated with a substantial 6.2% higher uptake probability. On the other hand, we do not find that the CHW's work motivation as latent construct has a significant effect on program utilization. Although both active engagement and work motivation are clearly correlated (Pearson's correlation coefficient 0.403, $p \leq 0.01$), only the former seems to be correlated with clients' willingness to make use of the CHW services. We also find that initial community motivation is positively correlated with uptake, but this effect is insignificant. Interestingly, the health worker's knowledge as a measure of her abilities does not seem to have an impact on the uptake propensity. The active promotion of the CHW's services by the KDCI staff members and the health workers, on the other hand, exhibits a positive effect. If the program was actively and continuously promoted, the utilization was on average by 13.4% higher.

The second model shifts focus to the social networks in the communities revealing their important role for program utilization. Being weakly or strongly connected with the CHW is estimated to raise the likelihood to make use of her services, although only the effect for having a close relationship is statistically significant. Being strongly connected with the CHW makes a community member 27.4% more likely to consult her for advice or treatment. The difference between the two relationship coefficients is significantly different ($p \leq 0.05$) suggesting that strength of relationship matters: Being strongly connected with the CHW leads to a substantial increase in uptake compared to those with a weak or no relationship. Interestingly, we find that apart from having personal ties to the health worker, also her overall prominence or status in the center network is relevant for clients' willingness to utilize the program. Having a CHW who is well-connected in the community substantially raises uptake. If she was nominated as a friend or acquaintance by all other center members (standardized indegree = 1), this leads to an increase in uptake by 29.1%. This finding supports the intuition that selecting more popular community members as CHWs is beneficial for program outreach.

As final set of variables, we consider factors related to the local public health infrastructure in the neighborhoods. As theoretically expected, a larger distance to the closest public health facility has a positive effect on community member's propensity to consult the CHW and to use her services. According to the third model, an additional kilometer in distance raises the chance of making use of the health worker's services by 12.5% suggesting that the program can be particularly helpful in areas where access to other health facilities is restricted. We obtain interesting results when we separately consider the number of hospitals and PHC units in a range of 2 and 5 km around respondents' homes under control for geographical area dummies. As expected, a larger number of hospitals in an area reduces clients' propensity to use the CHW services. On the other hand, a larger number of PHC facilities increases the uptake by 3.3% and 2.6% for each additional facility in a range of 2 or 5km, respectively. This may be an indication for important complementarities between the studied CHW services and the existing local PHC infrastructure. Even though this is

beyond the scope of this paper, a further exploration of this finding in future research seems to be worthwhile. We discuss this point in more detail in the next section.

The fourth model in the table includes all indicators. The results remain largely robust. Among the quality indicators, the effect for continued promotion of the program becomes insignificant, which is due to the correlation of the indicator with the public health infrastructure measures. As intuitively expectable, the program seems to have been stronger promoted in areas with a worse health infrastructure leading to a reduction of the promotion effects. On the other hand, the effect of the initial community motivation dummy becomes significant ($p \leq 0.1$): Having a health worker with a pro-social community motivation raises uptake by about 6.4%. The effects of the social network and infrastructure indicators do not differ much. Only the effect of the number of health centers in a range of 2km is reduced and becomes insignificant in the full model.

In the fifth and final model, we regress the wider acceptance measure on all indicators. For most of the considered aspects, the results do also widely hold for the second outcome measure. Yet, none of the quality measures is significant any more, suggesting that these may be more important for program uptake, and play less of a role for raising program awareness among the KDCI clients. Interestingly, we do also observe a significant effect of being weakly connected to the CHW if we consider the wider acceptance definition indicating that having a weak relationship to the health worker may be sufficient to raise awareness about the program, but not to induce higher utilization of the offered services. Despite this, the effect of being closely connected with the CHW is almost three times as strong as the effect of being weakly connected (difference between coefficients significant with $p \leq 0.05$), once more revealing the important role of relationship strength for program acceptance.

5 Discussion

Since its creation, our partner organization has gradually extended the CHW initiative by allocating more resources and by stronger aligning the program to its core activities. The evaluation has shown that the program, which provides essential health care services to the clients, has an overall positive impact on health outcomes in the communities. The program led to improvements in awareness about the activities of KDCI and health monitoring. For instance, respondents in treatment group centers were more likely to undergo a medical examination, to have their blood pressure measured, and to have a personal health care provider. While these effects may not generate immediate health gains, they can be seen as important preconditions for reaching long-term improvements. Especially, given the low levels of monitoring and care-seeking and the high prevalence of infectious diseases with high external costs in the impoverished neighborhoods, the reported effects on health monitoring are expected to translate into more manifest health impacts in the long-run.

On the other hand, we do not find an impact of the intervention on other substantial outcome categories, such as general health knowledge or social support. This is surprising, especially with

regard to the latter category. Although many respondents in the treatment group were aware of the existence of a CHW in their neighborhood, this seems to have not translated into greater perceived social support. The evidence on the impact of the intervention across outcome categories is hence mixed. One explanation for the restricted impact could be the limited acceptance of the intervention in the communities: Among all respondents from treatment group centers, only 44.8% were able to correctly identify the CHW by her name and only 23.3% said that they consulted the CHW to ask for advice or help.

The aggregate health outcomes are found to be significantly associated with program acceptance. Centers with a larger share of clients who were well-aware of the program and willing to make use of its services had on average better health outcome levels. A similar relationship can be observed on the individual level: While there is no significant difference between the control group and individuals in the treatment group who expressed low levels of program acceptance, we see substantial differences in the outcomes between individuals in the control group and clients with high levels of acceptance. The findings suggest that proper anchoring of the intervention in the communities is key for its success.

In additional analyses, we tried to uncover some of the mechanisms that influence program acceptance by the community members. Besides the engagement of the CHW in pursuing her activities, social networks are found to be a key driver. In particular, having a close relationship with the health worker leads to a significant increase in awareness and program uptake. Program acceptance is further increased if the CHW takes a central position in the microfinance group network. This suggests that the initiative can be most effective if the microfinance group is densely connected (many close relationships) and if the lay health worker has many connections to other clients. In line with this finding, other studies, for instance by Banerjee et al. (2013) or Shakya et al. (2014), show that targeting central actors in community networks can help improving the outreach of interventions. Also, the findings are consistent with other work showing that strong ties may be more influential than weak ties, especially in interactions related to intimate topics, such as personal health care (Putnam 2000; Shakya et al. 2014; Perkins et al. 2014). Implementing organizations should ensure that interventions are well aligned to the existing social structures in the neighborhoods. The organization's ability to make effective use of the social capital inherent in the community networks and to mobilize community participation can largely influence program success (Saha and Annear 2015).

Another interesting finding of our study is related to the role of the existing health infrastructure in the neighborhoods. As expected, we find higher acceptance among clients who cannot easily reach public health facilities. Uptake increases by about 10% for every additional km in distance to the closest health facility suggesting that there is a particularly high need for community health care solutions in areas with a less developed infrastructure.¹⁸ In line with this result, we find program

¹⁸ In line with this conclusion, we find uptake to be highest among the clients in the most rural area in Montalban, which is located in Rizal province. Based on the full uptake models, these have on average a 17.6% higher probability of using the CHW's services ($p < 0.1$) compared to the more urban communities in Batasan.

acceptance to be stronger in areas with fewer public hospitals in a range of 2 or 5 km. Interestingly, however, the effect is reversed if we consider the number of PHC units, such as small clinics, health centers, or rural health units, in an area. For instance, with every additional PHC facility in a range of 5 km around respondent's home, uptake of CHW services increases by about 2.2%.

Complementarities between the CHW intervention and the existing PHC infrastructure may explain the reversed effects. For instance, people living near public PHC units which are often themselves staffed with CHWs¹⁹ may be more used to lay health personnel and hence willing to seek help and advice from the KDCI health workers. Also, a stronger PHC infrastructure may foster cooperation leading to improved referral between the institutions. Indeed, in additional analyses, we find that respondents in treatment group centers increased their visits to health centers as one form of PHC in the communities by 8.0% ($p \leq 0.01$, t-test), while reducing hospital visits by about 6.9% ($p \leq 0.05$, t-test, both tests assuming identical distributions). Hence more PHC units in an area seem to not only lead to greater acceptance of the CHW program, but the intervention seems to have also led to an increase in the utilization of public PHC services. Further research is needed to examine this link between MFI-led integrated health initiatives and the existing public health facilities in the communities. As the results show, it is important for the initiatives to take the existing health infrastructure into account. Fostering cooperation with the public health sector, for instance in form of private-public partnerships, can be a promising way to increase the overall effectiveness of the initiatives.

This study faces some limitations. First, all presented outcome indicators rely on self-reported survey data, which may be prone to reporting and measurement errors. We tried to address this issue by using multiple indicators for the different outcome dimensions. Second, respondents were interviewed only one year after the start of the intervention. This may be a time period too short to observe the long-term effects of the intervention on the health outcomes and to assess whether or not the program impact is sustainable in the long run (e.g. given high levels of health worker attrition). Third, the analysis of factors influencing program acceptance is mainly explorative. The outcomes of the analysis may be influenced by omitted variables (e.g. environmental conditions in the neighborhood) and should hence be treated with care. Nevertheless, we believe that the findings point towards interesting relationships, which may play an important role in influencing the interest in and uptake of health interventions and which are worth a further exploration. And fourth, as for most RCTs, the generalizability of our results is restricted to the local setting. As outlined above, the success of community health interventions depends to a large extent on the local context, which needs to be taken into consideration.

So far, only few studies have considered integrated CHW programs offered by MFIs, and further research is needed to determine the potential contribution and particular implementation barriers of such initiatives. As our evaluation shows, MFIs can offer a suitable platform for the provision

¹⁹ Many health centers and outposts are staffed with so called Barangay Health Workers/Volunteers who represent the publicly accredited CHWs in the Philippines.

of essential health services in poor communities, in particular related to basic tasks, such as information dissemination and health monitoring (Leatherman et al. 2012; Saha & Annear 2014). Importantly, as we have shown, the local context needs to be taken into consideration. “CHWs do not exist in a vacuum” (Bhattacharyya et al. 2001, pp. 10), but are part of a complex social structure. Future research needs to address the social dimension of CHW activities as critical determinant of program outreach and success. Apart from the social dimension, also other environmental factors need to be taken into consideration. In this respect, it is particularly important to better understand how MFI-led interventions can be best linked to the public health system and how to make use of potential complementarities between different health care providers.

6 Policy Implications: Addressing Implementation Barriers

Based on our quantitative results and the complementary qualitative interviews with health workers and community members we identified different barriers in the implementation of the program, which may have contributed to lowering the impact and outreach of the initiative in the communities. In the presentation of the different points we follow the main stages of the intervention.

As our evaluation shows, it is crucial to select candidates for the CHW position who are well integrated in their communities and who are willing and able to actively pursue their tasks. These factors can raise the acceptance by the community and ultimately affect the program impact. A thorough *screening and selection* of potential candidates following standardized procedures is therefore crucial to ensure that all candidates are not only willing, but also well-suited (e.g. in terms of initial motivation, status in community, and knowledge) to perform the CHW function. In the KDCI program, the selection and screening process has not been systematized yet. The candidates are chosen by the socio-economic officers based on arbitrary, subjective criteria which may have led to the selection of unqualified candidates with low motivation in some cases: For instance, among the interviewed health workers, 12 (33.3%) described their work motivation as low or very low, and only 13 (36.1%) said that their initial motivation to become a CHW was to support their community (as opposed to their family).

Attrition is a problem commonly found in voluntary or low-compensated health worker initiatives (Nkonki et al. 2011). Also for the evaluated program, retention of the CHWs in the program is an issue, which should already be addressed during the initial screening stage. In our evaluation, four of the 37 initially trained health workers dropped out, mostly for work related reasons. In this respect, a stronger integration of the center members in the selection process may be a good way to determine a suitable candidate for the position and to improve ownership and acceptance of the program among the target population (Medley et al. 2009).

The screening is followed by the *CHW training*, which represents another critical stage in the intervention. Although CHWs’ average health knowledge is found to be significantly higher as compared to the knowledge of other clients, there is considerable variation among the health workers. While some of them seem to have benefited over-proportionally, others have been unable to take

advantage of the training. The length of the CHW training evaluated in this paper is with 4 days relatively short compared to other CHW programs leaving room for extensions (Lehman & Sanders 2007). In the qualitative interviews, different health workers expressed the wish to extend the training by several days to discuss topics in more detail and to repeat the contents. A stronger repetition of the contents, e.g. in form of refresher trainings during the early initiation phase, may furthermore help the health workers to internalize the contents. Also, the introduction of an exam at the end of each training session is recommendable to ensure that candidates have sufficient knowledge to perform their activities as CHWs and to give them an additional learning incentive. Finally, the interviews revealed that some health workers were unsure about their roles and tasks in the communities, which might explain why some of them did not actively perform their activities. During the training it is important to clearly define the CHW tasks and to encourage them to pro-actively pursue their function in the communities as a potential determinant of program take-up. In this respect, it is important not only to teach CHWs general information (e.g. about disease threats), but also didactical and social skills on how to disseminate the information among their peers and how to pro-actively deal with the local community. This could be helpful especially for those health workers without strong ties in the community network.

After the selection and training, *continued support* of the health workers in the field, *broad promotion* of the program, and *close supervision* of their activities (including regular feedback/reporting from the health workers) are important (Hill et al. 2014). All three factors are still underdeveloped at the current stage of implementation of the KDCI program. Especially the immediate time after the initial training is crucial in this respect. CHWs should be well introduced to the community they serve and closely accompanied while performing their first activities. Although more than 94% of the CHWs said that they were in some form publicly introduced in their new function to the other center members after their training (mostly by the socio-economic officers or the center leaders), only 66.7% reported that their services were continuously promoted by this person and only 69.4% started personally encouraging their peers to use their services after the first introduction.

Linking inexperienced and experienced CHWs in form of a *peer-to-peer mentoring* system has been shown to be beneficial in other settings (Dennis 2003) and could be one option to ensure continued learning and formative supervision during the post-training period. Also, once CHWs have gained experience and entered the daily routine of activities, it is important to not give up supportive and promotional activities as well as supervision. In general, the CHW activities should be closer linked to the weekly center meetings (e.g. by establishing regular health trainings during the meetings, consultation hours, etc.), as these offer a very well-suited platform for the health workers to perform their various tasks. Fully establishing the center meetings as central forum for the CHW activities requires a clear communication to all involved stakeholders of what is to be expected from the CHWs during the meetings.

The long-term productivity of health workers is determined by the provision of an enabling and stimulating work environment including a manageable workload, sufficient supplies and equipment, and *motivating incentives* (Jaskiewicz & Tulenko 2012; Gibbons 1998; Lazear 2000). As of today,

the KDCI program is not compensated which may lead CHWs to lose their motivation more easily, especially if they are confronted with denial in the communities as it has happened in some cases. The establishment of a sound and clear incentive mechanism rewarding pro-activity may help to raise the engagement and motivation of the health workers. Importantly, incentives do not necessarily have to be monetary (such as facilitated access to loans). Instead, increased social recognition or access to learning and self-development opportunities may serve as strong (intrinsic) motivators, not imposing additional financial strains on the program (Mathauer & Imhoff 2006; Amare 2009). Even the establishment of systematic and regular monitoring procedures can serve as a form of non-monetary motivation as health workers may feel to be taken more care of.²⁰ Importantly, extrinsic and intrinsic motivators may also interact, as has been suggested by Benabou & Tirole (2003; 2006). Using a principal-agent model with private information, the authors theoretically show that offering rewards (extrinsic motivation) can have detrimental effects on the agent's (in our case the health worker's) performance. Empowering the agent, for instance by providing better information about her tasks and by raising her capacity to achieve them, on the other hand, can increase intrinsic motivation and hence the agent's overall performance.

To successfully anchor the program in the communities, it is critical to not only address the health workers, but also to take mistrust and reservations among the other community members into account. As of now, some KDCI clients do not seem to perceive the CHW intervention as something particularly beneficial for them. Accordingly, 20 of the 36 interviewed health workers believed the interest of the community in their services to be either low or very low. Furthermore, 7 health workers (19.5%) had the impression that other center members do not listen to them, 6 (16.7%) said that they sometimes felt uncomfortable being with the other center members, and 25 (69.4%) said that other center members were not willing to actively share their private thoughts and problems with them. A stronger promotion of the program by the staff members and regular encouragements to use its services can help raising the acceptance and outreach of the intervention and ultimately its impact on the target group.

²⁰ For the monitoring and reporting, mobile technologies (see also e-health and m-health applications) can offer a suitable channel for feedback and the dissemination of relevant information. For instance, health workers could send brief monthly reports about their activities to the program organizers. At the same time short message could be used to remind health workers of their duties and to inform them about diseases and other health threats in the communities. Such reminders have been shown to be a useful tool to change recipients' behavior and to increase awareness in other settings (Cole-Lewis & Kershaw 2010). Of course, the use of information and communication technologies by the CHWs (e.g. to send reminders to other center members, to collect information about their health activities, for consultation, etc.) can be a useful extension to further increase the outreach and acceptance of the intervention and to raise its impact among the target population. There are different mobile solutions currently being used by MFIs: The Grameen Foundation, for example, is using a mobile technology called MOTECH as a health care tool, among others to remind their members of their medication intake (<https://motechproject.org/>). Another innovative example used in developing countries is MeraDoctor, an app which allows live chat consultations with doctors (<https://www.meradoctor.com/>).

7 Conclusion

Using a cluster randomized controlled trial design, this study evaluates a small-scale community health worker (CHW) program in the Philippines. The program was implemented by a MFI as part of its holistic development strategy combining financial and health services. In the intervention selected clients from impoverished communities received a short orientation training after which they returned to their communities as CHWs, where they were expected to disseminate general health knowledge and information about the health program of our partner organization, improve health monitoring, and raise social support by serving as a contact person for their peers.

Despite challenges in the implementation and restricted capacities, we find the intervention to have an overall positive effect on several of the evaluated health outcomes. Clients from treatment group centers were more aware of the health services provided by our partner organization, were more likely to undergo routine check-ups, to have their blood pressure measured, and to have a personal health care provider. On the other hand, we do not find a significant intervention impact on broader outcome categories, such as general health knowledge and perceived social support suggesting that the program has not yet achieved all of its priority objectives.

The acceptance of the program, which we operationalize with the clients' uptake and awareness, is found to be an important driver for the success of the intervention. Apart from the health worker's engagement in pursuing her activities, social networks play a particularly important role for the acceptance in the neighborhoods. Using techniques of social network analysis, we find that being a close friend of the health worker raises the probability to use her services substantially. At the same time, community members were more likely to use the offered services, if the CHW had a more central position in the microfinance group as measured with her indegree centrality. Interestingly, program acceptance is furthermore related to the existing infrastructure in the neighborhoods. Clients who live more far away from the next public health facility and in an area with fewer public hospitals were more likely to be aware of and to use the health worker services, as expected. Contrary to this result, we find a reversed relationship for the number of primary health care (PHC) units in an area. More PHC facilities led to greater awareness and utilization of the CHW's services pointing towards the existence of important complementarities between the CHW program and the existing PHC infrastructure.

The provision of health-related services outside the public health sector requires specific competencies and knowledge, management support, continuous quality control, and well-developed communication and feedback mechanisms (Leatherman et al. 2012). The evaluation has shown that MFIs can be an effective intermittent in the delivery of essential health services to medically underserved, impoverished communities. Yet, while the intervention of our partner organization was successful in raising specific knowledge and health monitoring, it did not achieve all of its target objectives, especially regarding some substantial outcomes, such as the dissemination of general health information. This suggests that additional support and adjustments in the program structure are needed for the intervention to bring transformative changes in the communities that go beyond

immediate effects. Further improvements in the screening and selection of the CHW candidates, the training, the monitoring and reporting, the support in the field, and the compensation of health workers can help increasing the acceptance and impact of the intervention. The valuable experiences of our partner organization can inform other organizations and provide useful lessons to be learnt for development and health policy.

Chapter 2

Following the Peers: The Role of Social Networks for Health Care Utilization in the Philippines

1 Introduction

Individual decision making is to a large extent influenced by social interactions. Economists and other social scientists have long been interested in understanding the nature and size of such peer effects in various fields, including education (Sacerdote 2001; Zimmerman 2003), health (Deri 2005; Trogon et al. 2008; Lundborg 2006), labor (Guryan et al. 2009; Falk & Ichino 2006), drug use and crime (Bayer et al. 2007; Glaeser et al. 1996), industrial organization (Guiso & Schivardi 2007; Mas & Moretti 2016), agriculture (Bandiera & Rasul 2006; Conley & Udry 2001; Conley & Udry 2010) and finance (Leary & Roberts 2014; Kaustia & Rantala 2015).

Peer effects can have important normative implications for the design of health policies as they may lead to an amplification of the impacts and outreach of interventions. In particular for poor households in developing countries, where the adoption of health products and services often remains sub-optimally low, social networks can play a crucial role (Perkins et al. 2014; Chuang & Schechter 2015). In this context, peers and kin often represent the only source for information and other resources possibly influencing individual decision making in various ways: For instance, adopting peers can enable households to experience the benefits and costs of a health innovation without having to use it through social learning; at the same time, they can help overcoming reservations and fears by encouraging or nudging others to change their behavior (Jackson 2011; Dupas 2011b).

In this paper, we study peer effects on the utilization of essential health care services by poor households in the Philippines, a lower-middle income country. The services, which aim at improving health monitoring mainly through regular medical check-ups, are provided as part of the integrated health program of a microfinance institution (MFI). Today, MFIs play a more and more active role in the health care sector as a mean to compensate for deficits in public health care and to improve the health situation of their clients (Leatherman et al. 2012; Leatherman & Dunford 2010). Despite the rising importance of such integrated health care solutions, there is little empirical evidence on the success of these initiatives and the role of social interactions in influencing the clients' utilization of the health services. In general, although MFIs serve more than 200 million

borrowers, according to recent estimates (Microcredit Summit Campaign 2015), with few exceptions (e.g. Banerjee et al. 2013), little is known about the ‘social fundamentals’ of microfinance group networks and how they affect individual decision making.

The estimation of peer effects is challenged with several econometric issues. For instance, the well-known reflection problem, which was first emphasized by Manski (1993) and further discussed by Moffitt (2001) and Blume et al. (2011), refers to the inability to disentangle endogenous peer effects from contextual effects in social interaction models. As peers may influence each other simultaneously, it is impossible to determine whether the peers’ outcomes are the cause of an individual’s outcome, or vice versa. Besides simultaneity, further endogeneity issues may challenge the estimation: Peer groups do not form randomly, but are themselves the result of individual choices. For examples, friends often share similar characteristics due to homophilous peer selection (McPherson et al. 2001). This may confound the estimation of peer effects if it is not the social interaction, but the similarity in specific characteristics which determines the friends’ outcomes in form of correlated effects. At the same time, peer groups may be exposed to the same environmental shocks, which may affect the outcomes, even if the peer group members did not interact with each other. Health shocks in a neighborhood, for instance, could make people simultaneously decide to undergo a medical check-up, even without having directly influenced each other in their decisions. In the recent years, an increasing number of studies have employed randomized controlled trial designs to study peer effects on the uptake of health innovations as they allow solving some of the aforementioned challenges (Kremer & Miguel 2007; Oster & Thornton 2012; Dupas 2011a). Commonly, these designs vary the access to an intervention randomly within networks to study how the exogenously created variation in the number of adopters or peers with access influences the individual adoption decision. Although methodically rigorous, such designs may face practical limitations, for instance if – like in our case – a treatment cannot be varied randomly within, but only across networks.

In this paper, we tackle the different econometric challenges with a novel instrumental variable (IV) identification strategy, which has not been used before for studying health care utilization decisions in a developing country context. The approach, which was first proposed by Bramoullé et al. (2009, see also De Giorgi et al. (2010) and Lin (2010) for other contributions), exploits variation in the network structure and the existence of partially overlapping peer groups for the unbiased estimation of peer effects. An overlap in peer groups exists if not all actors in a network are connected with each other and if some individuals are part of different peer groups. In this setting, exogenous characteristics’ of second order peers, i.e. the friends of an individual’s friends who she is not personally connected with, can be used to instrument the behavior of the directly connected peers. The idea of the approach is that second order peers can only influence an individual by influencing her peers’ behavior in form of contextual effects allowing to break the reflection problem. In our estimation, we also control for the level of the (plausibly exogenous) instrumental variable for the individual and her direct peers. With this, we attempt to capture any similarity in background characteristics between the individual as well as her first and second order peers that

may have resulted from homophilous peer group formation and which may confound the instrumental variable estimation. We further control for a rich set of background variables and neighborhood fixed effects in our preferred specification to minimize the potential bias due to environmental shocks.

Apart from the IV models, we exploit the variation in another dimension, the timing of the uptake of the program, to test for the robustness of our results. Using retrospective information on the adoption decision, we estimate discrete proportional hazard models, which allow us to explore some of the mechanisms moderating the peer effects. Here, we focus on three factors that have been shown to be relevant in other settings, namely the timing since first exposure, the strength of the relationship with the adopting peers, and their structural position in the microfinance group networks (Bandiera & Rasul 2006, Perkins et al. 2015; Shakya et al. 2014).

The data for this study was collected in interviews with 1064 clients of a social development MFI in the Philippines. The clients of our partner organization were clustered in 70 microfinance centers, which form the basis for our social network analysis. Our study is one of the few analyzing microfinance groups, which have become a focal point in the life of client families all over the world. Our setting offers several advantages: Every group consists of a restricted number of clients and hence has a clearly defined network boundary. Also, only the KDCI clients and their families are entitled to use the studied health care services, making it impossible to mimic or learn from the behavior of others outside the network. As part of our main survey, we collected rich sociometric data, which relies on direct nominations of peers in the network. In contrast, much previous research is based on arbitrary criteria in defining what constitutes a peer group, such as geographical proximity, shared characteristics, or kinship, which may not well reflect the actual interaction patterns in the networks (Sacerdote 2001; Deri 2005; Conley & Udry 2001; Wydick et al. 2011; Charles et al. 2009; De Giorgi et al. 2010; Caeyers 2014b).

We find evidence for significant and large peer effects. According to our preferred specification, a 10% increase in the number of direct peers using the health services leads to an increase of 6.6% in the individual adoption probability. The results are robust to the inclusion of a broad variety of individual and contextual factors as well as neighborhood fixed effects. We furthermore test for the consistency of our results using the dynamic uptake information and discrete proportional hazard models, which largely confirm the previous findings. Having a larger share of friends who made use of the services previously significantly increases individual uptake. Like in other studies, peer effects are found to be strongest immediately after first exposure to the intervention and to fade out over time. While the strength of the relationship with the peer does not seem to matter for adoption, the peers' structural position in the network does: Although high status individuals, as defined by their standardized indegree, have on average a higher level of program uptake, they are more susceptible to the influence of their low status peers. This finding may result from the particular nature of the microfinance group networks: In these, it is often the most active clients who hold central positions in the network. These central actors have a higher initial propensity to use services and products that are offered by the MFI. Wanting to serve as a role model in the group,

they may be more susceptible to external influences by their lower status peers in order to preserve their reputation as good clients in the group. We further discuss these findings and derive policy recommendations that are relevant for health interventions in other contexts.

The remainder of the paper is structured as follows. Sections 2 and 3 review the relevant theoretical and empirical literature on peer effects in developing countries. Section 4 introduces the linear-in-means model and discusses the used identification strategy. Section 5 describes the data and measurement. Section 6 reports the main results on the role of peer effects for the studied health care utilization decisions. Section 7 discusses the findings and concludes.

2 Theoretical Framework and Predictions

In economics, social network theory has developed as a rigorous and microfounded approach to analyze social interactions (Jackson 2011; Boucher & Fortin 2015). In particular, the approach is concerned with how networks endogenously form and how they in turn affect individual behavior and outcomes, the focus of this study. Individuals, who are embedded in social networks which restrict their action space, are represented by nodes $i = \{1, \dots, s\}$ in graphs G . The nodes have relationships (ties) g with each other and can be characterized by their structural position in the network, i.e. the set of ties to other actors, their ties, and so forth. The identification strategy employed in this paper heavily builds on such structural information about the considered networks.

Theoretically, peer effects in health care utilization can stem from different sources. For instance, they can result from pure imitation or conformity which is the tendency of people to adjust their behavior to the behavior of their peers. In formal economic models, conformity is usually expressed as a desire to imitate social contacts with different individuals having heterogeneous tastes for imitation (Bikhchandani et al. 1992; Bikhchandani et al. 1998). Given an environment with imperfect information, learning from others is another possible form of social interaction (Banerjee & Fudenberg 2004; Conley & Udry 2001). By observing others or communicating with them, individuals can acquire information about the availability of health services and their benefits. Indeed, studies found substantial evidence that information provided by others and shared experiences can have a strong impact on adoption decisions (Magnan et al. 2015; Dupas 2011b; Krishnan & Patnam 2014). Others have also emphasized the importance of learning on how to effectively use a technology, which has been shown to be a crucial driver for the diffusion of more complex technologies (Oster & Thornton 2012). Finally, peer effects may stem from behavioral complementarities and external effects. For instance, there could be a utility gain if others are also using the health services simply because it is more pleasant to participate in the check-ups as a group of friends.

Importantly, peer effects do not necessarily have to be positive. For instance, Kremer and Miguel (2007) find particularly pronounced social interaction effects on take-up of deworming medicine for families with better education. This group's prior beliefs about a deworming drug were very positive, but then rapidly decreased once they acquired more information about the costs of utilization through their social networks. If social learning is possible, individuals may also strategically

try to make use of their peers and wait for them to experiment with a product first to then learn from their experiences (Dupas 2011b; Besley & Case 1993). Furthermore, people can have non-conformist tastes inducing a desire to not behave like others in their peer group – a motivation which is commonly found in status or conspicuous consumption (Bagwell & Bernheim 1996). Finally, complementarities and external effects may as well result in a negative peer effect. For instance, the risk of being in contact with someone in the network who is infected with an undetected disease is lower for clients who are connected to many adopters of the health care services. This positive externality reduces the individual’s need to make use of the services and may hence result in a diminished take-up. In the end, how peers affect individual decision making is an empirical question. Besides analyzing whether positive or negative peer effects exist, this study also considers mechanisms that influence under which conditions peer effects are most likely to occur.

As a first mechanism, we study the role of the *time since exposure* to the intervention. Previous empirical research has suggested that peer effects are strongest shortly after the first introduction of an innovation, as individuals had little chance to themselves experiment with it or to acquire information through other channels (Oster & Thornton 2012). An attenuation of peer effects over time has also been observed in settings where conformity motivations are more important (Sacerdote 2001). On the other hand, having a large number of potential adopters in the network may induce incentives to strategically delay adoption and to free-ride on the experiences made by others (Bandiera & Rasul 2006). Apart from the time factor, research in the field has suggested that the size and direction of peer effects critically depends on characteristics of the relationship. In particular, *tie strength* and the *status* of the peer in the network were often emphasized as important moderators of social interaction effects (Perkins et al. 2014; Shakya et al. 2014).

Since Granovetter’s seminal study on the strength of weak ties (Granovetter 1973), researchers have analyzed the role of relationship strength for various outcomes in networks. While it is commonly argued that weak ties are better suited for the dissemination of information as they often constitute local bridges to structurally distant and loosely connected parts of the network (Burt 2000), strong ties are of greater importance for emotional support, access to valuable resources, and uncertainty reduction as they heavily rely on close reciprocal relationships and mutual trust (Krackhardt 1992). Health is an intimate topic, which is commonly only a matter for discussions in the close social environment. Accordingly, strong ties have often been considered to be more relevant for health-related outcomes and decisions than weak ties, or as Putnam (2000, p.323) puts it: “Strong ties with intimate friends may ensure chicken soup when you’re sick”.²¹ Indeed, using social network data from India, Shakya et al (2014) show that individuals are more likely to own latrines if their peers own latrines as well; and this effect is more pronounced among close friends (see also Bond et al. (2012) on political mobilization). We analyze whether tie strength influences

²¹ On the other hand, especially in poor communities, strong social ties can also represent a source of mental distress, as some studies have reported (Kunitz 2004). In settings, where little access to formal health services exists, individuals have to rely heavily on their informal networks which may result in burdensome obligations and liabilities for the households.

the size of peer effects in our settings expecting that stronger ties are more influential than weaker ties for the adoption decision.

Besides characteristics of the relationship, the actor's position in the network has received much attention in social network theory and research. In this respect, the concept of the *key player* is central (Zenou 2015). A key player can be defined as an actor in the network who is particularly important or influential for the outcome at hand, in our case the utilization of the health care services. For the empirical identification of key players, centrality concepts, which are based on specific features of an individual's position in the network, play an important role. Depending on the particular research setting, different centrality measures are appropriate (Marsden 2002; Jackson 2011). For instance, betweenness centrality, which is the number of shortest paths between all pairs of nodes in a network that pass through an actor, captures the importance of an individual as an intermediary who can control the transmission of resources, such as information. This concept forms the basis of the *structural holes* idea as developed by Burt (1992). In this study, we conjecture that for the uptake of the health services, the status or popularity of the adopting peers is particularly relevant, which we operationalize with the actor's number of incoming ties, i.e. her indegree centrality (Marsden 2002). It has been argued that people have a greater tendency to imitate popular individuals and that information transferred by high status peers is more influential for adoption decisions (Ibarra & Andrews 1993; Valente & Pumpuang 2007). Following this argument, we expect a stronger reaction in adoption behavior if higher status peers have started to use the program first.

3 Previous Empirical Evidence

The empirical evidence on the role of social networks for health behavior and the adoption of health technologies in developing countries is somewhat mixed, which in part results from the diversity of research designs employed and the different contexts studied. Oster and Thornton (2012) find strong evidence for peer effects on the uptake of menstrual cups among school girls in Nepal. In their identification, the authors make use of a randomized distribution of the cups which created an exogenous variation in the share of friends exposed to the intervention. Other studies have likewise reported positive peer effects on various health behaviors in developing countries, such as Godlonton & Thornton (2012) for the learning of HIV test results in rural Malawi, Dupas (2014) for the adoption of insecticide treated bed nets in Kenya, An (2015) for cigarette smoking in China, Munshi & Myaux (2006) for fertility in rural Bangladesh, Adhvaryu (2014) for anti-malarial treatment in Tanzania, and Shakya et al. (2014) for latrine ownership in rural India. On the other hand, some studies also found no or even negative effects of peers on individual's health behavior, which shows that the role of social interactions may strongly depend on individual preferences and the context (Kremer & Miguel 2007; Duflo et al. 2008; Meredith et al. 2013).

Few studies so far have considered the role of peer effects for the uptake of intangible health services. These can be described as a special case of an experience good in which consumers only

learn of potential benefits after having used the services.²² Like with more tangible experience goods (e.g. menstrual cups, deworming medicine), social learning can be a rational strategy prior to adoption. Deri (2005) studies the effects of social networks on health service utilization of immigrants in Canada. By using language group and geographic variation of the migrants, she finds peers to have a significant impact on individual utilization decisions. Likewise, Devillanova (2008) finds social networks to significantly increase health care utilization among undocumented immigrants in Milan. Similar results are reported from developing countries. For instance, Leonard et al. (2009) show that households deliberately collect information in their networks about health facilities in their neighborhoods and use this information when choosing whether or not they want to visit new health care providers.

In the recent years, researchers have increasingly employed randomized controlled trial designs to study peer effects. Examples are the studies by Kremer & Miguel (2007), Oster & Thornton (2012), or Dupas (2014). Exposing some randomly selected individuals in a network to a controlled stimulus allows gaining an unbiased estimate of peer effects. In particular, new social media platforms enable researchers to conduct so called large scale *networked experiments* with ten thousands of observations (Aral & Walker 2012; Aral 2016). As it is often not possible in these settings to perfectly enforce compliance, so called encouragement designs are frequently used (Eckles et al. 2016). In these, a randomly selected sub-sample is encouraged to use a product or service, for instance by distributing vouchers as treatment. Even though not all of the selected participants may adopt, the initial randomized assignment can be used as an instrument to obtain an estimate of the local average peer effect.

Although randomized controlled trials represent an extremely powerful method for studying social interaction effects, they face some practical limitations. In many settings, it is not feasible to set an experimental stimulus for some, but not all members of a network. The health care services considered in our study, for instance, were accessible for all clients of our partner organization in a neighborhood. Also, data restrictions are a common problem. Often, it is not possible to track participant's behavior over time, constraining the researchers to cross-sectional data, which comes with additional challenges in the econometric identification.

Recently, new directions have been adopted in the empirical estimation of peer effects based on non-experimental, cross-sectional data (Fletcher 2014). In this paper, we employ an instrumental variable strategy which exploits characteristics of second order friends (i.e. the peers' peers) as instruments for direct peer's behavior (Bramoullé et al. 2009, De Giorgi et al. 2010, and Lin 2010).²³ This approach has been used only by few empirical studies so far, none of which is concerned with the adoption of health products or services. For instance, De Giorgi et al. (2010) study peer effects

²² Health services, such as the ones offered by our partner organization, could even be described as a form of credence good. For this category of goods and services, it is hard for consumers to ascertain potential utility gains even after having used them (Dulleck & Kerschbamer 2006).

²³ Note that this approach was strongly inspired by the spatial econometrics literature, which uses information about the spatial distribution of locations and spatial autoregressive models in the identification (Lee 2007; Lin 2010).

in education decisions. They find individuals to be more likely to choose a major when many of their peers made the same choice. On the individual level, this social influence resulted in inefficiency as peers can divert students from majors in which they have a relative ability advantage. Using the same approach, De Melo (2014) find significant endogenous peer effects on student outcomes, which may likewise result in negative outcomes, such as an amplification of educational inequalities. Caeyers (2014b) considers the spread of information about a development program in rural Tanzania among the elderly and disabled. Using information about the geographically nearest neighbors as relevant peer group, the author estimates that an additional informed neighbor in a set of 10 sampled nearest neighbors leads to a 7.7% increase in the probability that a household is informed about the program. Peer effects on health-related outcomes have been identified by Lin (2015), who showed that peers strongly influence risky behaviors among adolescents, namely the consumption of alcohol, cigarette smoking, physical fighting, and the skipping of school. Similarly, Fortin & Yazbeck (2015) find positive but small peer effect in fast food consumption using the Add Health Data from secondary schools in the US.

4 Identification Strategy

We analyze peer effects using a dual identification strategy. First, we employ the described structural IV approach, which uses second order peers' background characteristics as instruments for peers' behavior. In a second step, we estimate discrete-time proportional hazard models. These exploit dynamic information about timing of adoption and allow us to test for the consistency of our findings.

4.1 Empirical Model: The Linear-In-Means Model

Following the pioneering work of Manski (1993), we empirically estimate a structural linear-in-means model which defines the behavior of an individual *ego i* as a function of the behavior of her peers (endogenous peer effects), the characteristics of her peers (exogenous peer effects), her individual characteristics, and an error term. In this study, we are mainly interested in the individual's use y_i of the health services provided by our partner organization and the influence of peers' utilization on the individual adoption probability, i.e. the endogenous peer effect.

Clients of our partner organization are nested in microfinance groups of size S which form the basic networks for our analysis. Furthermore, we assume that each individual has a close reference group R_i of size r_i from the more large-scale network of clients. In our setting, the reference group is defined by all peers j of an individual who have a connection with i based on the nominations in a social network questionnaire (see Section 4). Networks are assumed to be symmetric. Following the linear-in-means approach, let the structural model be as follows:

$$y_{ni} = \alpha_n + \beta \frac{\sum_{j \in R_i} y_{nj}}{r_i} + \delta \frac{\sum_{j \in R_i} x_{nj}}{r_i} + \gamma x_{ni} + \epsilon_{ni} \quad (1.1)$$

where y_{ni} is a dummy indicating whether a client i in network n used the health services. The coefficient β measures the endogenous peer effect of the average program uptake in the immediate peer group. Note that a client is not part of her own peer group, i.e. $i \notin R_i$. The contextual peer effect is captured in the coefficient δ and α_n represents network effects. For now, we assume that no correlated effects due to self-selection into the peer group or common shocks exist. This assumption will be relaxed later.

Apart from the endogenous peer effect β , we also consider the influence of various plausible contextual and individual characteristics x_{nj} and x_{ni} : Membership duration, education level, health knowledge, health status, wealth, insurance status, experienced social support, religiosity, and the number of children in the household. For instance, having a peer group with worse health (under control of the individual health condition) may make an individual more likely to utilize the health program as she learned from her peers' bad condition. At the same time, friends who know a lot about health (under control of individual health knowledge) may convince an individual of the importance of medical check-ups and hence increase her adoption probability. In addition, we include a measure for individual's and peers' utilization of health services that are offered by organizations other than our partner organization. This allows us to take indirect effects on ego's behavior into account, e.g. observing peers who underwent regular check-ups, even if these were offered by other organizations, may induce ego to use the health services. For each actor in the network, the characteristics of the first and second order peers are averaged over all peers. We furthermore control for a rich set of structural and socio-demographic background variables on individual level.

The model above can be neatly rewritten in matrix notation. First, we define an identity matrix I_s with ι_s being a vector of ones for each network. Second, based on the network information from each neighborhood we construct a weighted adjacency or interaction matrix G_n of $s \times s$ dimension with sender in rows and receiver in columns. The matrix is row-normalized with its cells taking the value $G_{ij} = 1/r_i$ if j is part of i 's reference group and $G_{ij} = 0$ otherwise. Please note that G_n is symmetric with all diagonal cells of the matrix G_{ii} set to zero. We can rewrite the adapted linear-in-means model in matrix notation for each neighborhood:

$$y_n = \alpha_n \iota_n + \beta G_n y_n + \delta G_n x_n + \gamma x_n + \epsilon_n \quad (1.2)$$

or in reduced form:

$$y_n = \alpha_n \iota_n (I_n - \beta G_n)^{-1} + (I_n - \beta G_n)^{-1} (\gamma + \delta G_n) x_n + (I_n - \beta G_n)^{-1} \epsilon_n \quad (1.3)$$

4.2 Instrumental Variable Estimation

The identification of the endogenous peer effect is challenged with several well-known econometric issues (Manski 1993; Moffitt 2001; Blume et al. 2011; Durlauf & Ioannides 2010). First, an individual and her peers may influence each other simultaneously, which Manski refers to as reflection problem. Furthermore, correlated effects due to self-selection into the peer group and common shocks may exist. The following IV identification strategy allows us to minimize the reflection and endogeneity problems in the analysis.

Before applying the IV identification, we first estimate the social interaction model using ordinary least squares (OLS). The estimates can serve as benchmark, but are likely to be biased because of the aforementioned issues. Commonly, it is believed that the OLS estimates cumulate the impact of endogenous effects and correlated effects and hence over-estimate the true effect. Yet, as it has been suggested by De Giorgi et al. (2010), this interpretation is based on the implicit assumption that both effects influence the outcome in the same direction, which is not necessarily the case in our setting. Individuals in the network can be members of different peer groups exerting heterogeneous correlated effects. Since each of the effects can have different signs, it is not possible to predict whether OLS would over- or underestimate the true peer effect. Moreover, if non-linearities and interactions in the structure of the correlated effects exist, it is even more difficult to assess the direction of the potential estimation bias. De Giorgi et al. (2010) underpin their argument with simulations showing that OLS is equally likely to over- or underestimate the true peer effects given a heterogeneity in the correlated effects across individuals. Furthermore, as has been highlighted by Guryan et al. (2009) and formalized by Caeyers (2014a), OLS estimates may be downward biased due to the exclusion of individuals from their peer group's average outcome calculation, what Caeyers refers to as 'exclusion bias'.

To overcome the biases in the OLS estimation, we extend our estimation in a second step by applying a two-stage least squares (2SLS) instrumental variable identification strategy (Bramoullé et al 2009, De Giorgi et al. 2010, and Lin 2010). The approach exploits variation in the structure of the networks and overlapping peer groups to identify causal peer effects. Bramoullé et al (2009) show that if the matrices I_n , G_n , and G_n^2 are linearly independent, i.e. some of the peers' peers are not friends with ego, then both endogenous and contextual effects can be identified. Here, G_n^2 describes the second-order row-normalized interaction matrix which assigns a value greater than zero to all actors in the network n that can be reached by i within two steps (i.e. second order peers). The linear independence condition is fulfilled if peers have friends who are themselves not friends with ego, i.e. reference groups do not overlap. In this case, the characteristics of network

member who are not part of ego's direct reference group, but who can be reached through her direct friends in two (or more) steps can serve as valid instruments to predict peers' behavior $G_n y_n$.

In our estimation we control for the level of the instrumental variable for the individual x_n and her direct peers $G_n x_n$ to account for similarities in background characteristics between the individual and her first and second order peers. Such similarities that may result from homophilous peer group formation may threaten the exogeneity of the used instruments $G_n^2 x_n$ if not properly controlled for. In addition, we control for properties of the network (e.g. density/clustering and size) and the individual network positions (e.g. degree centrality), which may be correlated with the adjacency matrixes G_n and G_n^2 . The intuition of the identification strategy is illustrated in Figure 4: The characteristics of ego's peers' peers' $G_n^2 x_n$ (blue nodes, generic identifier k) can influence ego's behavior (red node) only by influencing the behavior of her direct peers (green nodes) in form of contextual effects.

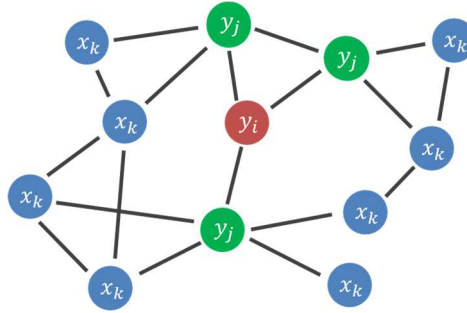


Figure 4 - Illustration of identification strategy

The identification strategy rests on several assumptions. First, for the identification to empirically hold, contextual effects have to exist on the aggregate level. Characteristics of second order peers can only be relevant instruments if they are correlated with peers' average behavior (relevance assumption). To raise the relevance of our instruments, we restrict our sample to individuals whose second order peer group is at least half as big as the first order peer group (82% of total sample). Through this, we want to avoid cases in which the behavior of a large number of direct peers is instrumented with the background characteristics of very few second order peers which may create noise in the first-stage estimation. Second, we assume that second order peers influence ego only through her peers' behavior and not any other channel under control for ego's own characteristics x_n and the characteristics of her direct peers $G_n x_n$ (exclusion assumption). This assumption may be violated if correlated effects are present, e.g. due to common shocks to the entire network, which affect both ego's decision to use the health services and the instruments. Hence, the presented IV estimation allows solving the reflection problem, but does not fully rule out potentially remaining endogeneity.

To address this issue, we do not only control for a rich set of individual and contextual background characteristics in our models, but also take neighborhood fixed effects into account. Single centers

are categorized in larger neighborhood units which are located in close proximity and are all supervised by the same staff member, a so called socio-economic officer, who is likely to exert a strong influence on the uptake decision of the center members. In total, this categorization yields 15 neighborhood clusters.²⁴ To control for fixed effects, we demean the data by subtracting the neighborhood average from each variable, i.e. each term in equation (1.2) is multiplied by a factor $D_n = I_n - \frac{1}{n_n} \iota_n \iota_n$. Because of the demeaning, the constant network effect cancels out in the structural model:

$$D_n y_n = \beta D_n G_n y_n + \gamma D_n x_n + \delta D_n G_n x_n + D_n \epsilon_n ; \quad (2.1)$$

and in the reduced form model:

$$D_n y_n = D_n (I_n - \beta G_n)^{-1} (\gamma + \delta G_n) x_n + D_n (I_n - \beta G_n)^{-1} \epsilon_n \quad (2.2)$$

To further check for the robustness of our results, we exploit dynamic information on the uptake of the health program among the clients using discrete-time hazard models. These more flexible models also allow us to explore some of the mechanisms influencing the strength of the peer effects in different settings and under different conditions.

4.3 Discrete-Time Hazard Models

In the second step of our analysis, we are interested in the hazard of an individual i at time interval t to make use of the program as a function of her peers' past behavior, contextual variables, and the individual's characteristics. We estimate a discrete-time hazard function, which can be interpreted as the conditional probability of an event occurring during an interval t given that the event, in our case the first utilization of the health services, did not occur before (Jenkins 1995; Allison 2010)

$$\lambda_{it} = \Pr(T = t \mid T \geq t, \bar{y}_{R_{it}}, \bar{x}_{R_{it}}, x_i) \quad (3.1)$$

Where λ_{it} is the individual hazard rate, and $\bar{y}_{R_{it}}$ and $\bar{x}_{R_{it}}$ represent the peer group's mean program uptake and background characteristics. These variables are time-varying depending on 1) the timing of uptake in the peer group, and 2) the peer group composition at time interval t , which depends on the entry of the peers into the organization. A peer is only included in the peer group calculation if she was a client of our partner organization at time interval t . The individual characteristics x_i ,

²⁴ We also test for the robustness of our findings calculating fixed effects on the network level. However, this results in a very low relevance of the included instrumental variables in the first stage regressions making the IV approach infeasible.

such as the educational background or marital status, are assumed to remain stable over the observed period.

In our case, the considered time intervals t are quarters. The counting starts with the entry into the organization (or with the full initiation of the program in January 2009) and ends in April 2015 ($t_{max}= 25$). An observation is right censored if the client has used the health program during the study period. To estimate the models, the data is transformed into multiple period data with several episode observations per subject. Note that the analysis is based on retrospective information about the respondent's adoption of the program. The informational quality of the data is hence restricted. Full longitudinal information would allow us to gain a more accurate picture, first of the role of changing individual characteristics for adoption decisions (e.g. changing health status) and second of the social dynamics within the network.

We use the complementary log-log function to model the individual hazard at time interval t , which is commonly applied in the literature (Jenkins 2004). The results are not sensitive to the use of alternative link functions, such as logit or probit. The cloglog model takes the event history form of:

$$\log(-\log(1 - \lambda_{it})) = \lambda_0(t) + \alpha_n + \beta \bar{y}_{Rit} + \gamma \bar{x}_{Rit} + \delta x_i + \varepsilon_{it} \quad (3.2)$$

or as probabilities:

$$\lambda_{it} = 1 - \exp[-\exp(\lambda_0(t) + \alpha_n + \beta \bar{y}_{Rit} + \gamma \bar{x}_{Rit} + \delta x_i + \varepsilon_{it})] \quad (3.3)$$

where $\lambda_0(t)$ is the baseline hazard function, which models the changing hazard over time and which takes a logarithmic functional shape in our preferred specification. We also estimate it using a non-parametric approach by including dummies for the single time intervals. As the findings remain largely consistent, we present only the results for the logarithmic baseline hazard here. Note that all models are estimated with fixed neighborhood effects and including the full set of additional individual and contextual controls to minimize the risk of bias due to unobserved correlated effects. Using the dynamic setting, we explore some potential moderators and mechanisms of peer effects by varying the baseline specification. More details on the model variations will be given in Section 6.3 together with the results.

5 Data and Measurement

5.1 Institutional Framework

This project was conducted in cooperation with the Kasagana-Ka Development Center Inc. (KDCI), a Philippine social development microfinance organization. KDCI is active in the greater

area of Metro Manila and the surrounding provinces. In total, the organization serves nearly 30000 mostly female clients who are clustered in centers as the smallest administrative unit of the organization in the neighborhoods. Each center convenes on a weekly basis at the house of one of the center members. The meetings are supervised by a socio-economic officer who is representing KDCI during the meetings.

As a reaction to health deficits in the poor communities, KDCI initiated a health program in 2009 together with partner organizations from the health sector. As part of the program, clients and their families are invited to medical check-ups, which are offered on an annual or bi-annual basis. During the check-ups, participants receive a full physical examination and take part in different laboratory tests. They are notified of the results of these tests at another follow-up meeting in which they receive a full diagnosis of their condition and an appropriate treatment plan. Furthermore, during the check-ups and follow-up consultations the participants are given additional information about appropriate health prevention and common disease threats in their environments. To attract clients, the medical check-ups are offered in locations that can be easily accessed from the centers and provided at a price 70 to 80 percent lower than the rates in local hospitals and clinics, according to a study conducted by KDCI (Sebastian 2012). Clients can choose from one of four check-up packages including different services (see Table B1 in Appendix B). Besides a medical examination, the smallest package (A) includes a complete blood count, a urinalysis, a stool examination, and a chest x-ray at a price of PHP 310 (~\$7.00). KDCI clients can avail health loans to cover the costs of the health services and the necessary medical treatments.

Many of the clients of our partner organization have no or only restricted access to the public health infrastructure. In the baseline survey conducted in 2014 by the author, more than 51% of respondents said that they never underwent a routine check-up in their entire life without experiencing any concrete disease symptoms. Even if symptoms occurred, many of the poor clients did not seek professional help. Self-treatment of symptoms, on the other hand, was found to be quite common among the respondents. Insufficient health monitoring and the low willingness to undergo medical examinations can have dramatic consequences for the poor for who health shocks and related expenditures represent an existential threat (Xu et al. 2003).

The essential health services provided by our partner organizations are meant to fill the gap by promoting care seeking and by reducing clients' barriers in the utilization of health services. Indeed, the rates of detected diseases show that the check-ups can be highly useful. Among the participants of an examination that was conducted in June 2013 in Tandang Sora, a district in Metro Manila, 85% were diagnosed with a medical condition even though many did not experience any disease symptoms prior to that. In total, 17% were diagnosed with hypertension which may lead to fatal cardiovascular diseases, 13% were diagnosed with urinary tract infection, 10% with high cholesterol levels, and 6% with diabetes mellitus. Strikingly, 8% of patients had a positive pulmonary tuberculosis (PTB) test result. If untreated, PTB is a highly infectious disease, also revealing the important external effects of the offered health services for the communities. The findings mirror the test

results from other areas of the city and underpin the need for more rigorous testing and health monitoring in the poor communities.

Despite their potential for improving the clients' health situation, uptake of the health program remains moderate. At the time of our main survey in 2015, only 30% of the respondents have ever made use of the services with the majority having used the examinations only once and not regularly as intended by our partner organization. The low uptake is unlikely to be due to financial reasons as the program is offered at rates that are affordable for the households. The smallest package comes at a rate of 6.0% of the monthly median gross household income in the sample. In addition, the costs can be covered through loans offered by the organization.²⁵ When asked for why they have not used the program, respondents often name a lack of time or an absence of pain as main reasons.

5.2 Data

The data for this study was collected among 1064 randomly selected KDCI clients from 70 centers which are located in Quezon City and Rizal province at the north to northeastern outskirts of Metro Manila. The centers form the basis for the microfinance group networks analyzed in this study. Each center represents a separate entity and serves only one neighborhood minimizing the chance for spill-overs from one center to another. This represents a major advantage of this study as it allows us to analyze *complete networks* of clients with clearly defined *network boundaries*. Importantly, the health program of our partner organization can only be used by its clients and their families, but not by outsiders to the organization.

Defining the set of peers who can potentially influence an individual is a major challenge in social interaction research. Often, peer groups are defined based on arbitrary criteria, such as geographical proximity, the sharing of common traits and characteristics, or kinship relations (Sacerdote 2001; Deri 2005; Conley & Udry 2001; Wydick et al. 2011; Charles et al. 2009; De Giorgi et al. 2010; Caeyers 2014b). This approach leaves considerable uncertainty as to whether the identified groups are actually relevant and whether or not sources outside the peer group may have an influence. Furthermore, other studies rely on egocentric network data, which restricts the analysis to small peer groups in the immediate environment of an individual (O'Malley et al. 2012; Smith & Christakis 2008). In this paper, we employ a sociometric approach, which enables us to combine the information from different actors in the network and to study the role of structural network features in influencing outcomes. The sociometric network data is based on direct nominations of peers by (almost) all members of the networks. When answering to the name generator questions described below, each respondent received a complete list (sample frame) of all clients in her microfinance group reducing possible recall and identification biases in the nominations.

²⁵ As several studies have shown, poor households have an extreme price elastic demand for health products and services, even if these can lead to large health improvements, such as in the case of insecticide treated bed nets or rehydration salts (for an overview of studies, see Kremer & Glennerster 2011)

The KDCI centers are of different sizes normally ranging from 10 to a maximum of 42 members. Usually, centers emerge from a group of friends who form the core of each center. Over time, the centers grow larger as new persons enter. The new entrants are usually recruited by friends who are already clients of the organization. Many networks hence take the shape of a tree with a central core of old members and ramifications of newer members who form more isolated, peripheral peer groups.

Respondents were interviewed with an 18-page long questionnaire which contained several questions on client's background characteristics and her utilization of the KDCI health services. At the end of the questionnaire, respondents were shown a complete list of all members of their KDCI center and were given four *name generator questions* to assess their relationship to the other center members. Respondents were asked, i) who on the list they considered to be a personal friend, ii) who they met regularly (i.e. at least once every week for more than 15 minutes besides the regular center meetings), iii) who they considered to be one of their five best friends, and with iv) who they spoke about their personal, intimate problems, such as their health situation. Answers were carefully recorded by the interviewers and encoded in separate adjacency matrices G_n for each center.

5.3 Measurement

To measure the utilization of the health services, respondents were asked if they or someone else in their household underwent a check-up provided by our partner organization in the past resulting in a binary outcome measure. If the program was used by someone in the respondent's household, she was subsequently asked for the exact years and months when the program was used, which forms the basis for our dynamic analysis.

Our data allows us to distinguish between weak and strong ties. Considerable ambiguity exists in the literature as to what constitutes a strong tie. In his early study, Granovetter said that the "strength of a tie is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterizes the tie" (1973, p. 1361). We have integrated several aspects of this concept in our four name generator questions, which indicate increasing levels of friendship intensity. Other studies have relied on more simplistic definitions of friendship and strong ties. Some have used reciprocated nominations as basis for their definition of strong ties (Oster & Thornton 2012), others have used frequency of interactions as a surrogate for tie strength (Huszti et al. 2013) or have created additive indices combining the information from different relationships (Shakya et al 2014).

In our study, a weak link between two nodes i and j is present if for any of the four relationship questions (i to iv) either i named j , or j named i , or both. This results in a symmetric network with adjacency matrix $G_{ij} = G_{ji}$. A strong link, on the other hand, exists if at least one of the individuals nominated the other person as either being one of her five best friends or as someone she shares personal, intimate problems with. An actor's status in the network was measured with her indegree

centrality $\frac{1}{s} \sum_j g_{ji}$, which is equal to the number of incoming friendship nominations standardized by the size of the center. The calculation of the centrality measure is based on both weak and strong ties.

We use four background characteristics of second order peers as instruments in our IV estimation, which are all strongly correlated with the uptake of the health services among the direct peers: The average membership duration measured in months since entry into the organization, education level measured in years of education, health knowledge assessed with a question battery on 28 relevant health topics (more details on the health knowledge measure are given in chapter 3), and the subjective health condition, which is included in the models as a dummy variable indicating if a respondent perceived her health as being rather good or bad. We also include variables that measure the value of these four characteristics for the considered individual ego and her direct peers to control for similarity between ego and her peer group.

In addition, we consider a broad set of other plausibly relevant individual and contextual characteristics: Insurance status, the number of own children in the household, religiosity assessed with a measure for subjective religiosity (four-point scale) as well as the frequency of church visits (seven-point scale), and social support in the community which was measured by asking respondents if they knew someone in their surrounding who they could ask for help or advice if a health concern arose. Wealth was measured with an asset-based wealth index. The single items for the index were weighted with empirical weights derived from principal component analysis (Vyas & Kumaranayake 2006). Furthermore, we control for dummies if ego and her direct peers underwent check-ups in the past 12 months that were offered by an organization other than KDCI.

Various structural and socio-demographic individual background characteristics are controlled for in our models to raise the precision of the estimation and to reduce the risk of bias due to omitted correlated effects. As structural variables we control for the absolute number of first and second order peers in the network, the standardized indegree of the individual, the proportion of strong ties in the network, as well as the network size. As socio-demographic variables we control for the relationship and marital status, the respondent's age, the size of her household, the parental educational background, and the distance of the respondent's home to the closest public health facility, which can either be a hospital or a primary health care unit. The geographical information on the location of the health facilities was kindly provided to us by the National Mapping and Resource Information Authority in the Philippines.

6 Results

6.1 Descriptive Statistics

In terms of structural characteristics our sample of networks is quite heterogeneous. While some of the microfinance group networks are dense and characterized by a large number of connections,

other networks express lower degrees of connectedness. On average, networks have a size of 21.3 and a diameter of 3.7, which is the longest path between two persons in a network. The size of the networks varies greatly with the smallest network in the sample consisting of only 6 and the largest of 42 clients. As sensitivity check we removed centers with a size below 10 (in total 3 centers) from the analysis.

Table 8 shows summary statistics on the individual ties in the network. Respondents have a mean number of 7.88 connections in their network. Among these, 4.51 are weak and 3.37 strong ties, on average. The high number of strong ties suggests that for many clients the microfinance networks represent a central focus of their social life (Feld 1981). Only few respondents (<1%) were isolated in the network, i.e. did not have a connection to any of the other clients. According to the standardized degree measure, clients are on average connected to 36% of others in the network with few respondents being connected to all other members of the center (degree of one). The few number of isolates and the strong overlap of peer-groups represents an advantage for our identification which exploits structural information from the existing ties in the network. The indegree variable, which measures how often the respondent was nominated as a direct contact by one of the others, has a mean value of 0.21 and a maximum of 0.83.

Table 8 - Summary statistics of individual relationship characteristics

	Mean	Standard deviation	Min	Max	N
Degree: # connections	7.88	4.39	0	34	1064
# weak ties	4.51	3.3	0	29	1064
# strong ties	3.37	2.37	0	20	1064
Isolated	0.09	0.03	0	1	1064
Standardized degree	0.36	0.20	0	1	1064
Standardized indegree	0.21	0.15	0	0.83	1064

Figure 5 shows three exemplary networks from our sample. Clients are depicted as nodes. Thin lines represent weak and thick lines strong relationships. The size of the nodes is based on their number of direct connections to others in the network. The graphs are arranged around the most central actors with the largest number of connections. There is great variation in the number of connections between the nodes with some peripheral actors just having one or two connections to other clients in the network. The color of nodes indicates whether clients have used the health services provided by our partner organization or not. Red nodes are users, blue nodes are non-users. As it also becomes visible in the depicted graphs, users often take more central positions in the networks (standardized degree of 0.45 compared to 0.25 for non-users) and are more likely to form cliques with other users (probability of having at least one user among the direct peers is 15% higher for users compared to non-users). The question is whether or not this pattern is due to peer effects or merely a result of correlated effects in the networks.

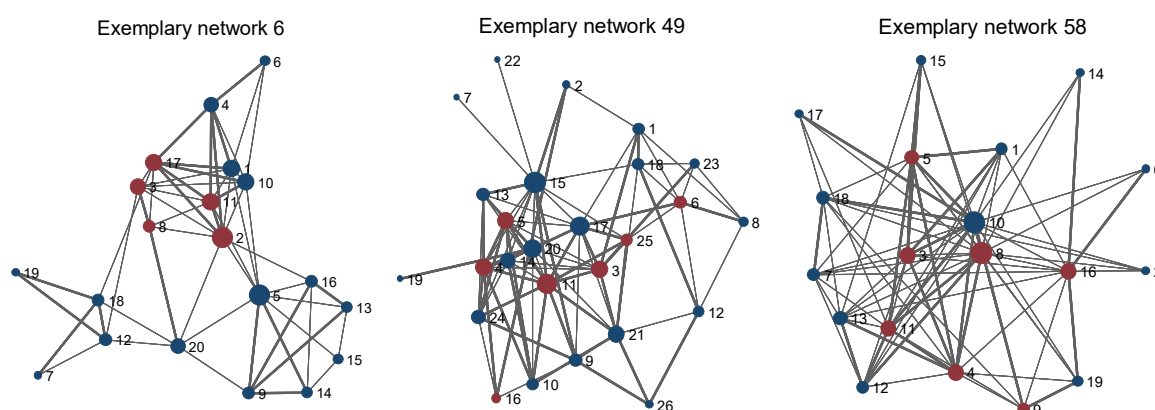


Figure 5 - Exemplary networks with different sizes and densities

Table 9 provides further information about clients' utilization of the health services. The health program was used by 30% of the respondents or other members of their households. Despite our partner's promotion of a regular use of the essential health services, the majority of users have used them only once or twice. On average, the program was used 1.5 times with some having used it up to 6 times. The variable time to adoption, which forms the basis for the dynamic analysis in Section 5.3, measures how long users waited before making use of the program for the first time after becoming a client of the organization or after the introduction of the program (for those who were clients of the organization prior to the introduction of the program). The vast majority of respondents made use of the program for the first time in the past one (61.1%) or two years (20.0%). The average time to adoption is 44.3 months. Respondent's beliefs of the benefits of the program were assessed with an index ranging from 1 (very bad) to 5 (very good). On average, most clients evaluate the health examinations either as good or very good. Only few gave the program bad grades across the evaluated items (reachability and accessibility of check-up venue, waiting time, personal manner of medical staff, privacy during testing, price of services, and usefulness for health). On average, users value the program higher (4.05) than non-users (3.83). The difference is statistically significant ($p \leq 0.05$) according to a two-sided t-test (assuming identical distributions).

Table 9 - Summary statistics of program utilization

	Mean	Standard deviation	Min	Max	N
Used program	0.3	0.46	0	1	1064
Times program used (users only)	1.54	0.86	1	6	322
Time to adoption (users only)	44.27	25.65	0	98	322
Belief of non-users	3.83	0.49	2	5	742
Belief of users	4.05	0.51	2.57	5	322

Table 10 shows further differences in some key background variables between users and non-users of the program. On average, users have a higher membership duration ($p \leq 0.01$, t-test), have better health knowledge ($p \leq 0.01$, t-test), and are older ($p \leq 0.01$, t-test), wealthier ($p \leq 0.05$, t-test), more religious ($p \leq 0.05$, t-test), and more often married ($p \leq 0.01$, t-test) than non-users. As can be inferred from the higher standardized indegree measure, users were also more likely to be nominated as a peer compared to non-users ($p \leq 0.01$, t-test, for all tests we assume identical distributions).

Table 10 - Differences in background variables between users and non-users

	Range	<u>Non-user (n=742)</u>		<u>User (n=322)</u>	
		Mean	SD	Mean	SD
Membership duration (months)	2-101	38.78	[28.71]	58.05	[28.45]
Years of education	0-19	9.73	[2.85]	9.44	[2.89]
Health knowledge	1-28	15.34	[4.50]	16.48	[4.07]
Health status	0/1	0.77	[0.42]	0.77	[0.42]
Age	20-76	44.1	[10.06]	47.5	[8.95]
Wealth	0-5	1.76	[0.88]	1.9	[0.88]
Cognitive abilities	0-10	4.11	[1.41]	3.93	[1.51]
Religiosity	1-4	2.34	[0.67]	2.25	[0.65]
Marital status	0/1	0.67	[0.47]	0.73	[0.44]
Number of children	0-12	2.19	[1.60]	2.25	[1.91]
Standardized indegree	0-1	0.18	[0.14]	0.28	[0.17]

6.2 Structural Analysis: OLS and Instrumental Variable Estimation

Table 11 presents the linear probability models estimated with OLS, which give us a first intuition of social interaction effects in our setting. The estimation is based on equation (1.2) with $y_i = 1$ if a client underwent a medical check-up as part of the health program of our partner organization and 0 otherwise. The baseline model (1a) contains only the mean program uptake in the peer group as well as the basic background controls (not displayed). It is gradually extended in several steps by including additional relevant individual characteristics (1b), characteristics of the peer group which may exhibit contextual effects (1c), and neighborhood fixed effects (1d). Standard errors are clustered on network level ($m=70$).

Across all models, we find statistically significant evidence for endogenous peer effects. According to the full model specification (1d) an increase of 10% in uptake in the peer group is associated with a 2.58% increase in individual adoption. While we observe substantial endogenous peer effects, we find only weak evidence for contextual effects on individual behavior: According to model 1c, having direct peers with higher education reduces utilization of the health services. However, once neighborhood fixed effects are controlled for, the effect becomes insignificant.

Table 11 - OLS peer effect estimates

	<u>Outcome: Individual program uptake</u>							
	1a		1b		1c		1d	
Endogenous peer effect	0.327***	[0.059]	0.300***	[0.061]	0.311***	[0.065]	0.258***	[0.072]
Individual characteristics								
Membership duration (months)			0.003***	[0.000]	0.003***	[0.001]	0.003***	[0.001]
Years of education			-0.008	[0.006]	-0.006	[0.006]	-0.005	[0.006]
Health knowledge			0.004	[0.003]	0.003	[0.004]	0.003	[0.004]
Health status			0.025	[0.034]	0.021	[0.033]	0.026	[0.035]
Wealth			0.014	[0.016]	0.026	[0.016]	0.02	[0.016]
Other check-up			-0.027	[0.031]	-0.033	[0.032]	-0.031	[0.033]
Personal health insurance			0.058*	[0.032]	0.064**	[0.032]	0.060*	[0.032]
Children			0.006	[0.016]	0.006	[0.016]	0.002	[0.016]
Religiousness			0.009	[0.022]	0.013	[0.023]	0.008	[0.024]
Church visits			-0.01	[0.008]	-0.009	[0.008]	-0.009	[0.009]
Social support			-0.003	[0.032]	-0.002	[0.033]	0.005	[0.032]
Contextual characteristics								
Peers' membership duration					-0.001	[0.001]	-0.001	[0.001]
Peers' years of education					-0.018*	[0.010]	-0.016	[0.010]
Peers' health knowledge					-0.001	[0.007]	-0.004	[0.008]
Peers' good health status					0.101	[0.067]	0.101	[0.066]
Peers' wealth					-0.003	[0.033]	-0.007	[0.035]
Peers' other check-up					-0.009	[0.057]	-0.09	[0.060]
Peers' personal health insurance					-0.08	[0.059]	0.018	[0.062]
Peers' children					0.011	[0.015]	0.005	[0.017]
Peers' religiousness					0.038	[0.038]	0.032	[0.040]
Peers' church visits					-0.027	[0.019]	-0.029	[0.018]
Peers' social support					0.001	[0.064]	0.006	[0.066]
Constant	-0.456***	[0.129]	-0.469***	[0.163]	-0.364	[0.270]	-0.015	[0.017]
Additional controls included	Yes		Yes		Yes		Yes	
Fixed effects	No		No		No		Yes	
Observations	863		863		863		86	
Adjusted R ²	0.106		0.139		0.141		0.123	
AIC	951.562		929.63		938.998		934.794	

Notes: OLS coefficients in cells, standard errors in brackets. Standard errors are clustered on center level (m=70). Additional controls included in the model, but not displayed: Number of peers, number of second order peers, standardized indegree, proportion of strong ties, network size, network density, relationship and marital status, age, household size, parental education background, and distance to closest health facility. Fixed effects calculated for 15 neighborhood clusters. P-value: * p≤0.1, ** p≤0.05, *** p≤0.01.

The endogenous peer effects estimated with OLS may be biased due to simultaneous peer influences and correlated effects. Table 12 presents the 2SLS estimates for the full model specification including all individual and contextual variables estimated both without (2a) and with neighborhood fixed effects (2b). The F-statistics of the models are clearly above the 5% error thresholds recommended by Stock & Yogo (2002) indicating that weak instruments are not a major concern. The first stage regressions are reported in Table B2 in Appendix B. We provide further descriptive results in Table B3, which shows similarities in the distribution of some key variables between the

first and second order peer groups. On average, the mean values of the groups are highly similar suggesting that we do not pick up any particularities in the way we construct the peer groups. The Hansen overidentification test is used to test for the exogeneity of the used instruments. According to this test, there is no evidence that the instruments influence ego's behavior in any other way than by influencing her direct peers' behavior.

Table 12 - 2SLS peer effect estimates

	<u>Outcome: Individual program uptake</u>			
	2a		2b	
Endogenous peer effect	0.628***	[0.195]	0.662***	[0.234]
Individual characteristics				
Membership duration (months)	0.004***	[0.001]	0.004***	[0.001]
Years of education	-0.005	[0.006]	-0.005	[0.006]
Health knowledge	0.003	[0.004]	0.003	[0.004]
Health status	0.021	[0.035]	0.023	[0.035]
Wealth	0.028	[0.019]	0.024	[0.019]
Other check-up	-0.031	[0.031]	-0.027	[0.032]
Personal health insurance	0.063*	[0.037]	0.061	[0.037]
Children	0.003	[0.014]	0.002	[0.015]
Religiousness	0.017	[0.022]	0.017	[0.023]
Church visits	-0.007	[0.009]	-0.007	[0.009]
Social support	0.007	[0.035]	0.01	[0.035]
Contextual characteristics				
Peers' membership duration	-0.002**	[0.001]	-0.002*	[0.001]
Peers' years of education	-0.006	[0.013]	-0.006	[0.012]
Peers' health knowledge	-0.007	[0.009]	-0.009	[0.009]
Peers' good health status	0.112*	[0.066]	0.111	[0.070]
Peers' wealth	-0.023	[0.035]	-0.033	[0.037]
Peers' other check-up	0.028	[0.064]	-0.134*	[0.076]
Peers' personal health insurance	-0.116	[0.075]	0.054	[0.066]
Peers' children	0	[0.017]	-0.004	[0.018]
Peers' religiousness	0.06	[0.046]	0.063	[0.050]
Peers' church visits	-0.021	[0.018]	-0.027	[0.019]
Peers' social support	-0.009	[0.067]	-0.018	[0.071]
Constant	-0.489*	[0.282]	-0.031	[0.021]
Additional controls included	Yes		Yes	
Fixed effects	No		Yes	
F-test excluded instruments	20.13		18.31	
Hansen J statistic	4.472		3.001	
P-val Hansen overidentification test	0.2148		0.3915	
Observations	863		863	
Adjusted R ²	0.111		0.081	
AIC	968.25		975.295	

Notes: 2SLS Coefficients in cells, robust standard errors in brackets. Additional controls included in the model, but not displayed: Number of peers, number of second order peers, standardized indegree, proportion of strong ties, network size, network density, relationship and marital status, age, household size, parental education background, and distance to closest health facility. Fixed effects calculated for 15 neighborhood clusters. P-value: * p≤0.1, ** p≤0.05, *** p≤0.01.

The estimated 2SLS peer effects are significant and substantial. According to the fixed effects model (2b), an increase of 10% of program users in the direct peer group leads to a 6.62% increase in individual utilization of the health services. The effect is larger than in the previous models suggesting that the OLS estimates are downward biased, which may result from non-linearities and heterogeneity in the correlated effects (De Giorgi et al. 2010) or an ‘exclusion bias’ (Caeyers 2014a). The estimated effects could also represent a local average treatment effect (LATE) explaining the differences between the OLS and IV estimation. Such an explanation would hold if direct peers who are stronger influenced by their peer’s characteristics (the so called compliers in our case) also exhibit a stronger endogenous peer effect on ego (Angrist & Pischke 2009).

The observed changes in effect sizes are comparable to other studies which report peer effects of similar size lending further support to our findings. For instance, using the same identification strategy, De Giorgi et al. (2010) report an average peer effect of 6.9% (restricted peer group definition) to 8.0% (wider peer group definition). Similarly, Caeyers (2014b) obtains a peer effect estimate of 7.7% and in De Melo (2014) peer effects in education outcomes range from 3% in science to 4.6% in reading in their full fixed effect specifications.

Like in the OLS models, we do not find much robust evidence for contextual peer effects on individual behavior. Again, having direct peers with a longer membership duration reduces utilization of the health services. In the fixed effects model, we do in addition observe that a higher utilization of health services provided by other institutions in the direct peer group is associated with a reduced individual take-up of the KDCI services. This may reflect a tendency of clients to follow their peers and to substitute KDCI health services with the services offered by other facilities. Among the individual characteristics, we observe that being a member of the organization for a longer time and having a personal health insurance are positively related with the propensity to make use of the essential health services. We test for the robustness of our results in the following section in which we base our identification on dynamic information about the timing of the first uptake of the medical check-ups.

6.3 Dynamic Analysis: Peer Effects on the Adoption Hazard

Table 13 shows the estimates of the discrete-time hazard models. The coefficients are exponentiated and can hence be interpreted as hazard ratios. All models control for the logarithmic time variable that reflects the baseline hazard and the full set of individual and first order peer characteristics. Instead of individual membership, we include a variable that measures the time difference between the respective time period and the survey in 2015.

Table 13 - Complementary log-log hazard models: Uptake of program over time

	Outcome: Individual program uptake							
	3a		3b		3c		3d	
Baseline hazard (log time)	1.650***	[0.199]	2.008***	[0.339]	1.662***	[0.220]	1.686***	[0.194]
Endogenous peer effect								
Program uptake (all)	8.744***	[2.352]	67.630***	[90.391]				
Program uptake * log time			0.550*	[0.197]				
Program uptake (weak ties)					2.920***	[0.731]		
Program uptake (strong ties)					2.680***	[0.465]		
Program uptake (low status)							3.591***	[0.997]
Program uptake (high status)							2.223***	[0.441]
Individual characteristics								
Standardized indegree	13.088***	[7.464]	12.739***	[7.185]	15.935***	[9.131]	9.259***	[5.842]
Time to survey (months)	0.978***	[0.008]	0.980**	[0.008]	0.975**	[0.010]	0.978***	[0.008]
Years of education	0.947**	[0.024]	0.946**	[0.024]	0.955*	[0.025]	0.950**	[0.024]
Health knowledge	1.035**	[0.017]	1.036**	[0.017]	1.040**	[0.018]	1.033**	[0.016]
Health status	1.119	[0.153]	1.127	[0.152]	1.097	[0.152]	1.085	[0.151]
Wealth	1.123*	[0.074]	1.128*	[0.075]	1.076	[0.068]	1.053	[0.066]
Other check-up	0.867	[0.107]	0.869	[0.105]	0.844	[0.113]	0.952	[0.134]
Personal health insurance	1.279*	[0.166]	1.280*	[0.163]	1.382**	[0.176]	1.276*	[0.176]
Children	1.028	[0.073]	1.033	[0.073]	1.007	[0.077]	1.044	[0.071]
Religiousness	0.965	[0.111]	0.968	[0.110]	0.947	[0.106]	0.962	[0.109]
Church visits	0.948	[0.037]	0.951	[0.037]	0.953	[0.037]	0.943	[0.037]
Social support	1.007	[0.148]	1.024	[0.148]	0.936	[0.147]	0.949	[0.136]
Contextual characteristics								
Peers' membership duration	0.988**	[0.005]	0.988**	[0.005]	0.987**	[0.005]	0.987**	[0.005]
Peers' years of education	0.921*	[0.041]	0.923*	[0.041]	0.977	[0.046]	0.937	[0.045]
Peers' health knowledge	1.002	[0.038]	1.005	[0.040]	0.983	[0.039]	1.047	[0.043]
Peers' good health status	1.279	[0.438]	1.274	[0.438]	1.627	[0.603]	1.556	[0.617]
Peers' wealth	0.906	[0.155]	0.907	[0.153]	0.925	[0.191]	0.872	[0.154]
Peers' other check-up	0.754	[0.226]	0.73	[0.225]	0.881	[0.238]	0.572*	[0.186]
Peers' personal health insurance	0.748	[0.243]	0.761	[0.243]	0.822	[0.293]	0.686	[0.262]
Peers' children	0.981	[0.075]	0.983	[0.075]	1.000	[0.082]	0.977	[0.079]
Peers' religiousness	0.756	[0.167]	0.751	[0.166]	0.617*	[0.157]	0.642*	[0.166]
Peers' church visits	0.958	[0.087]	0.961	[0.087]	0.999	[0.099]	1.037	[0.110]
Peers' social support	1.197	[0.315]	1.221	[0.323]	1.216	[0.357]	1.109	[0.351]
Additional controls included	Yes		Yes		Yes		Yes	
Fixed effects	Yes		Yes		Yes		Yes	
Observations	12540		12540		10368		10102	
AIC	2637.283		2635.099		2396.216		2379.75	

Notes: Coefficients are displayed as hazard ratios, standard errors in brackets. Standard errors are clustered on center level (m=70). Additional controls included in the model, but not displayed: Number of peers at time t, standardized indegree, network size, network density, relationship and marital status, age, household size, parental education background, and distance to closest health facility. Fixed effects calculated for 15 neighborhood clusters by including neighborhood dummies. P-value: * p≤0.1, ** p≤0.05, *** p≤0.01.

In total, we estimate four model specifications. The first model 3a includes only the mean uptake of the program $\bar{y}_{Rit}$ in the peer group at time t . The models 3b interacts the mean program uptake with the baseline hazard to allow peer effects to vary over time. In the final two models 3c and 3d, the central explanatory variable, mean uptake in the peer group, is split up in two variables which capture the mean uptake among weak and strong ties and peers with a low and high indegree, which we define as individuals who are connected to more than 25% of the other center members (30.7% of all respondents, all results are robust to different status specifications). Please note that this specification requires that observations are connected to at least one weak and one strong tie, and to at least one peer with a low and one with a high indegree, respectively, which explains the drop in the number of cases.

The baseline hazard is estimated in model 3a at a value of 1.650. An increase in the logarithm of time by one (i.e. in the membership duration or the time since introduction of the program) is associated with an increase in the hazard to use the program of 65.0%. As can be inferred from the time to survey variable among the individual characteristics, uptake of the program was overall lower in the first time after introduction of the program. The variable measuring mean program adoption among the direct peers reveals again a significant and substantial peer effect. Having 10% more peers in the network who used the program before raises the individual hazard to adopt by 87.44% confirming the previous findings.

In the second model the mean uptake is interacted with the baseline hazard indicating an interplay between the two variables: Peer effects seem to be strongest in early time periods after program exposure and become weaker as time progresses. Figure 6 shows the survival rates over time for respondents with a mean uptake in the peer group greater than 50% and those with a mean uptake below this threshold. Clearly, the chances of not being a user, i.e. the survival rates, are much lower in the group with a majority of adopters among the peers. As time progresses, however, the marginal peer effect in this group decreases leading to a flattening of the curve. For those respondents with fewer adopters in the peer group, on the other hand, uptake increases more steeply over time leading to a slight narrowing of the gap between the two groups.

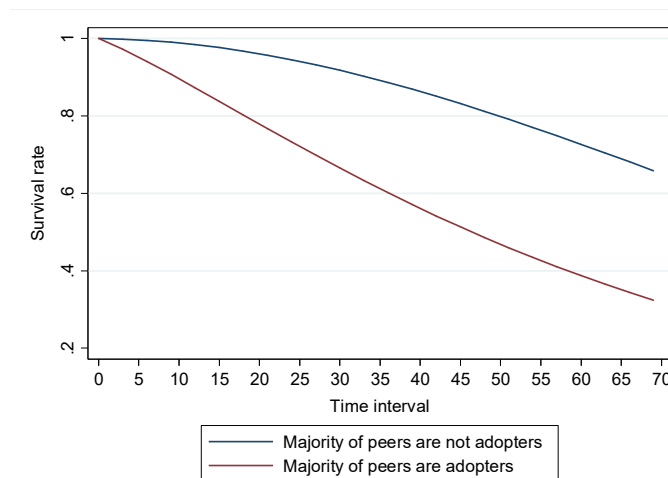


Figure 6 - Survival functions over time by adoption in the peer group

In the next two models, the mean uptake variable is split to capture the uptake in different subgroups in the social networks: Uptake by weak vs. strong tie peers and peers with a high vs. low indegree. According to model 3c, both weak and strong ties exhibit a positive peer effect on individual adoption ($p \leq 0.01$) of almost equal size suggesting that relationship strength does not matter for the size of the peer effects in our setting. When we analyze the peer effects separately for low and high status peers, we find again a positive, and similarly strong effect for both subgroups in the network. Although the uptake in the low status group seems to be more influential (effect of 3.591 vs. 2.223), the two coefficients are not statistically different from each other ($p > 0.1$)

Yet, if we interact the mean uptake of peers with lower and higher status with the individual indegree, we find evidence for an interesting interplay. For better illustration, we categorized the individual indegree into a binary variable with high status individuals being connected to more than 25% of the network. The results, which are reported in Table B4 in the appendix, do also hold if we use the continuous individual indegree variable. While individuals with a high standardized indegree generally express higher levels of take-up, we find low status peers' behavior to be more influential for high status individuals than the other way round (coefficient difference significant with $p \leq 0.1$). We also observe a significantly positive peer effect of smaller size ($p \leq 0.1$) of low status peers' behavior on low status individuals' adoption decisions. On the other hand, we do not find evidence that well-connected individuals are influenced by their high-status peers.

Why are high status individuals more susceptible to the behavior of their lower status peers? One possible explanation for this finding is that lower status clients are less well integrated in the microfinance group and less interested in the activities of our partner organization. Uptake by better connected, more active members in the network thus may have less of an effect on them compared to the other way round. The adoption of lower status peers, on the other hand, may serve as a strong motivator for higher status individuals who have already an a priori higher adoption probability and may perceive themselves as role models in the microfinance groups. To credibly maintain their status as good clients in the network they may hence be more susceptible to external influences from ties with lower status.

In the models, several of the included individual characteristics exhibit a robust effect on the use of the health services. Respondents are more likely to adopt if they have higher health knowledge and if they hold a personal health insurance. Furthermore, we find weak evidence that wealthier and less educated clients are more likely to make use of the program. Again, we do not find any substantial evidence for contextual effects. Like in the previous modes, the peer's average membership duration is negatively correlated with individual uptake. Besides, we find weak evidence for negative effects of peers' level of education and religiousness. However, these effects are not robust across models.

7 Discussion and Conclusion

In this paper, we study the role of peer effects for the use of health services and medical check-ups that are offered as part of the integrated health program of a microfinance institution (MFI) in the Philippines. In the recent years, MFIs all over the world got increasingly engaged in the provision of health services in addition to their core financial activities (Leatherman et al. 2012; Leatherman & Dunford 2010). While this trend is increasingly shaping today's health care service landscape in many low- and middle-income countries, little is known about client's adoption of such programs and the role of the microfinance groups for individual uptake decisions.

We make use of a novel instrumental variable strategy to overcome reflection and endogeneity problems in the estimation of peer effects using non-experimental, cross-sectional data (Bramoullé et al. 2009). The approach exploits information on the structure of the networks and partially overlapping peer groups to reach identification. Besides, we consider the variation in another dimension, the timing of the program uptake, to check for the robustness of our results and to explore some mechanisms that moderate the strength of peer effects under different conditions.

Studying microfinance group networks offers several advantages for the analysis: First, as the microfinance groups are characterized by clear boundaries, we can use pre-defined sampling frames of the considered networks and do not have to rely on proxies, such as geographical proximity or shared characteristics, when defining the peer groups in the networks. Respondents were asked to directly nominate their interaction partners from the entire list of clients allowing us to collect sociometric information on the complete microfinance network. Furthermore, as only clients of our partner organization and their families are eligible to use the program, uptake cannot be strongly influenced by network outsiders reducing disturbing external influences.

We find evidence for substantial endogenous peer effects in the microfinance group networks. According to our preferred IV specification, an increase of program uptake by 10% in the direct peer group leads to an increase in the individual uptake probability by 6.6%. The results do also hold in the discrete-time hazard models, which show that an individual's decision to make use of the health services is strongly influenced by the percent of peers who have used the program before. Further analyses using the dynamic information reveal that peer effects differ over time. The social influence seems to be strongest briefly after the first exposure to the program and to gradually fade out over time. This is in line with findings from other studies, such as by Oster & Thornton (2012) or Sacerdote (2001). It becomes evident that there is an additional value to observing behavior over time in a dynamic setting, even if the information was collected only retrospectively.

While we do not find that behavior of strongly connected peers is more relevant than the one of weakly connected peers, the peers' structural position in the network matters. We find peers with fewer incoming connections than the individual, i.e. a lower structural status, to be more influential for the take-up decision of higher status individuals. This challenges the popular view that more central actors in the network are exhibiting a stronger influence on their peers (Ibarra & Andrews 1993; Munshi 2004; Valente & Pumpuang 2007; Perkins et al. 2014; BenYishay & Mobarak 2015).

One explanation for the finding is that clients who are better integrated in the microfinance networks are more active and more interested in the provided services, as can be inferred from their higher a-priori uptake probability. These clients may want to serve as role models and develop a reputation as good clients (Fehr 2004; Kreps & Wilson 1982). If a larger number of their less well-connected (and arguably less active) peers starts using the services, they may feel more inclined to start using the services themselves as an expression of their strong interest. In other words: If even the less well-connected network members start using the services, the better integrated clients may face a stronger fear of losing their face if they do not follow making them more susceptible to influences from their lower status peers. The finding could also reflect strategic motivations by the high status individuals who wait for their structurally more dependent peers to experiment with the program first to learn from their experiences (Cook & Emerson 1978; Yamagishi et al. 1988). However, as overall uptake is higher and average adoption times are shorter in the first group, this is not a likely explanation for the observed patterns.

The findings reveal the importance of understanding the exact mechanisms which underlay the observed peer effects. Although we have shown that peer effects can be substantial in the considered setting, it is unclear whether they are driven by pure imitation, learning, or the existence of externalities.²⁶ Importantly, without better knowledge about the actual mechanisms at play, it is impossible to calculate the social multiplier resulting from the interactions as the size of the multiplier fundamentally depends on the clients' preferences and utility functions (Graham 2015). Moreover, although low status peers are found to exert stronger influence on their higher status peers on the individual level, this does not necessarily translate into an overall greater influence. Although their influence is weaker, better connected individuals can reach out to more peers and hence may have a more substantial effect on the entire network.

Conducting research on social networks comes with various challenges ranging from the appropriate definition of the peer group to econometric difficulties in the identification. Also this study faces some limitations. First, we have to rely on cross-sectional information and are hence unable to properly trace the dynamics of the social interactions in the networks. Even though we try to integrate more dynamic elements in the hazard model estimation, we have to rely on the retrospective information provided to us by the respondents. Also, our analyses are based on survey data, which might be prone to measurement and recall error. Second, this study rests on the assumption that we are able to adequately capture the relevant peer groups in the microfinance networks and that external influences from outside the network are minimized. Although our analysis takes advantage of the peculiar setting of the microfinance group networks, we cannot perfectly control for influences from outside the network which may have affected the results (see also Valente et al. 2013). This is a common challenge in social network studies, independent of whether they focus

²⁶ We included an index for peers' beliefs about the potential benefits and costs of the program to the models in some additional analyses not reported in the paper. If peer effects worked through the transmission of experiences and beliefs we would expect a reduction in the peer effect after controlling for the belief measure. However, we do not observe any substantial changes in the size of the peer coefficient serving as an indication that social learning may not be the primary underlying mechanism driving the peer effects in our setting.

on networks in classrooms (e.g. De Melo 2014), dormitories (e.g. Sacerdote 2001), or villages (e.g. Conley & Udry 2001). Finally, although our used instrumental variable methodology is rigorous, we cannot fully exclude possible bias due to remaining endogeneity. In particular, the endogenous nature of the peer group formation process may have created unobserved similarities in preferences and background characteristics that may have influenced our results. In order to minimize remaining endogeneity, we estimate our models with neighborhood fixed effects and by including a variety of individual and contextual characteristics that are potentially relevant for the adoption decision.

Understanding the dynamics in social networks and their influence on program uptake is important for the promotion and anchoring of health interventions. Although our analysis is focused on the context in the Philippines, the findings of this study have broader applicability and come with several policy implications. As has been shown, the utilization of the health services is largely determined by the behavior of other clients in the network with peer effects being strongest shortly after the first introduction of the program. Social networks can hence be effectively used for client targeting and the promotion of the program. In particular, based on our results, two groups should receive special attention: First, individuals with a very central position in the network as they can reach out to and influence many others; and second, weakly connected individuals, who are not strongly integrated in the microfinance group. Addressing the latter group may be useful because lower status individuals are overall less likely to make use of the health services (net of peer effects) and a stronger promotion of the program among them may help increasing their uptake. At the same time, this may generate important indirect effects on individuals with a more central position in the network who are found to be most strongly influenced by the behavior of their lower status peers. In general, our results suggest that fostering the integration of clients in the microfinance groups and strengthening social ties between them is a useful strategy, which may positively affect the utilization of the services through social interaction effects. Ultimately, this can help raising the outreach of the integrated health program and contribute to improving the health situation in the impoverished communities.

Chapter 3

The Health Knowledge Mechanism: Evidence on the Link between Education and Health Lifestyle in the Philippines

1 Introduction

Previous studies have documented considerable inequalities in health between educational groups. Better educated people have a lower mortality, experience less often harmful diseases, and feel overall healthier than their less educated peers (Grossman 2006). A relationship between education and health has also been found in low and middle-income countries, for example in Nicaragua (Behrman & Wolfe 1989), Bangladesh (Hurt et al. 2004), Mexico (Smith & Goldman 2007), or China (Zimmer & Kwong 2004). One behaviorally based explanation for educational differentials in health is provided by the allocative efficiency hypothesis, which extends on the reasoning of early health capital models (Grossman 1972; Muurinen 1982; Wagstaff 1986). The theory suggests that education raises a person's health knowledge, allowing the educated to choose a more efficient input mix in the health production process, i.e. to make better health decisions, leading to improved health outcomes (Rosenzweig & Schultz 1989; Kenkel 1991).

In line with this argument, previous studies have found education to positively influence health-related lifestyles and behaviors, such as smoking (de Walque 2007a; Kemptner et al. 2011; Jensen & Lleras-Muney 2012; Jürges et al. 2011), drinking (Jensen & Lleras-Muney 2012), or care seeking (Park & Kang 2008, Robyn et al. 2012). Despite this evidence, little is known about the actual mechanisms through which education affects behavioral patterns. The few studies that test for the relevance of knowledge as a mediating channel in explaining education effects on health decisions come to mixed results. While most of them do at least partially confirm the allocative efficiency predictions, in none of them health knowledge accounts for a considerably large share of education effects (Kenkel 1991; Meara 2001; Cutler & Lleras-Muney 2010; Mocan & Altindag 2014). The evidence suggests that other mechanisms, such as differences in productive efficiency or omitted third factors, might drive the effects.

Unlike previous studies, which rely predominantly on data from developed countries, we provide a test of the allocative efficiency hypothesis in the Philippines, a lower-middle income country. In this setting access to health-related information may be restricted, raising the importance of educational institutions in improving knowledge and disseminating information about disease threats and appropriate health practices (Dupas 2011b). As a further contribution to the literature, we try to overcome a major challenge in the testing of the allocative efficiency mechanism, which is the

measurement of respondents' health knowledge. In previous studies, indicators tended to measure knowledge in a restricted way, limiting attention to knowledge about one health topic, such as the risks of smoking, which might not well capture the multi-dimensionality of the construct (Kenkel 1991; Altindag et al. 2011; Johnston et al. 2014). Another commonly encountered problem in the measurement is the degree of simplicity of the posed questions and presented answer categories. For example, applying simple guessing strategies, such as replying yes to all questions, would yield high knowledge ratings in some studies (Kenkel 1991; Meara 2001; Cutler & Lleras-Muney 2010). Using self-collected data, we construct an extensive knowledge index, which is tailored to the local context. The measure is based on 28 openly answerable questions about various health topics, such as disease prevention, medical treatments, child health, family planning, and sexual transmittable diseases. Using this novel measure, we find knowledge to play a pivotal role in explaining education effects, lending strong support to the allocative efficiency argument.

Previous research considered mostly individual behavioral indicators, such as exercising or drinking, which were analyzed separately (de Walque 2007a; Park & Kang 2008; Jensen & Lleras-Muney 2012). Although commonly used, this approach does not account for the fact that health decisions are not made in isolation, but may depend on each other in the health production function. For instance, an individual could try to compensate a bad health behavior, such as the consumption of unhealthy food, with a good health behavior, such as regular exercising. In this study, we consider an individual's *health lifestyle*, which we define as an aggregate expression of different health practices, such as disease prevention, eating habits, and exercising. Based on 14 binary coded behaviors respondents are categorized as having either an overall healthy or unhealthy lifestyle using techniques of cluster and latent class analysis (Kaufman & Rousseeuw 2009; Hageaars & McCutcheon 2009). To test for the consistency of our results we perform the analysis not only for the aggregate lifestyle measures, but also separately for the single behavioral indicators.

We employ a propensity score matching approach, which allows us to identify education effects under control of potentially confounding background variables that may influence both the selection into education and the health lifestyle. The matching is performed based on respondents' pre-education characteristics, such as socio-economic status in childhood, parental educational background, and birth region characteristics. A special feature of our identification strategy is the use of generalized propensity score (GPS) matching with a continuous treatment variable, years of education, as developed by Hirano and Imbens (2004). In addition to logit models, we use the KHB method, which allows us to decompose direct and indirect (mediated through knowledge) education effects across non-linear nested models with binary outcome variables (Breen et al. 2013; Kohler et al. 2011). Following previous research (Fuchs 1982; Cutler & Lleras-Muney 2010), we control for other theoretically relevant mediating factors, such as wealth and risk preferences, in additional models to identify the isolated effect of knowledge on health lifestyle. The data for this study was collected among 1064 low-income households in the greater area of Metro Manila, the capital of the Philippines. All respondents were clients of a social development microfinance institution at the time of the survey.

Like other low and middle-income countries, the Philippines are characterized by strong inequalities in health care access and utilization with the poor being most strongly disadvantaged. Many of the most prevalent diseases could be effectively avoided or treated. Yet, the take-up of preventive and curative services as well as investments in healthy lifestyles are often low among the poor (WHO 2011; WHO 2013b). Besides supply-side restrictions in access to health care, lacking information and knowledge are named as primary reason for low health investments in the literature (Dupas 2011). Gaining a better understanding of the mechanisms that influence health-related decisions is hence not only of importance from an academic point of view, but also for the design of policies which aim at reducing informational and knowledge deficits among disadvantaged populations.

Controlling for the individual propensity to get educated, we find strong support for the predictions of the allocative efficiency hypothesis. Education is strongly related to health knowledge levels, which in turn are positively associated with health lifestyle. The effect sizes are substantial: An additional year of schooling raises the probability of having a healthy lifestyle by about 3.5%. Once we introduce knowledge as a mediating factor in the full lifestyle models, education effects are significantly reduced by between 65% and 69% depending on the lifestyle typologisation used (cluster vs. latent class analysis, respectively). As a benchmark, wealth as a measure of economic resources explains up to 32% of the observed education effects, further highlighting the role of knowledge and information as important mediating channel. The results also hold if we perform the analysis separately for each health behavior, even though we observe some heterogeneity in effect sizes and mediation strength across the different indicators. Interestingly, knowledge has a positive influence also for some of the health behaviors for which education does not seem to matter, suggesting that the variable can also be of importance independent of a person's level of education.

Although our empirical results strongly confirm the predictions of the allocative efficiency argument, it is worth noting that our study faces some limitations. Due to the cross-sectional nature of our data we cannot make causal claims. Even though we attempt to control for the pre-education background of our respondents, our key explanatory variables education and knowledge may still be potentially endogenous. As an explorative mediation analysis, the strength of our study does not lie in the rigorous causal identification, but in the detailed examination of the knowledge mechanism as a possible explanation for education effects. Also, we are unable to provide a full specification of the individual health production function, which would require the simultaneous analysis of input levels or costs (including different efforts) and outputs to determine the total welfare effect. Nevertheless, our findings can serve as an indirect test of the allocative efficiency mechanism and as first evidence for the importance of health knowledge as mediator in explaining health-related outcomes in a developing country context.

The remainder of the paper is structured as follows. The next section introduces the theoretical framework of our analysis and summarizes previous empirical evidence. Section 3 gives an overview of the data, the identification strategy, and the operationalization of the key variables. Section

4 presents the results and Section 5 discusses the findings against the background of the current literature. The final section concludes with a summary of the main results.

2 Previous Theoretical and Empirical Literature

There is strong, although not uncontested, evidence for a positive causal link between education and health (see Eide & Showalter 2011 for an overview). Commonly studies use variations in compulsory schooling law across regions/counties, or those induced by school reforms at a certain point in time, to reach an identification of education effects. The seminal Grossman model (1972) laid the theoretical foundation to which most of the present empirical and theoretical work refers to. Inspired by classical human capital models, such as Ben-Porath (1967) or Becker (1962), Grossman considers health as both an investment and consumption good. In his model he directly addresses the demand for health as a durable capital stock. He argues that an individual's level of education enhances the productive capacity for market employment as well as commodity production. Accordingly, better educated people are able to reach better health states at lower costs, because education renders the individual's health production process more efficient (Grossman 2000; Jacobson 2000; Halliday et al. 2009). Here productive efficiency refers to a greater outcome keeping the input allocation constant.

A complementary theoretical explanation is the *allocative efficiency hypothesis* (Rosenzweig & Schultz 1989; Kenkel 1991; Altindag et al. 2011). In this theory, schooling improves an individual's knowledge about health and the implications of her health choices, leading to a superior allocation of inputs in the health production process (Lillard & Molloy 2010). This implies that persons with different degrees of education and knowledge, choose different health inputs, i.e. they show different health behaviors. Schooling can raise health knowledge either directly, for example in school delivered health trainings, or indirectly by raising a person's absorptive capacity for health information. The latter claim means that the educated are better able to acquire and process information, especially if it is complex (Schultz 1975). In line with this argument, de Walque (2007b) finds that the more educated show a stronger and faster reaction to an HIV information campaign in Uganda. Similar results are presented by Aizer and Stroud (2010) for behavioral responses to novel information about the impacts of smoking or Lange (2011) for the adoption of preventive behaviors as a reaction to varying personal cancer risks. The main theoretical mechanism of the allocative efficiency hypothesis is depicted in Figure 7.

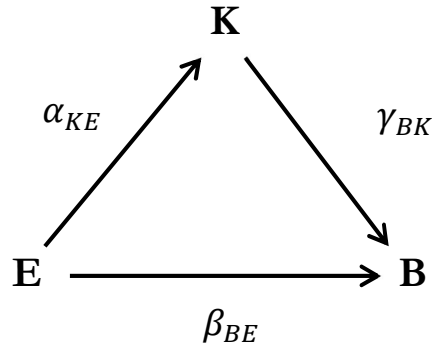


Figure 7 - The allocative efficiency mechanism

We derive three main testable predictions based on the allocative efficiency argument which claims that behavior B is a function of education E , knowledge K , and other factors X with $B = f(E, K(E), X)$. First, education E is predicted to positively influence knowledge about health K ($H_1: \alpha_{KE} = \delta K / \delta E > 0$); second, education is expected to positively influence health lifestyle B ($H_2: \beta_{BE} = dB/dE = \delta B / \delta E + (\delta B / \delta K) \cdot (\delta K / \delta E) > 0$); and third, knowledge K is predicted to be one of the mechanisms explaining the relationship between education and health lifestyle as a mediating factor ($H_3: \beta_{BE} - \gamma_{BK} \cdot \alpha_{KE} > 0$).

In line with the second prediction, various studies find that education influences health behaviors in a positive way (Tenn et al. 2010; Jürges et al. 2011; Mokdad et al. 2004; Robyn et al. 2012; Arendt 2008). For instance, using data on a major schooling information campaign in the Dominican Republic, Jensen & Lleras-Muney (2012) find that schooling significantly reduces smoking and delays the onset of daily or regular drinking among male students. On the other hand, only few studies have directly tested for the mediating effect of knowledge on the education-health lifestyle relationship.²⁷ In one of the first studies, Kenkel (1991) finds that health knowledge explains part of the positive effect of education on health-related behaviors, such as smoking, drinking, or exercising. However, even under control for health knowledge, a large share of the education effect remains unexplained, suggesting that schooling may additionally have an impact on behavior through channels other than knowledge. Similarly, Cutler and Lleras-Muney (2010) find only a modest impact of knowledge on the education gradient in health behavior, using two measures of knowledge about the risks of smoking and drinking. They report a decrease of 17% of education effects on current smoking and no change in the coefficients for drinking once the knowledge measure is introduced in the model (See also Meara (2001), who reports similar effects). In addition to health knowledge, the authors tested for the relevance of a broad set of other mediators revealing an

²⁷ Several studies have tested for the role of health information and knowledge in developing countries (Dupas 2011a; Cairncross et al. 2005; Cohen et al. 2015). They show that additional health-related information can lead to changes in behaviors, but its effectiveness strongly depends on the kind of information provided, the way of communicating it, and characteristics of the recipient, e.g. her absorptive capacity (see Dupas 2011b for an overview).

important role of economic resources and cognitive abilities in explaining differences between educational strata. Unlike the other studies, Mocan and Altindag (2014) do not find significant changes in education effects on smoking and drinking after controlling for knowledge. Also, Oster (2012), who uses a proxy for knowledge about the risks of HIV in Sub-Saharan Africa, does not find that regions with more health knowledge show a less risky sexual behavior.

Health knowledge seems to play a role, but does not appear to be the main explanatory factor in the education-health lifestyle relationship. The question remains if it is actually education that raises knowledge, or if another factor, such as parental background, is driving the effects. Few studies have tried to identify the direct effect of education on health knowledge α_{KE} , which can be understood as a pre-requisite for the allocative efficiency argument to hold. Altindag et al. (2011b) use two waves of the US National Longitudinal Survey of Youth. The data contains information about individuals who were aged 12-16 in the initial survey period in 1996. In their identification the authors use the exogenous variations in the timing of the follow-up surveys in 2002 (from 54 to 78 months after the initial interviews) as instruments for school attendance. They find only weak evidence for education effects on knowledge, concluding that “allocative efficiency is not likely to be the main reason for why education improves health” (pp.811). Similarly, Johnston et al. (2014), who use data of the UK Health and Lifestyle Survey and compulsory schooling reforms in 1947, do not find education to have a positive effect on knowledge, further challenging the validity of the allocative efficiency argument.

The empirical literature faces different methodical and econometric challenges: Studies analyzing the role of health knowledge as a mediating factor are often not able to properly account for background characteristics that may, at the same time, influence a person’s education level, her knowledge, and her health behavior (Kenkel 1991; Meara 2001; Cutler & Lleras-Muney 2010; Mocan & Altindag 2014). The presented studies investigating education effects on knowledge, on the other hand, use exogenous variation and instrumental variable estimation for their identification (Altindag et al. 2011; Johnston et al. 2015). Although methodologically rigorous, the generated IV estimates rely on difficult to test assumptions and may capture only local average treatment effects, which cannot be generalized to the entire population. Importantly, all of the presented studies use health knowledge measures that are either based on proxies or on a small number of items on selective health topics, restricting the resulting measures both in scale and scope.

We employ a propensity score matching approach as an alternative strategy for the identification of education effects in a developing country context, where health behaviors and its determinants may strongly differ from those in developed countries, which have been the focus of most previous research. Methodically, we add to the literature by (i) using an extensive knowledge index that overcomes common caveats in standard health knowledge measurement and by (ii) considering respondents’ aggregate health lifestyles, instead of individual behavioral indicators, allowing us to account for interdependencies between the single health decisions.

3 Research Design

3.1 Data

We use cross-sectional data collected by the authors in April 2015 in the Philippines. The sample of respondents was randomly drawn among the female clients of a social development micro-finance institution, the Kasagana-Ka Development Center Inc. (KDCI). The interviewed respondents were part of microfinance centers which had up to 42 members depending on the client base in the neighborhood. The sample selection was done using a multi-stage sampling procedure: In a first step, microfinance groups were randomly drawn as primary sampling units from the baseline population of centers in three wider geographical areas in Metro Manila and the neighboring province of Rizal. The three geographical areas were selected by our partner organization and represent the diverse social and geographical background of the organization. In a second step, a number of clients was randomly selected from each center (proportional to the total size of the group) for the interviews. In total, 1064 KDCI clients from 70 different microfinance groups were interviewed for this study using an 18 page long standardized questionnaire.

The research instrument consisted of different sections on participants' health situation, her health behavior, her educational background, her financial situation, and other socio-demographic and household characteristics. As complementary data we collected geographical information on the locations of respondents' homes and public health facilities, such as hospitals or primary health care units, in the study areas. The infrastructure data was provided to us by the National Mapping and Resource Information Authority in the Philippines. (<http://www.namria.gov.ph/>). For the propensity score matching, we additionally use aggregate census data on the provincial level for the years 1948, 1960, 1970, 1975, 1980, and 1990. The data was provided to us by the Philippine Statistical Authority and encoded by the authors.

3.2 Identification Strategy

To answer our research questions, we follow a three-step identification strategy. First, we estimate respondent's propensity to obtain a specific level of education based on her pre-education characteristics. The generalized propensity score derived from this exercise is then used in the subsequent analysis as a balancing variable. In the second step, we estimate the effect of education on health knowledge while controlling for the GPS. This procedure is repeated in the third step, in which we are interested in the effect of education on respondent's health lifestyle and behaviors. Education effects are estimated first without and then under control for knowledge as a potential mediating factor. Section 3.2.1 presents the first step and Section 3.2.2 the remaining steps of our analysis in more detail.

3.2.1 Generalized Propensity Score Matching

We are interested in estimating how different exposure to education influences a person's level of knowledge and her health lifestyle as an aggregate measure of different health behaviors. We test for this relationship using propensity score matching (PSM) with years of education as a continuous treatment variable (Rosenbaum & Rubin 1983). Hirano & Imbens (2004) developed a generalization of the binary-treatment PSM method for continuous treatments with similar properties and assumptions (see also Egger & von Ehrlich 2013). The formalization is based on the potential outcome framework. For each unit i in the sample there exists a potential outcome $Y_i(t)$ for treatment level $t \in \mathcal{T}$ in the interval $[t_0, t_1]$. In the analysis we are interested in estimating the average *dose-response function* $\mu(t) = E[Y_i(t)]$ of education on health knowledge and health behavior based on a vector of covariates X_i , the actually observed treatment status $T_i \in [t_0, t_1]$, and the potential outcome resulting from the received treatment level $Y_i = Y_i(T_i)$. In the implementation of the procedure the (potentially transformed) treatment variable is assumed to be normally distributed given the covariates.

The estimation of the dose response function requires the actual treatment level, conditional on the set of covariates X , to be independent of the potential outcome, such that:

$$Y_i(t) \perp T_i \mid X_i \text{ for all } t \in \mathcal{T} \quad (1.1)$$

This so called weak unconfoundedness assumption is key for a causal interpretation of the results. Like in the binary treatment case it is not statistically testable. The assumption can be violated, if the potential outcome has an influence on the treatment level or if omitted variables influence both outcome and treatment. For instance, in our case, health in childhood or unobserved personality traits, such as time preferences (Fuchs 1982; van der Pol 2011), could influence both the propensity to get educated and health lifestyle. However, even if this assumption does not hold, the method can still be applied and useful in describing the relationship between the variables of interest.

With the conditional density of the treatment given the covariates $r(t, x) = f_{T|X}(t|x)$ the generalized propensity score (GPS) is defined as $R = r(T, X)$. The GPS can be described as an individual's propensity to obtain a certain treatment level. It has a balancing property, which requires for educational strata with similar GPS that the probability of $T = t$ does not depend on the value of X . Combined with the unconfoundedness assumption, the balancing property implies that assignment to different treatment levels is unconfounded given the GPS. Furthermore, it is required that different treatment strata have common support. This means that there are individuals who, even if they are different in their treatment status, are comparable in terms of their GPS.

The GPS can be used to estimate the dose response function $\mu(t)$ by averaging the conditional expectation function $\beta(t, r)$ over the GPS at each treatment level.

$$\mu(t) = E[\beta(t, r(t, X))] \quad (1.2)$$

The dose response function describes the effect of different doses of the treatment, in our case education, on the outcome variables. In the implementation of the approach in Section 4 we use a Stata user-written program by Bia & Mattel (2008), which also allows us to verify the main testable assumptions of the procedure.

3.2.2 Dose Response Functions: Effects of Education on Health Knowledge and Lifestyle

We continue our empirical analysis with a test of the main predictions of the allocative efficiency argument. First, we estimate the dose response function for health knowledge as an outcome variable using linear OLS estimation with standard errors clustered at community level ($m=70$). We include the GPS in the estimation to condition on pre-education characteristics. Under the first prediction of the allocative efficiency hypothesis, we expect α_1 to be significantly larger than zero.

$$K = \alpha_0 + E\alpha_1 + GPS\alpha_2 \quad (2.1)$$

In the final step of our analysis, we are interested in the effect of education on health lifestyle and the role of knowledge as a mediating factor. Based on their behavior, respondents are categorized into two lifestyle types, a healthy and an unhealthy one. For the categorization we use 14 binary coded health behaviors with high relevance for the low-income context (see Section 3.3 on measurement). The data aggregation facilitates the interpretation of our results and allows us to account for interdependencies across the different health behaviors. Methods of cluster analysis and latent class modeling are used to assign respondents to the two lifestyle types (Kaufman & Rousseeuw 2009; Hagenaars & McCutcheon 2009). While cluster analysis uses (arbitrary) distance and similarity criteria to determine the lifestyle typology, latent class analysis follows a probabilistic model-based approach. Applying both methods allows us to test for the robustness of our results using different typologisation techniques. For the cluster analysis we apply a k-mean ($k=2$) partition approach with the simple matching similarity coefficient used for the clustering. As the k-mean procedure does not allow for a deterministic classification, we rerun the method 2000 times and select the typologisation that maximizes the average difference across all behavioral indicators between the identified healthy and unhealthy lifestyle groups (see Table 14 in Section 3.3.3.). For the latent class analysis we use a user-written Stata command provided by the Penn State Methodology Center (Lanza et al. 2015).

Education effects are first estimated for the lifestyle typologisation categories and then separately for each health behavior to identify common patterns in the data. As both the health lifestyle and behavioral indicators (B) are binary coded, we use logit models for the identification of the dose response function, for which we include again the GPS. The baseline model is extended in two steps: First, we add only our health knowledge measure K as a potential mediator (2.3). If the

predictions of the allocative efficiency hypothesis hold, we expect that (i) education positively affects health lifestyle ($\beta_1 > 0$), and that (ii) the inclusion of the potentially mediating knowledge measure significantly reduces the education effects ($\beta_1 - \gamma_1 > 0$).

$$P(B = 1|E, GPS) = \frac{\exp(\beta_0 + E\beta_1 + GPS\beta_2)}{1 + \exp(\beta_0 + E\beta_1 + GPS\beta_2)} \quad (2.2)$$

$$P(B = 1|E, GPS, K) = \frac{\exp(\gamma_0 + E\gamma_1 + GPS\gamma_2 + K\gamma_3)}{1 + \exp(\gamma_0 + E\gamma_1 + GPS\gamma_2 + K\gamma_3)} \quad (2.3)$$

In a final step (model not displayed), we extend the baseline model (2.2) by additionally including a set of other potential factors M which have been proposed as alternative mediating channels in the literature (Cutler & Lleras-Muney 2010; Fuchs 1982; Picone et al. 2004; Ettner 1996). Like before, we add knowledge K to the right-hand side of the baseline model to test for changes in the education coefficient. By including the other variables M, we can ensure that any change in the education effect is due to the inclusion of knowledge and not another potentially confounding mediating factor. In particular, we control for economic resources, risk preferences, access to health facilities, social capital, marital status, number of children in the household, religiosity, and the subjective health status. Furthermore, we control for the education and knowledge background in the microfinance network and in the direct peer group to take potential contextual peer effects into consideration (Durlauf & Ioannides 2010; Jackson 2011). These have been shown to be of importance for health behaviors in different other settings (Fletcher 2014). By controlling for these additional factors, we can identify the mediation effect of health knowledge net of any other channels.

The comparison of education effects ($\beta_1 - \gamma_1$) across non-linear models is not straightforward, as the scale of the underlying models may change if an additional factor is included. To be able to make cross-model comparisons, we apply the *KHB method* (Breen et al. 2013; Kohler et al. 2011), which harmonizes the scale of the baseline and full logit models in a two-step procedure. At first, the mediating variable K is regressed on the original explanatory variable E. The residual R of this first estimation capturing the unexplained variation in the mediator is then included in the baseline model (2.2). This leads to a scale harmonization between the baseline and the extended model including the mediator (2.3), making direct comparisons between the education coefficients possible. The difference in coefficients between both models can be considered as an indication for the strength of the mediation by the health knowledge variable. The KHB method takes the difference in coefficients and tests if it is significantly different from zero, which would support the allocative efficiency argument.

3.3 Measurement

3.3.1 *Determinants of Education*

We estimate respondent's propensity to obtain a specific level of education using information on relevant personal pre-education characteristics: Parental education is measured with two dummies that capture if the father and mother visited or completed secondary school as well as a dummy that measures if both parents could read and write. Furthermore, we include two dummies measuring if a person grew up without a mother and/or father to capture effects of the missing parent. Personal cognitive abilities were measured with a brief word recall test (10 words). Although the ability to memorize may change, there is evidence that human mental abilities are relatively persistent over time (Deary et al. 2000). Furthermore, we include a dummy measuring if the respondent had early work experience at an age younger than 11 years as a proxy for her wealth in childhood. Finally, we control for respondent's age which is measured in four categories (<35, 35-44, 45-54, >54).

Besides personal characteristics, we include different potentially relevant birth province characteristics into the models.²⁸ We exploit the particularly rich variation in provinces of origin in our sample (respondents came from 68 different provinces, and only 25 % were born in one of the study areas in Metro Manila or Rizal Province). In particular, we are interested in context variables, which capture the economic development level and educational infrastructure in the province and are expected to influence individual education decisions. All data were derived from the Philippine Census of Population and Housing since 1948. Information on respondent's birth province and birth year was merged with the environmental background characteristics of the respective province at the time of respondent's birth. If the respondent's birth year was in between two censuses, we used linear extrapolation to obtain an estimate for the considered variables in the birth year. Missing data for provinces in selected years was imputed based on regional averages. We use a broad variety of provincial background characteristics, namely, the distance of the birth province to the capital, the provincial literacy rate, the population density, the elementary school completion rate, and the electrification rate in the province. All variables, except distance to the capital, were dichotomized at the median²⁹.

²⁸ Provinces are the main political and administrative entities in the Philippines. In 2015 there were 81 provinces which formed the 18 greater regions (17 administrative and 1 autonomous regions) of the country (<http://www.nscb.gov.ph/activestats/psgc/listprov.asp>).

²⁹ Although this leads to a loss of information it helps improving the balancing of the sample, a necessary condition for the propensity score estimation. The main results remain largely consistent if we use continuous regional characteristics. However, in order to improve the balancing between the different treatment strata, we decided to restrict our analysis to the binary measures.

3.3.2 Explanatory Variables: Education and Health Knowledge

Education is measured in years of education. All results are robust to the use of alternative education measures, such as the highest educational degree. The sample is relatively well educated. On average, respondents completed 9.6 years of education, which is comparable to the high national average of 8.9 years in the Philippines in 2013 (UNDP 2014). 7.2% of our sample has not completed primary education, 11.1% completed primary school, 48.6% visited or completed highschool, and 33.1% pursued some form of tertiary education, either vocational (10.12%) or at college (8.51% with completed degree, 14.47% without college degree).

The second major explanatory variable is the health knowledge measure, which is based on 28 items, a considerably larger number than in other studies. Using a more extensive set reduces the weight of the single items, which can increase the overall reliability of the measure. Furthermore, the instrument differs in terms of scope from previously used measures: The single items are not restricted to specific aspects of knowledge, but represent a broad range of context relevant health topics, such as disease care or reproductive health. With this we attempt to better capture the multidimensionality of the construct acknowledging that the single knowledge dimensions may be difficult to assess with simple indicators.³⁰ To further increase the validity of the instrument, we do not present respondents with pre-defined answer categories to avoid anchoring effects and the use of simple guessing strategies such as replying yes to all questions (Cutler & Lleras-Muney 2010). Instead, respondents were allowed to give open answers in order to gain a more accurate and exhaustive picture of a person's health knowledge.

Table C1 in Appendix C presents the single items included in the health knowledge index and provides summary statistics. All answers were categorized and evaluated based on *minimum answer rules*. Taking the non-medical background of the survey respondents into account, some answer rules are rather simple and only control for respondent's basic understanding of a method or disease³¹. If an open question required several correct answers, the answer rule represents a minimum number of correct answers. This number was defined based on a median split, such that the item was classified as correct for not more than 50% of the sample.

The single items were additively combined in a health knowledge index (Cronbach's alpha: 0.769). The index has a scale from 0 to 28 and an approximate bell-shaped distribution around the mean of 15.7 (see Figure 8). Our findings are not sensitive to the use of differently aggregated measures, such as (i) an additive index of the normalized knowledge items k where each item $x_{ik} \in \{0, 1\}$

³⁰ For example, not knowing that smoking causes bladder cancer, as asked in the 1990 US National Health Interview Survey (Cutler & Lleras-Muney 2010) does not mean that one does not know that smoking is harmful. At the same time, knowing that smoking causes cancer does not imply that one knows (or understands) that smoking is bad for health (see section 5 for a more lengthy discussion).

³¹ For instance, respondents were asked to explain the procedures of different medical tests. An answer was evaluated as correct if the respondent was able to show that she possesses a basic understanding of the tests and could vaguely describe the procedure. For instance, to correctly describe what an Electro Cardio Graph (ECG) is, respondents had to know (at least) that for this test devices are being attached to the breast. As minimal answer to correctly describe a urinalysis, they had to know that a urine sample is collected to perform further tests.

was transformed by subtracting the mean of correct answers of all respondents and dividing it by the standard deviation, or (ii) an index for which single items were weighted based on principal component analysis (PCA). The education level, measured in years of schooling, and the health knowledge index are significantly correlated with a correlation coefficient of 0.331 ($p \leq 0.01$).

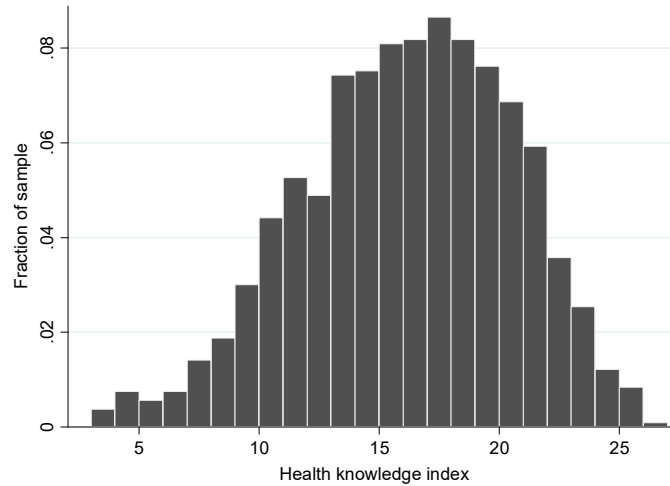


Figure 8 - Distribution of health knowledge index

While we focus in our analysis on the role of general health knowledge, we also perform various robustness checks in which we test whether respondents with specific health knowledge, e.g. about strategies to prevent hypertension, are more likely to undertake specific beneficial behaviors, such as exercising or healthy food consumption. The results, which are shown in Table C5 in the appendix, are discussed together with the main findings in Section 4.3.2.

3.3.3 Main Outcome: Health Lifestyle

We derive a health lifestyle typology (healthy vs. unhealthy lifestyle) based on 14 different behavioral indicators, which are all highly relevant for the low-income context of our sample and the health challenges faced in the Philippines. Several of the indicators, e.g. on exercising or nutrition, have been adopted from previous studies (Cutler & Lleras-Muney 2010; Park & Kang 2008). All indicators were dichotomized for the analysis and take the value one if the respondent pursued a certain behavior that is (presumably) beneficial for her health. In the following paragraph, the values in parentheses indicate the share of respondents who showed a specific behavior in our sample. Table C2 in the appendix gives more detailed information about the operationalization of the single indicators.

The indicators measure if the respondent was exercising regularly (25.4%), consuming fruits regularly (48.4%), able to keep a diet (65.9%), underwent a routine check-up in the last year (44.5%), planned to undergo a routine check-up in the next year (64.9%), had a personal professional health

care provider (61.9%), made use of breast self-examination in the past 3 months (32.5%)³², ever used family planning methods (83.8%), regularly washed her hands throughout the day (54.8%), did not drink any untreated/unfiltered water in the past 3 days (47.4%), was insured with the Philippine public health insurance Phil Health (20.9%), actively sought general health-related information in the past 3 months (52.3%), learned new information about health threats in the past 6 months (41.4%), and searched for information about family planning in the past 12 months (18.0%).

Table 14 - Summary statistics for different lifestyle typologies

	<u>Unhealthy lifestyle</u>		<u>Healthy lifestyle</u>		<u>Difference</u>	
	Cluster	Latent	Cluster	Latent	Cluster	Latent
Exercising	0.17	0.16	0.36	0.38	0.19 ***	0.22 ***
Fruit consumption	0.33	0.34	0.70	0.67	0.37 ***	0.33 ***
Keeping a diet	0.64	0.63	0.69	0.70	0.05	0.07 **
Routine check-up last year	0.25	0.28	0.72	0.67	0.48 ***	0.39 ***
Routine check-up next year	0.53	0.52	0.81	0.82	0.28 ***	0.30 ***
Healthcare provider	0.50	0.48	0.79	0.81	0.29 ***	0.32 ***
Breast self-examination	0.16	0.15	0.55	0.57	0.39 ***	0.42 ***
Ever used family planning	0.8	0.78	0.89	0.91	0.09 ***	0.13 ***
Handwashing	0.47	0.48	0.67	0.64	0.20 ***	0.16 ***
Not drinking untreated water	0.42	0.44	0.55	0.53	0.13 ***	0.09 ***
Public health insurance	0.14	0.11	0.31	0.34	0.17 ***	0.23 ***
Search for health information	0.33	0.32	0.79	0.79	0.46 ***	0.47 ***
Learning info about diseases	0.27	0.28	0.62	0.60	0.35 ***	0.32 ***
Search info about family planning	0.14	0.12	0.24	0.27	0.10 ***	0.15 ***
Total						
Observations	612	612	442	452	1054	1064 ^a
Percent of total	58.2%	57.5%	41.8%	42.5%	100%	100%

Notes: Lifestyle typologies based on cluster and latent class analysis. All health behavior indicators are binary coded. Z-tests are used to test for mean differences between the groups. P-value: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$. ^a Note that while cluster analysis is sensitive to missing values for the single behavioral indicators, this is not the case for latent class analysis, explaining the differences in sample sizes.

Based on these indicators respondents were categorized as having either a healthy or unhealthy lifestyle, using cluster and latent class analysis (Kaufman & Rousseeuw 2009; Hagenaars & McCutcheon 2009). Through this we obtain a comprehensive measure which captures different dimensions of health behavior taking interdependencies into account. Table 14 informs us about the percentage of people showing a certain health behavior by lifestyle category. The dichotomous lifestyle variables effectively split the sample along the multiple health behavior dimensions, suggesting that the derived lifestyle typologies are informative. The dichotomization allows us to compare our estimates for the aggregate lifestyle outcome (section 4.2) with the estimates for the separate health behaviors (4.3), which are all binary coded. Additional analyses (not reported), in which

³² We use breast self-examination as indicator, although recent studies have put into question the effectiveness of breast self-examination methods for early cancer screening and detection (Thomas et al. 2002). Despite these recent findings, the method is still being taught and widely used in the Philippines. It is also promoted by our local partner organization.

we used continuous lifestyle indices instead of the binary measures, did not indicate a sensitivity of our findings to the use of alternative lifestyle measures.

3.3.4 Other Mediating Factors

To identify the isolated mediation effect of health knowledge net of any other explanatory channels, we control for a broad set of other potentially mediating factors in our full model specification. We include such factors that may potentially be related to education, knowledge, and health lifestyle.

Economic resources were measured with an asset based wealth index which was generated by employing PCA using the information on 28 different assets, such as vehicles or household appliances, (Vyas & Kumaranayake 2006). To assess subjective health status respondents were asked how they rate their health on a scale from 0-10. Risk preferences were measured by asking respondents' for their general willingness to take risks on a scale from 0-10 (Dohmen et al. 2011). In addition, we control for marital status and number of children in the household.

Access to the local health infrastructure was operationalized with the linear distance between the clients' homes and the next health facility. To measure social support respondents were asked if there was at least one person among her friends and acquaintances who gave her advice on health, shared information, and encouraged her to undergo medical check-ups. The resulting indicator has a range from one to four. Subjective religiosity on a scale from 1-4 is used as an indicator for religiousness, an important cultural variable in the Philippines.

As a final critical mediating channel we control for the mean education and knowledge level in the whole microfinance group and in the respondent's direct peer group. Both higher levels of education and knowledge in the network may make individuals more likely to express a healthy lifestyle in form of contextual or exogenous peer effects (Manski 1993; Fletcher 2014). At the same time, education and knowledge are likely to be correlated within the peer groups due to homophilous peer group formation, which may confound our estimation of individual knowledge effects, if not properly accounted for.

The direct peer group was identified based on a sociometric network questionnaire (Perkins et al. 2014) which consisted of four relationship questions in which respondents were asked to nominate those people in the microfinance group (i) who they perceived to be their personal friend, (ii) with who they had contact at least once a week, (iii) who they perceived as one of their 5 best friends, and (iv) who they shared private, intimate thoughts with. If a group member was nominated in either one of these questions, she was counted as a direct peer in our analysis. Although with this procedure we may not capture the entire social network of our respondents, the measure can serve as a proxy for the mean education and knowledge level among the peers in the area, especially since for many of our respondents there is a strong overlap between the general social network and the microfinance group network (e.g. on average respondents have 2 of their 5 closest friends in the microfinance group).

4 Results

4.1 GPS Estimation and Test of Assumptions

In the estimation of the generalized propensity scores we closely follow the procedures outlined in Hirano and Imbens (2004) and Kluve et al. (2012). After estimating the GPS, the central assumptions of the propensity score method are tested: the normality assumption, the balancing of covariates along the treatment spectrum, and the common support condition.

4.1.1 GPS Estimation

For the calculation of the GPS the treatment variable, years of education, which is not significantly different from a normal distribution according to a one-sample Kolmogorov-Smirnov test, is regressed on various relevant individual and environmental pre-treatment characteristics. Table 15 summarizes the results of the linear GPS estimation. The model explains a significant share of the variation in schooling, although some unexplained variation remains.

Table 15 - OLS models: Estimation of generalized propensity score

	Education	
Age: <35	-0.650	[2.760]
Age: 35 - 44	0.080	[0.301]
Age: 45 - 54	0.041	[0.220]
Mother with secondary education	0.661***	[0.212]
Father with secondary education	0.811***	[0.207]
Mother not known	-0.327	[0.563]
Father not known	-0.681	[0.586]
Both parents literate	1.009***	[0.267]
Cognitive abilities	0.278***	[0.060]
Early work experience ($\leq$ age of 10)	-1.020***	[0.318]
Above median literacy rate in birth province (bp)	-0.292	[0.303]
Above median population density rate in bp	0.051	[0.216]
Above median elementary school completion rate bp	0.628**	[0.298]
Above median electrification rate in bp	-0.244	[0.308]
Distance of bp to capital in 100 km	-0.046	[0.042]
Constant	6.903***	[0.384]
Observations	1041	
Adj. R ²	0.135	
AIC	5007.1	

Notes: Coefficients in cells, standard errors in brackets. Standard errors are clustered on center level (m=70). P-value: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

Parental education level and literacy exert strong effects on children's education. Having literate parents, who obtained at least some form of secondary education, raises a person's education level on average by almost 2.5 years. Furthermore, we find that respondents, who made early work experiences (at an age younger than 11) and who hence grew up in an economically less fortunate

environment, had a significantly smaller chance of obtaining higher education degrees. Besides parental background characteristics, a person's cognitive abilities are associated with higher educational attainment. A one point increase on the cognitive ability scale is associated with a significant average increase in years of education of 0.28. Interestingly, we do not find an effect of age on education, which might be due to early school reforms in the Philippines, which led to improved schooling access for large parts of the population. Among the provincial background characteristics, we find that respondents from provinces with a below median elementary school completion rate had a significantly lower education level, which might be due to differences in schooling infrastructures across the provinces. We do not find statistically significant effects for any of the other provincial background variables.

4.1.2 Test of Main Assumptions

For the test of the balancing property, we divide the range of the treatment variable into three intervals. Following Hirano & Imbens (2004), we define the groups to have approximately an equal size: The first group ranges from 0 to 9 years of education and covers 36.95% of the sample (approximately up to lower secondary), the second group includes people with 10 to 11 years of education and makes up for 38.55% of the sample (approximately upper secondary and secondary completed), and the third group consists of persons with more than 11 years of education covering 24.51% (approximately respondents with tertiary education). For each individual we calculate the GPS at the median of the three groups. The groups are split into deciles based on individuals' estimated GPS. The balancing property of this adjusted sample is then tested by comparing respondents in the first treatment group, i.e. those with low education, with respondents from the other two treatment groups, who belong to the same GPS decile. Differences across groups are analyzed with t-tests, based on weighted mean differences between the groups. Table C3 in the appendix presents the results of the comparison. If the sample is well-balanced, we expect no significant differences across the educational strata. Indeed, for all considered covariates we observe no t-statistic larger than 1.64, providing strong evidence in favor of the balancing property for our sample.

Finally, we test for the common support condition by graphically comparing the distribution of the GPS evaluated at the median of each interval between the three educational strata. For this, we first evaluate the GPS for the entire sample at the group median of the first educational interval. Then we plot the GPS distribution of the first treatment stratum against the GPS distribution of the other two treatment strata. This exercise is repeated for the second and third group. The histograms in Figure C1 in the appendix show the distribution of the GPS for each educational group in red bars, plotted against the aggregate GPS distribution of the other two strata in blue bars. By inspecting the overlap of the distributions, we are able to examine the common support condition (see Kluve et al. (2012) and Flores et al. (2012) who use the same procedure). The histograms show that the common support condition is fulfilled, with the exception of minor deviations in the lower tail of the GPS distribution in the second educational stratum.

4.2 Education Effect on Health Knowledge

Table 16 shows the results of the GPS-adjusted dose response estimation of education effects on health knowledge. The two main arguments of the function are included in a linear form, but the results are robust to the use of different functional forms in the estimation, e.g. multi-polynomial.

Table 16 - Linear dose response estimation: Effect of education on health knowledge

	<u>Knowledge</u>	
Years of education	0.534***	[0.048]
GPS	0.252	[3.274]
Neighborhood 2	1.177***	[0.344]
Neighborhood 3	1.781***	[0.339]
Constant	9.605***	[0.602]
N	1041	
Adj. R-squared	0.140	
AIC	5878.9	

Notes: Coefficients in cells, standard errors in brackets. Standard errors are clustered on center level (m=70). P-value: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

The results clearly confirm the first allocative efficiency prediction. An additional year of schooling is estimated to significantly raise health knowledge by about 0.535 points on the knowledge index. This represents an increase of the knowledge index of 1.9% with every school year (or a substantial 0.35 standard deviation increase with a 1 standard deviation increase in education). Figure 9 illustrates the finding by plotting the dose response function and the treatment effect function over the treatment variable. The estimated treatment effect function is flat, suggesting equal marginal gains in health knowledge for different education levels.

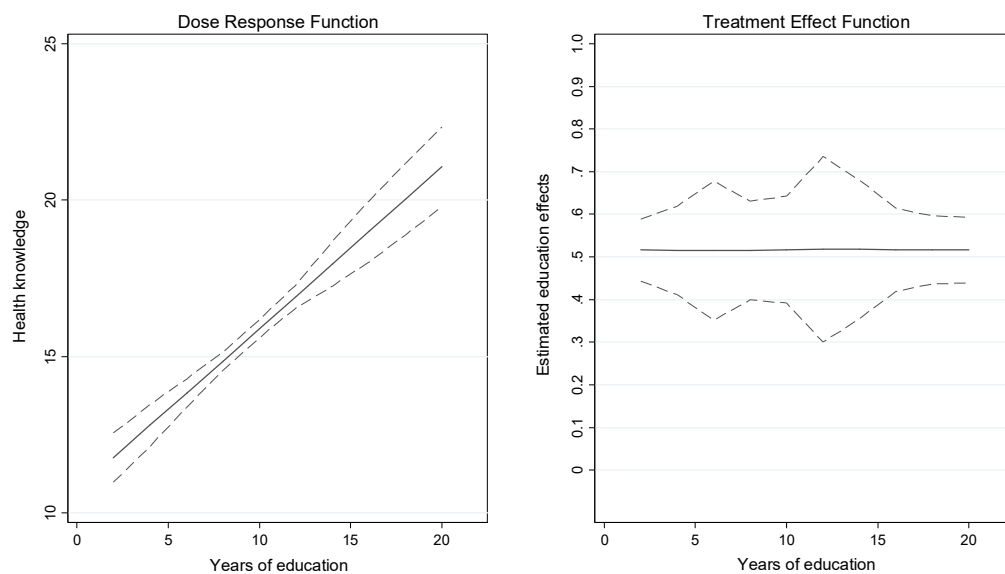


Figure 9 - Dose response and treatment effect function: Education effects on health knowledge

4.3 Effects of Education and Health Knowledge on Health Lifestyle

As a final step, we estimate the effects of education under control of the GPS first for the binary lifestyle variable (Section 4.3.1) and then separately for the single health behavior indicators (Section 4.3.2). By additionally controlling for health knowledge in the models, we are able to assess the importance of this variable as a mediating factor.

4.3.1 *Health Lifestyle*

Table 17 summarizes the results of the GPS-adjusted Logit and KHB estimations for the two binary lifestyle indicators, which were calculated using cluster and latent class analysis. For both outcome variables we estimate first a baseline logit model (1a & 2a) with only education as explanatory variable, which is then extended by the knowledge index (1b & 2b). In a final step (1c & 2c), we further include an additional set of mediating variables that may potentially confound the estimation of knowledge effects. To ease the interpretation, all logit coefficients are presented as marginal effects calculated at the mean of all covariates.

The procedure is repeated using the KHB method, which allows us to decompose education effects in total, direct, and indirect effects operating through the health knowledge channel. While the total education effect is comparable to the one in the baseline logit estimation (1a & 2a), the indirect effect captures the share of the education effect on health lifestyle, which is driven by differences in knowledge levels. It is calculated by comparing the education coefficient in the harmonized baseline and the extended logit models. The larger the indirect relative to the total effect, the larger the explanatory power of the mediating variable. The strength of mediation is captured in Δ reported below, which measures the percentage change of the education effect between the baseline and extended model and which can be interpreted as the share of the education effect, which is driven by differences in knowledge levels. The full KHB models are reported in the appendix in Table C4.

In the baseline specification, we find significant positive education effects for both lifestyle indicators and estimation procedures. Based on the logit estimation, an additional year of schooling raises the probability of having a healthy lifestyle by about 3.5% for both outcomes. The results suggest a statistically significant and economically meaningful effect of education on lifestyle under control for the GPS. The extended models (1b & 2b) reveal the important role of health knowledge as a mediating channel in the education-health lifestyle relationship. The knowledge index exhibits a significant positive effect on lifestyle. A one point increase on the index is associated with a 4.2% and 4.3% increase in the chance of having a healthy lifestyle for the two outcome measures, respectively. Once health knowledge is included, education effects are considerably reduced in the models. Based on the KHB estimates, knowledge explains between 64.7% and 68.9% of the education effect, lending strong support to the allocative efficiency argument.

Table 17 - Logit dose response estimation: Effect of education and knowledge on health lifestyle

	Outcome: health lifestyle					
	Cluster typologisation			Latent class typologisation		
	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)
Years of education	0.035*** [0.006]	0.012* [0.006]	0.009 [0.007]	0.034*** [0.006]	0.010* [0.006]	0.01 [0.006]
Health knowledge		0.042*** [0.003]	0.041*** [0.003]		0.043*** [0.003]	0.042*** [0.004]
GPS	-0.609 [0.385]	-0.607 [0.390]	-0.483 [0.369]	-0.597 [0.364]	-0.606* [0.367]	-0.515 [0.351]
Wealth			0.062*** [0.017]			0.059*** [0.019]
Subjective health			0.012 [0.007]			0.014* [0.007]
Distance to health facility			0.003 [0.023]			0.005 [0.021]
Social support			0.172*** [0.038]			0.204*** [0.038]
Married			-0.008 [0.032]			-0.013 [0.033]
Children			-0.007 [0.008]			0.002 [0.008]
Religiousness			-0.029 [0.023]			-0.019 [0.023]
Risk preferences			0.013** [0.006]			0.015*** [0.006]
Average education center			-0.013 [0.020]			-0.019 [0.020]
Average knowledge center			-0.011 [0.015]			-0.005 [0.015]
Average education peers			0.013 [0.015]			0.006 [0.016]
Average knowledge peers			-0.009 [0.010]			-0.005 [0.009]
KHB						
Δ		64.7%	68.6%		68.9%	68.0%
Observations	1032	1032	1025	1041	1041	1034
Pseudo R ²	0.035	0.134	0.171	0.034	0.139	0.179
AIC	1363.9	1227.7	1192.1	1382.4	1235.8	1195.5

Notes: Coefficients are displayed as marginal effects calculated at the mean of all covariates, standard errors in brackets. Standard errors are clustered at the center level (m=70). All models control for area fixed effects. P-value: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

The strength of mediation does not considerably change once we control for other possible mediators, such as economic resources and risk preferences. Among these variables, we find wealth to have a significant and strong effect on health lifestyle. In model 1c an increase of one standard deviation on the wealth index increases the probability of having a healthy lifestyle by 6.2% (or 0.126 standard deviations). Using the KHB method, differences in wealth levels are found to explain about 32% of education effects, which is comparable to the mediation strength for wealth reported for instance in Cutler & Lleras-Muney (2010). Although this is sizeable, knowledge can explain twice as much of the total education effect further underpinning the important role of this variable.

Apart from the influence of economic resources, we observe a positive effect of having social support in the community and of having a good subjective health status (only weakly significant in model 2c). Also, the risk preference measure has a positive effect. Surprisingly, respondents who are more risk seeking based on our 11-point scale self-assessment, are more likely to have a healthy lifestyle. This result may be due to the perception of risk in our respondent sample which consisted mostly of small business owners. Many of them seemed to perceive risk taking as a very positive personality trait and saw it as a sign of an entrepreneurial mindset. We do not find any evidence in our data for effects of peers' average education and knowledge level on health lifestyle. This finding is in line with our results from chapter 2: While we observed strong endogenous peer effects (i.e. individual behavior is influenced by peers' behavior), we found only weak evidence that peers' background characteristics exert an influence on individual behavior in the considered setting.

4.3.2 *Estimation for Separate Health Behaviors*

We repeat the analysis for the separate health behavior indicators, which were used as the basis for the lifestyle typologisation. Table 18 presents the results for the logit estimation with the single outcome indicators in the rows. Again, the baseline models (a) are extended by the knowledge index first without (b) and then under control for additional mediating factors (c).

For most of the considered indicators the findings are similar to the ones for the aggregated lifestyle measures. Education has a significantly positive effect on 11 of the 14 health behaviors. According to the baseline logit estimates, an additional year of schooling raises the probability for regular exercising by 0.9%, of regular fruit consumption by 2.3%, of having no problems with keeping a diet by 1.0%, of planning to undergo a routine check-up by 1.9%, of having a personal health care provider by 1.7%, of using breast self-examination by 3.2%, of using appropriate handwashing practices by 2.2 %, of not drinking untreated water by 3.0%, of having a personal health insurance by 1.2%, of having searched for health information by 2.2%, and of having learned new information about diseases by 1.6%.

Once knowledge as a potential mediator is controlled for, education effects are reduced in all models and even become insignificant in some cases. The health knowledge measure, on the other hand, exhibits a positive effect in most models, revealing a pattern that is consistent with the one observed for the aggregate lifestyle outcomes for 10 of the 14 indicators. Yet, some heterogeneity remains. In two cases, health knowledge exhibits a significant effect even though we do not find an education effect, suggesting that knowledge may also be of importance independent of education levels. Only in one case, the drinking of untreated water, variations in knowledge cannot explain the reported education effects.

Table 18 - Logit dose response estimation: Baseline and extended models for separate health behaviors

Health behaviors		Years of edu- cation	Health knowledge	KHB Δ	Other me- diators in- cluded?	N	Pseudo R ²	AIC
Exercising	(1a)	0.009* [0.005]			No	1041	0.003	1189.2
	(1b)	0.004 [0.006]	0.010** [0.004]	56.8%	No	1041	0.01	1183.0
	(1c)	0.002 [0.006]	0.008** [0.004]	73.1%	Yes	1034	0.029	1178.4
Fruit consumption	(2a)	0.023*** [0.006]			No	1039	0.014	1428.9
	(2b)	0.016*** [0.006]	0.014*** [0.004]	32.8%	No	1039	0.024	1416.6
	(2c)	0.009 [0.006]	0.011*** [0.004]	38.6%	Yes	1032	0.054	1389.4
Keeping a diet	(3a)	0.010* [0.006]			No	1041	0.003	1343.0
	(3b)	0.003 [0.006]	0.013*** [0.003]	69.3%	No	1041	0.014	1331.1
	(3c)	0.002 [0.006]	0.012*** [0.003]	78.4%	Yes	1034	0.023	1334.6
Routine check last year	(4a)	0.003 [0.005]			No	1041	0.005	1433.6
	(4b)	-0.009* [0.005]	0.023*** [0.004]	-	No	1041	0.031	1398.5
	(4c)	-0.012** [0.005]	0.021*** [0.004]	-	Yes	1034	0.058	1375.8
Routine check next year	(5a)	0.019*** [0.005]			No	1041	0.016	1338.2
	(5b)	0.013** [0.005]	0.012*** [0.003]	33.5%	No	1041	0.024	1329.0
	(5c)	0.014** [0.006]	0.012*** [0.004]	29.2%	Yes	1034	0.046	1317.4
Healthcare provider	(6a)	0.017*** [0.004]			No	1041	0.014	1374.4
	(6b)	0.006 [0.005]	0.020*** [0.003]	62.8%	No	1041	0.037	1345.1
	(6c)	0.006 [0.006]	0.020*** [0.004]	64.6%	Yes	1034	0.061	1327.2
Breast self- examination	(7a)	0.032*** [0.006]			No	1041	0.046	1262.5
	(7b)	0.014** [0.006]	0.034*** [0.003]	56.4%	No	1041	0.121	1165.4
	(7c)	0.014*** [0.005]	0.032*** [0.003]	53.5%	Yes	1034	0.127	1174.4
Ever used family planning	(8a)	0.003 [0.004]			No	1038	0.016	920.7
	(8b)	-0.003 [0.004]	0.009*** [0.003]	-	No	1038	0.028	911.3
	(8c)	0.001 [0.004]	0.007** [0.003]	-	Yes	1031	0.089	877.1
Handwashing	(9a)	0.022*** [0.005]			No	1041	0.013	1424.0
	(9b)	0.011** [0.005]	0.020*** [0.003]	48.8%	No	1041	0.032	1398.4
	(9c)	0.011* [0.006]	0.017*** [0.004]	42.4%	Yes	1034	0.044	1396.5
Not drinking un- treated water	(10a)	0.030*** [0.006]			No	1041	0.039	1394.9
	(10b)	0.030*** [0.006]	0.001 [0.004]	2.4%	No	1041	0.039	1396.7
	(10c)	0.022*** [0.006]	0.001 [0.005]	2.6%	Yes	1034	0.049	1396.2
Public health insur- ance	(11a)	0.012*** [0.005]			No	1038	0.017	1059.1
	(11b)	0.003 [0.005]	0.018*** [0.004]	76.5%	No	1038	0.048	1027.7
	(11c)	0.003 [0.006]	0.019*** [0.004]	77.7%	Yes	1031	0.056	1037.7
Search for infor- mation	(12a)	0.022*** [0.005]			No	1041	0.02	1422.9
	(12b)	0.009 [0.005]	0.024*** [0.004]	59.8%	No	1041	0.049	1382.9
	(12c)	0.008 [0.006]	0.024*** [0.004]	59.9%	Yes	1034	0.086	1343.9
Learning new info about diseases	(13a)	0.016*** [0.006]			No	1040	0.007	1410.0
	(13b)	0.002 [0.006]	0.027*** [0.004]	87.1%	No	1040	0.044	1359.6
	(13c)	0.004 [0.006]	0.029*** [0.004]	76.9%	Yes	1033	0.056	1358.7
Search info about family planning	(14a)	0.001 [0.004]			No	1040	0.019	971.0
	(14b)	-0.001 [0.005]	0.005 [0.004]	-	No	1040	0.023	969.8
	(14c)	0.004 [0.005]	0.005 [0.004]	-	Yes	1033	0.08	926.5

Notes: Logit coefficients in cells, standard errors in brackets. Standard errors are clustered on center level (m=70). All models control for the GPS and area fixed effects. Additional mediators included in models c: wealth, subjective health, distance to health facility, social support, marital status, children in household, religiousness, risk preferences, average education and knowledge level in center and direct peer group. P-value: * p $\leq$ 0.1, ** p $\leq$ 0.05, *** p $\leq$ 0.01.

Although the allocative efficiency explanation seems to matter for most of the considered indicators, the size of the education effects and the importance of knowledge as a mediator depends on the particular behavior. As expected from the changes in coefficients in the logit estimation, the KHB estimation confirms health knowledge to be an important mechanism in explaining education effects. According to the estimates from the full models including all mediators, between 29.2% (routine check-up next year) to 78.4% (Keeping a diet) of identified education effects are attributable to differences in knowledge.

As an additional robustness check, we also perform the analysis for selected health behaviors using specific knowledge measures that are closely related to and meaningful for the respective behavior. For instance, we test if respondents with knowledge about the benefits of exercising or healthy food consumption, e.g. in the prevention of hypertension, are more likely to show the beneficial behavior. The results of the models, which are again estimated in three steps, are displayed in Table C5 in Appendix C. Although the reduction in education effects is smaller in most cases when we use the specific knowledge measures (e.g. for exercising or public health insurance), we find a similar pattern as for the general knowledge index: Also under control for specific health knowledge, education effects are significantly reduced lending further support to our previous findings.

5 Discussion

Our results clearly confirm the main predictions of the allocative efficiency argument, which claims that (i) education raises a person's health knowledge and that (ii) resulting differences in knowledge levels may explain differences in health lifestyle and behaviors across educational groups. The effect sizes are substantial. Knowledge explains between 65% and 69% of the education effect, which is about twice as much as the explanatory power of differences in wealth levels. The findings stand in stark contrast to the previous literature, which either suggests that education may not have a strong effect on knowledge (Altindag et al. 2011; Johnston et al. 2015), or that knowledge only plays a minor role in the education-health lifestyle relationship (Kenkel 1991; Meara 2001; Cutler & Lleras-Muney 2010)

Design and sampling differences may explain the discrepancies in the results: First, the focus of our study are poor households in the Philippines, a lower-middle-income economy. In this context, access to knowledge and information may be more restricted than in developed countries, where information is widely available and where public awareness is high (Dupas 2011b; Aboud & Singla 2012). In our sample education may hence play a more decisive role for the dissemination of information and for raising awareness about health threats. Second, differences in the results of the studies may stem from the use of different knowledge measures. In contrast to other studies, our knowledge index relies on an extensive set of openly answerable questions about diverse topics. With this procedure we attempted to capture the multidimensionality of the health knowledge construct and to overcome common caveats found in the literature, such as measurement and interpretation issues.

Our study faces some limitations. First, due to the cross-sectional and non-experimental nature of our data, we are unable to make causal claims in our analysis. Although we try to control for pre-education characteristics using propensity scores, the results could be driven by simultaneity issues (e.g. those falling sick search for information and hence obtain more health knowledge), or omitted variables (unobserved characteristics, not captured in the propensity scores, such as preferences). Also, we can only provide an indirect test of the allocative efficiency mechanism, as we are not able to observe the full individual health production function including different input and outputs levels. People with more knowledge may adopt healthier lifestyles, but whether this is actually efficient, i.e. welfare/utility enhancing, is not evident from the analysis. Yet, as has been shown in other studies, the simple observation of differences in health behaviors can already explain a substantial share of the educational gradient in health even if the analysis is not based on a full specification of the health production function (Brunello et al. 2015; Tubeuf et al. 2012).

Another limitation is that our findings rely on survey data that might be prone to measurement and reporting errors. Also, in few cases we had to use proxy variables (e.g. cognitive abilities) that can be particularly noisy. To check the reliability of our results we performed various consistency tests, for instance by using different model specifications and operationalizations, which did not indicate any problems with the used research design and identification strategy. Finally, the generalizability of our sample is restricted to members of our partner organization in the Philippines. Nevertheless, we believe that the sample is well-suited to test our theoretical predictions and represents an interesting case for the analysis of the allocative efficiency mechanism in a low-income setting. Further research using more representative data from different countries and regions is needed to test if the reported relationships hold in other settings and to further improve our understanding of determinants of health decisions in developing countries.

While we have focused on the link between education and knowledge in explaining differences in lifestyle across educational groups, there are other mediating channels, such as differences in economic resources and social capital, that can explain part of the education effects (Cutler & Lleras-Muney 2010). In our analysis, we controlled for these additional channels to determine the isolated mediation effect of health knowledge net of any other possible factors. Yet, due to data restrictions, we were not able to control for the full set of theoretically relevant mediators: For instance, in the economic literature time preferences are often named as important channel in explaining educational gradients in health (Fuchs 1982; van der Pol 2011), although recent studies find that differences in tastes play only a minor role for the relationship between education and health outcomes (Cutler & Lleras-Muney 2010).

Also, we are not able to perfectly control for changes in cognitive skills that occurred as a result of schooling, although we include a measure for cognitive abilities in our propensity score estimation. Education may not only positively affect health knowledge and information, but also cognitive skills, enabling the better educated to process information more effectively (Auld & Sidhu 2005; Bijwaard & Van Kippersluis 2016). Put differently, it is less about what one knows, but more about how the knowledge is understood and translated into actions. At the same time, the results could

be driven by cognitive dissonance (Festinger 1957; Freijy & Kothe 2013): Those who express a certain negative health behaviour may (unconsciously) avoid or suppress information that this behavior is bad. If this is the case, it is the respective health action that determines the information set, and not the other way round. In this context, beliefs may also play a role: In some cases, people may know about how a healthy lifestyle looks like, but they may not believe that strongly in the validity of the information. Differences in cognitive abilities, search and avoidance strategies, and beliefs could for example explain why we still observe higher levels of smoking among the less educated in many countries, even though the information that smoking is harmful is widely available (Cutler & Lleras-Muney 2010).

We believe that a further more in-depth exploration of these other potentially relevant pathways and mechanisms in the context of a developing country seems to be promising. Also, so far, only few studies have addressed the question of how education actually affects health knowledge, which can happen either in a direct way, e.g. in form of health trainings or campaigns, or indirectly by raising the absorptive capacity and awareness for health-related information. In this respect, we may miss an important part of the picture if we consider education effects only in terms of the quantity of education obtained (often measured in years of education), while ignoring the specific features of education and characteristics of the local context. Extending the perspective to such aspects can help us to understand not only how education shapes our behavior, but also what forms of education can be most effective in different situations.

6 Conclusion

This paper provides an empirical test of the allocative efficiency hypothesis (Rosenzweig & Schultz 1989; Kenkel 1991). As an extension of early health capital models (Grossman 1972; Muurinen 1982; Wagstaff 1986) this theory offers a behavioral explanation for the well-documented educational gradient in health (Eide & Showalter 2011). It postulates that education raises health knowledge levels and, through this channel, positively impacts health lifestyle and ultimately health. Using original survey data from poor communities in the Philippines, we contribute to the literature in several ways: Besides, extending the research focus to a developing country context, where people face different health risks and constraints to their health behavior, we apply a generalized propensity score matching approach, which has not been used to study this research topic so far. Methodically, we add to the literature by (i) using a comprehensive health knowledge index, which is based on 28 questions allowing us to capture the multidimensional nature of the construct, and by (ii) considering respondents' health lifestyles as an aggregate of 14 different context relevant health behaviors, taking into account that single health decisions are not made in isolation, but may depend on each other. Techniques of cluster and latent class analysis are used for the lifestyle typologisation.

Conditioning on pre-education characteristics, we find strong support for the predictions of the allocative efficiency hypothesis. Education has a positive effect on health knowledge levels, which

are in turn positively related with health lifestyle. According to our estimates, an additional year of schooling increases the probability of having a healthy lifestyle by about 3.5%. Once knowledge as a potential mediating factor is introduced in the models, education effects are significantly reduced. By applying the KHB method, which allows the comparison of education effects across non-linear models (Breen et al. 2013; Kohler et al. 2011), knowledge is found to explain between 65% and 69% of identified education effects on health lifestyle, more than any of the other considered mediating factors. The observed pattern does also hold, if we analyze the role of this potential mechanism separately for individual health behaviors. Even for the few behaviors, for which we do not detect any education effects, knowledge seems to play an important role, indicating that what one knows about health may also matter independent of education levels.

Respondents with better education are more likely to properly undertake preventive measures against common disease threats and to actively search for information about how to improve their health. Schooling can hence generate important health externalities, which is of relevance for policy making and planning that aims at improving health consciousness and preventive health care in poor communities. By raising general education levels, governments can contribute to improving knowledge and ultimately health outcomes through the allocative efficiency mechanism. Health deficits can be further reduced by implementing campaigns that directly address information and health knowledge gaps among the poor, in particular among the less educated. Such health education and promotion campaigns have been shown to be successful in raising health awareness and improving health practices in other low and middle-income countries (Cairncross et al. 2005; Dupas 2011a; Cohen et al. 2015).

On the other hand, simply providing information to the poor may not always be effective, as negative experiences with some information and education interventions have shown (Kremer & Miguel 2007; Dupas 2009; Hamad et al. 2011; Ashraf et al. 2013). The potential of an intervention largely depends on the specific context, the complexity of the provided health information, and the characteristics of the recipient (Dupas 2011b). Furthermore, although insufficient health knowledge and information matter in many contexts, they are unlikely to be the only constraints to a healthy lifestyle, as we have shown in our analysis. Nevertheless, investments in education and health knowledge can be an effective means to improve health in the long run, and to potentially break health-related poverty traps that impede development in many regions.

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Appendices

Appendix A: First Chapter

Survey on Health and Health Behavior in Metro Manila

Dear study participant,

This survey is conducted as part of a non-commercial research project on health and health behavior by the University of Vienna (Austria) in cooperation with the Kasagana-Ka Development Center. In particular, we are interested in finding ways to improve the health of community members. With this interview you can make an important contribution to the success of this study. Answering the survey questions will take approximately 60-90 minutes. You will receive PHP100 after completing this questionnaire. Of course you can always interrupt the interview or skip a question.

As a respondent of this study you were randomly selected among all Kasagana-Ka client beneficiaries of your KDCI center. In total, 1000 participants are interviewed in this month. The majority of our participants were already interviewed for the first time about a year ago. This follow-up study allows us to analyze changes in our respondents' health situation and behavior over the course of the last year.

All responses that you give during the study are anonymous and will be treated confidentially. At no time, your name and address will be saved together with your survey responses. The interviews are conducted by interviewers who are not staff-members of Kasagana-Ka and your individual information will not be accessible by Kasagana-Ka. Please do not hide any information or opinion from us. When answering the questions please do always think of your own situation and behavior. Do not base your answers on what you think others would answer, or what is right or wrong. It is very important that you answer honestly to all questions. After the completion of the study in a year the results of the study will be provided to the participants by Kasagana-Ka. If you have any questions or comments please contact us via e-mail (manila.healthsurvey@gmail.com) or call us under 09086215280.

On behalf of all project members I would like to thank you very much for your support!

I would like you to confirm a short consent form.

I am willingly participating in this research activity about health in Metro Manila and surrounding areas. I understand that this research project is run by university researchers and that it is not related to any private interest, the tax administration, or anybody from the Philippine government. I agree that the data I am providing will be used only for scientific purposes and policy improvements regarding health. I understand that the information I provide is strictly confidential, and that my name will not be included in any report of the study. Also, I understand that the interviewers are not Kasagana-Ka staff members and that Kasagana-Ka is not able to trace back the given answers to the respondent. I will be providing truthful information.

I understood the aforementioned and I agree to participate:

☐ no

☐ yes

Figure A1 - Consent form in questionnaire

Table A1 - Balance check: Regressions on original and actual treatment status

Outcomes (range in brackets)	Original treatment status		Actual treatment status		N	R ²
Health knowledge [1-10]	0.006	[0.137]	-0.062	[0.135]	788	0.002
Fruit consumption [0/1]	-0.071	[0.190]	-0.069	[0.189]	792	0.007
Exercising [0/1]	-0.049	[0.036]	-0.055	[0.037]	792	0.009
Personal health insurance [0/1]	0.019	[0.045]	0.003	[0.045]	792	0.008
Having soap near toilet [0/1]	0.042	[0.032]	0.025	[0.034]	792	0.003
Underwent KDCI routine check-up in past year [0/1]	0.007	[0.030]	0.016	[0.030]	792	0.004
Underwent routine check-up By other organization [0/1]	-0.017	[0.050]	-0.05	[0.051]	792	0.008
Sought help after experiencing disease symptoms [0/1]	0.034	[0.045]	0.039	[0.046]	737	0.007
Hospitalization in past year [0/1]	-0.028	[0.041]	-0.043	[0.041]	783	0.015
Knowing a person to ask for help if sick [0/1]	-0.02	[0.034]	-0.047	[0.033]	792	0.006
Having a personal health care provider [0/1]	-0.051	[0.050]	-0.086	[0.048]	788	0.019
Number of disease symptoms in past 3 months [0-∞]	0.29	[0.239]	0.322	[0.256]	792	0.014
Subjective health rating [0-10]	-0.166	[0.156]	-0.205	[0.156]	792	0.009
Household income per capita [0-∞]	104.586	[93.855]	98.996	[95.788]	786	0.011
Experiencing financial constraints in health behaviour [0/1]	0.011	[0.050]	0.016	[0.051]	792	0.015
Household size [0 - ∞]	-0.17	[0.159]	-0.288	[0.161]	792	0.005

Notes: Linear regression coefficients in cells and standard errors in brackets. Standard errors are clustered on center level (m=70). Original treatment status and actual treatment status are dummy variables taking the value one if respondent lived in a center in the (original or actual) treatment group. P-value: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A2 - 2SLS first stage estimation: Original and actual treatment status

	<u>Outcome: Actual treatment status</u>	
Original treatment status	0.917 ***	[0.011]
Exogenous controls		
CHW dummy (direct effect)	0.088 **	[0.032]
Neighborhood: Masinag	-0.115 ***	[0.014]
Neighborhood: Batasan	-0.067 ***	[0.014]
Years of education	-0.001	[0.002]
Age	0.001 *	[0.001]
Household size	0.002	[0.003]
Married	-0.035 ***	[0.012]
Constant	0.090 **	[0.040]
Observations	1057	
F-test excluded instruments	6501.87	

Notes: First stage IV coefficients in cells, robust standard errors in brackets. P-value: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

Appendix B: Second Chapter

Table B1 - Medical check-up packages offered by the Kasagana-Ka Development Center

Package A	Package B	Package C	Package D
Recommended age: 34 years old and below	Recommended age: 35 to 39 years old	Recommended age: 40 years old and above	Recommended age: 15 years old and below
• Complete blood count • Urinalysis • Stool examination • Chest x-ray • Medical check-up	• Complete blood count • Urinalysis • Stool examination • Chest x-ray • Fasting blood sugar • Lipid Profile • Medical check-up	• Complete blood count • Urinalysis • Stool examination • Chest x-ray • Fasting blood sugar • Lipid Profile • Blood urea nitrogen • Creatinine • SGOT / SGPT • Electro-cardiograph • Medical check-up	• Complete blood count with blood typing • Urinalysis • Stool examination • Chest x-ray • Medical check-up
PHP 310	PHP 480	PHP 940	PHP 180

Table B2 - 2SLS first stage estimation

Instruments	Outcome: Mean uptake among peers			
	1		2	
Peers' peers' membership duration	-0.004***	[0.001]	-0.004***	[0.001]
Peers' peers' years of schooling	-0.041***	[0.008]	-0.018**	[0.008]
Peers' peers' health knowledge	0.012**	[0.006]	0.004	[0.006]
Peers' peers' health constitution	-0.245***	[0.051]	-0.222***	[0.052]
Constant	0.707***	[0.197]	0.029***	[0.010]
Additional controls included	Yes		Yes	
Fixed effects	No		Yes	
F-test excluded instruments	20.13		18.31	
Hansen J statistic	4.472		3.001	
p-val Hansen overidentification test	0.2148		0.3915	

Notes: First stage IV coefficients in cells, robust standard errors in brackets. Models include in addition all exogenous individual and contextual variables: Wealth, utilization of health service of another organization, health insurance, number of children, religiousness, church visits, and social support. Additional exogenous controls included in the model, but not displayed: Number of peers, number of second order peers, standardized indegree, proportion of strong ties, network size, network density, relationship and marital status, age, household size, parental education background, and distance to closest health facility. Fixed effects calculated for 15 neighborhood clusters. P-value: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

Table B3 - Summary statistics of background characteristics for first and second order peers

	Peer characteristics				Peers' peer characteristics			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Membership duration (months)	50.36	17.76	4	110.4	42.33	15.17	7.5	95.33
Years of education	9.69	1.67	3.5	15.25	9.62	1.32	3.6	13.25
Health knowledge	16.22	2.22	7.75	23	15.49	1.85	7.75	22.5
Health status	0.77	0.2	0	1	0.77	0.17	0	1
Age	45.68	5.08	26	62	44.73	4.46	27.67	62
Wealth	1.88	0.54	0.48	3.97	1.74	0.45	0.45	3.39
Cognitive abilities	4.12	0.7	1	7	4.07	0.56	2.25	5.83
Religiosity	2.29	0.31	1	3.5	2.31	0.27	1.25	3.33
Marital status	0.71	0.23	0	1	0.68	0.19	0	1
Number of Children	2.23	0.86	0	5.75	2.22	0.63	0.25	4.75
Belief about program benefits	3.95	0.27	2.86	4.76	3.88	0.21	3.21	4.71

Table B4 - Complementary log-log hazard models: The role of peers' and ego's structural position in the network

	Outcome: Individual program uptake			
	3e		3f	
Baseline hazard (log time)	1.722***	[0.200]	1.764***	[0.207]
Endogenous peer effect				
Uptake low status peers	3.765***	[1.054]		
Uptake high status peers	2.203***	[0.439]		
Uptake low status peers & low status respondent			2.619***	[0.887]
Uptake low status peers & high status respondent			8.630***	[3.283]
Uptake high status peers & low status respondent			2.878***	[0.693]
Uptake high status peers & high status respondent			1.407	[0.451]
Own characteristics				
Standardized indegree (dummy)	1.361**	[0.211]	1.423	[0.323]
Time to survey (months)	0.981**	[0.008]	0.982**	[0.008]
Observations	10102		10102	
AIC	2388.873		2385.504	

Note: Coefficients are displayed as hazard ratios, standard errors in brackets. Standard errors are clustered on center level (m=70). Model 3e reproduces model 3d including a binary measure for the standardized indegree. Model 3f presents the interactions between peers' and respondent's structural position in the network. All individual and contextual variables included, but not displayed: Wealth, utilization of health service of another organization, health insurance, number of children, religiousness, church visits, and social support. Additional controls included in the model, but not displayed: Number of peers, proportion of strong ties, network size, network density, relationship and marital status, age, household size, parental education background, and distance to closest health facility. Fixed effects calculated for 15 neighborhood clusters by including neighborhood dummies. P-value: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

Appendix C: Third Chapter

Table C1 - Measurement of the health knowledge index and summary statistics

	Item/Question	Accepted answers	Answer Rule	Correct
1	Do you know what an Electro Cardio Graph (ECG) is and can you explain it to me?	Attach devices to the breast	R can describe method	61.1%
2	What diseases can be detected with an ECG?	Heart diseases	R knows any disease	67.0%
3	Do you know what a fasting blood sugar test is and can you explain it to me?	Blood sample is collected, need to fast before	R can describe method	59.4%
4	What diseases can be detected with a blood sugar test?	Diabetes	R knows any disease	64.4%
5	Do you know what a urinalysis is and can you explain it to me?	Collection and analysis of urine sample	R can describe method	80.6%
6	What diseases can be detected with a urinalysis?	Diseases of inner organs, UTI, etc.	R knows any disease	81.0%
7	Which family planning methods have you heard of?	Pill, IUD, injection implant, condom, sterilization, BBT rhythm, LAM, BOM, etc.	R knows > 3 methods	41.0%
8	What can you do to improve the health of a newborn child?	Breastfeeding, immunization, right nutrition, check-up, proper hygiene, etc.	R knows > 2 methods	41.3%
9	Do you know any techniques how mothers of newborn children can increase their milk production?	Nutrition, pump, massage, offering both breasts, skin-to-skin contact, keep schedule, etc.	R knows > 1 techniques	23.4%
10	Do you know what breast self-examination is and can you explain it to me?	Examination to detect changes or problems in the woman's breast	R can describe method	52.1%
11	Do you know a lot about healthy eating?	Agreement scale (1-5)	R agrees (4 or 5)	83.0%
12	Do you know what urinary tract infection (UTI) is and can you explain it to me?	Painful inflammation of urinary tract	R can describe disease	82.9%
13	Is UTI a contagious disease?	No		83.6%
14	How can you prevent UTI?	Water consumption, not holding urine, hygiene, clothing, medicine, etc.	R knows > 1 methods	21.7%
15	Do you know what Tuberculosis (TB) is and can you describe it to me?	Disease that usually attacks the lungs	R can describe disease	87.9%
16	IS TB a contagious disease?	Yes		92.2%
17	How much does a package of TB medicine cost at the health center?	Zero PHP (Financed by national TB program)		45.7%
18	Do you know what TB DOTS is and can you explain it to me?	Free and accessible medication, monitoring	R can describe program	32.6%
19	What are symptoms of TB?	Coughing, chest/back pain, bloody sputum, fever/cold, weight loss, loss of appetite, fatigue, breathing/sleeping problems, skin/eye color, etc.	R knows > 3 symptoms	25,3%
20	Do you know what hypertension is and can you explain it to me?	Constant high blood pressure		67.9%
21	Is hypertension a contagious disease?	No		95.6%
22	How can you prevent hypertension?	Diet, exercise, rest, avoid smoking/drinking, avoid heat, water, check-up, medicine, etc.	R knows > 2 method	22.2%
23	Can you use antibiotics to reduce the harmful effects of a viral infection, such as a cold or flu?	No		26.7%
24	What problems can occur if you take antibiotics too often?	Resistance, liver/kidney or other organ damage	R knows 1 side-effect	49.1%
25	Do you know any diseases you can get from having sex?	AIDS/HIV, Genital warts, gonorrhea, herpes, chlamydia, syphilis, hepatitis, infection, vermin, etc.	R knows > 1 STD	43.8%
26	Through which channels can you apply for a Phil Health membership aside from going directly to the PhilHealth Office?	Health center, municipal office, barangay hall, work, online, etc.	R knows alternative channel	77.1%
27	If you are PhilHealth member, who can be covered with you through your membership as beneficiary?	Children, spouse, parents	R knows > 1 beneficiary	63.8%
28	Do you need to provide a birth certificate to become a PhilHealth member?	No		19.7%

Notes: (1)-(28) R stands for respondent. PhilHealth is the public health insurance in the Philippines.

Table C2 - Measurement of health behaviors and summary statistics

Health behavior	Measurement (all indicators binary coded: 1 if respondent shows behavior)	Percent of sample
Exercising	Respondent was physically active at least once a week	25.38%
Fruit consumption	Respondent consumed fruits at least every second day a week	48.44%
Keeping a diet	Measured based on respondents' self-assessment. Respondents agreed that they do not have problems with keeping a diet	65.85%
Routine check-up last year	Respondents underwent a routine check-up in the past 12 months without feeling sick or experiencing any disease symptoms	44.45%
Routine check-up next year	Respondent planned to undergo a routine check-up as part of the health program provided by our partner organization in the next 12 months	64.94%
Healthcare provider	Respondent had a personal health care provider, i.e. a health professional who knows her and her medical history well	61.94%
Breast self-examination	Respondent performed breast self-examination in the past 3 months as an early breast cancer detection method for mature women	32.46%
Ever used family planning	Respondent ever used reliable family planning methods (Pill, IUD, injection, implant, condom, sterilization, rhythm, body temperature, or BOM) in her life	83.77%
Handwashing	Respondents were asked at which occasions they wash their hands regularly. Answers were categorized based on recommendations given by the US Center for Disease Control and Prevention (e.g. before preparing food and eating, or after using the bathroom) Indicator takes the value one if respondent washed her hands on at least two of 7 recommended occasions.	54.79%
Not drinking untreated water	Respondent did not drink any untreated, unfiltered tap or dwell water in the past 3 days	47.41%
Public health insurance	Respondent was personally insured with public health insurance (not considering beneficiaries of other family members)	20.94%
Search for health information	Respondent actively sought information about health-related topics in the past 3 months	52.3%
Learning info about diseases	Respondent obtained new information about health threats that she was not aware of in the past 6 months	41.43%
Search info about family planning	Respondent actively sought information about family planning in the past 12 months either for herself or other family members	17.98%

Table C3 - GPS Matching: Test of balancing property in adjusted sample

	Interval 1 [0-9]		Interval 2 [9.5-11]		Interval 3 [11.5-19]	
Age: 20 -34	-0.0015	[-0.7750]	0.0013	[0.5695]	0.0011	[0.3439]
Age: 35 - 44	-0.0004	[-0.016]	-0.0207	[-0.9468]	0.0178	[0.7296]
Age: 45 - 54	-0.0074	[-0.2379]	0.0277	[0.9435]	-0.0165	[-0.4681]
Reference: Age ≥ 55						
Mother with secondary education	-0.0031	[-0.1411]	0.0097	[0.3577]	-0.0196	[-0.7133]
Father with secondary education	-0.0081	[-0.3575]	0.0136	[0.4979]	-0.0168	[-0.6059]
Mother not known	0.0053	[0.5098]	-0.006	[-0.5185]	0.0021	[0.1360]
Father not known	-0.0022	[-0.2146]	0.0068	[0.6393]	0.0026	[0.1726]
Cognitive abilities	0.1149	[1.4485]	-0.1268	[-1.462]	-0.0553	[-0.5836]
Early work experience (≤ 10)	-0.0074	[-0.4517]	0.0123	[0.7356]	-0.0089	[-0.3970]
Both parents literate	-0.0108	[-0.6756]	0.0074	[0.4093]	-0.0179	[-0.6900]
Above median literacy rate in birth province	0.0249	[0.7857]	-0.0200	[-0.6763]	-0.0216	[-0.5849]
Above median density rate in birth province	0.0308	[0.9576]	-0.0250	[-0.8111]	-0.0014	[-0.0389]
Above median elementary school completion rate in birth province	0.0147	[0.4770]	-0.0071	[-0.2300]	-0.0202	[-0.5635]
Above median electrification rate in birth province	0.0129	[0.4024]	-0.0189	[-0.6053]	0.0046	[0.1244]
Distance of birth province to capital in 100 km	-18.093	[-1.078]	1.1925	[0.0740]	24.079	[1.2450]

Notes: Cell entries are aggregated differences between the GPS quintiles in one treatment stratum and the quintiles in the other two strata; t-values in brackets. P-value: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

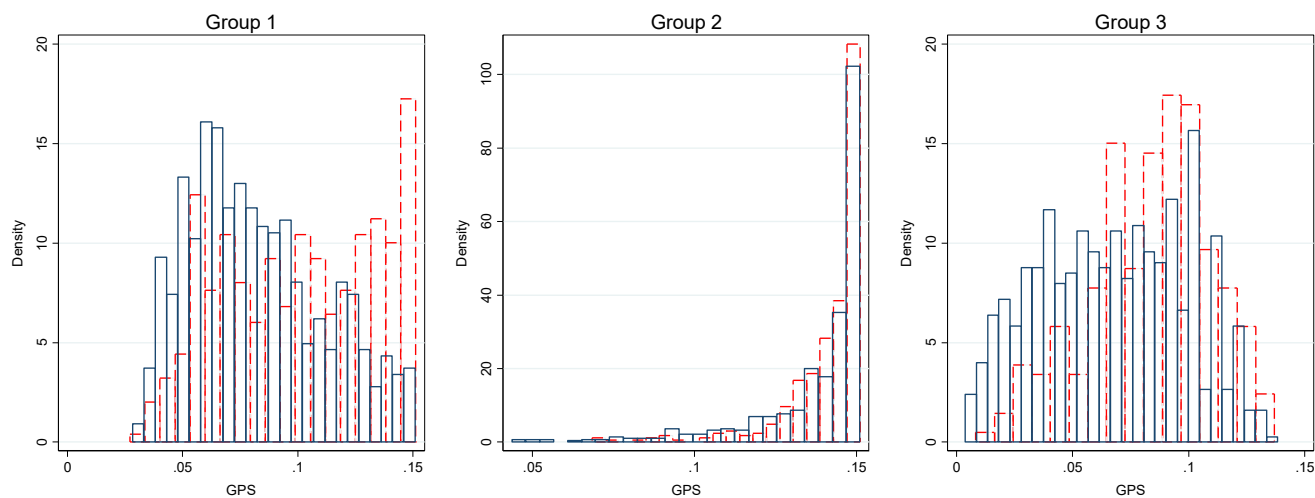


Figure C1 - Graphical inspection of common support condition

Table C4 - KHB models: Decomposing education effects on health lifestyle

	<u>Cluster typologisation</u>		<u>Latent class typologisation</u>	
	Without other me- diators	With other medi- ators	Without other medi- ators	With other media- tors
	(1b)	(1c)	(2b)	(2c)
Education effects				
Total effect	0.171*** [0.029]	0.157*** [0.032]	0.167*** [0.028]	0.164*** [0.031]
Direct effect	0.061* [0.031]	0.049 [0.034]	0.052* [0.030]	0.052 [0.034]
Indirect effect	0.111*** [0.014]	0.107*** [0.015]	0.115*** [0.015]	0.111*** [0.015]
Δ	64.7%	68.6%	68.9%	68.1%
Observations	1032	1025	1041	1034

Notes: Cell entries are coefficients estimated with the KHB method. Standard errors in brackets are clustered at the center level. The total effect refers to the education effect in the baseline model; the direct effect refers to the effect in the extended model. The indirect effect, which is due to changes in the mediating factor (health knowledge) is the difference between the total and direct effects. Δ reports the percentage change in the education coefficient after controlling for the relevant mediator. Additional control variables are included in the models, but not displayed: Household size, number of children, marital and relationship status, neighborhood dummies. Models 1c and 2c additionally control for other mediating factors: Subjective health, distance to health facility, social support, religiousness, risk preferences, average education and knowledge in center, average education and knowledge in direct peer group. P-value: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

Table C5 - Logit dose response estimation: Consistency check for specific health knowledge indicators

Health behaviors		Years of education	Specific health knowledge	KHB Δ	Other mediators included?	N	Pseudo R ²	AIC
Exercising	(1a)	0.009* [0.005]			No	1041	0.003	1189.2
	(1b)	0.008 [0.005]	0.091*** [0.028]	13.1%	No	1041	0.011	1182.2
	(1c)	0.005 [0.005]	0.086*** [0.028]	14.3%	Yes	1034	0.031	1175.9
Fruit consumption	(2a)	0.023*** [0.006]			No	1039	0.014	1428.9
	(2b)	0.023*** [0.006]	0.083** [0.041]	1.4%	No	1039	0.017	1426.8
	(2c)	0.014** [0.006]	0.062 [0.041]	2.3%	Yes	1032	0.049	1395.5
Keeping a diet	(3a)	0.010* [0.006]			No	1041	0.003	1343
	(3b)	0.009* [0.005]	0.123*** [0.037]	8.6%	No	1041	0.01	1336
	(3c)	0.007 [0.006]	0.114*** [0.036]	7.9%	Yes	1034	0.02	1337.8
Routine check last year	(4a)	0.003 [0.005]			No	1041	0.005	1433.6
	(4b)	-0.006 [0.005]	0.193*** [0.026]	-	No	1041	0.031	1397.4
	(4c)	-0.008 [0.005]	0.160*** [0.028]	-	Yes	1034	0.056	1379.2
Routine check next year	(5a)	0.019*** [0.005]			No	1041	0.016	1338.2
	(5b)	0.015*** [0.005]	0.093*** [0.031]	22.8%	No	1041	0.023	1330.8
	(5c)	0.016*** [0.005]	0.095*** [0.033]	18.3%	Yes	1034	0.045	1317.6
Breast self-examination	(6a)	0.032*** [0.006]			No	1041	0.046	1262.5
	(6b)	0.010** [0.005]	0.430*** [0.023]	66.8%	No	1041	0.254	990.9
	(6c)	0.009* [0.005]	0.420*** [0.023]	69.0%	Yes	1034	0.262	997.9
Ever used family planning	(7a)	0.003 [0.004]			No	1038	0.016	920.7
	(7b)	0.001 [0.004]	0.110*** [0.023]	-	No	1038	0.038	902.2
	(7c)	0.002 [0.004]	0.081*** [0.025]	-	Yes	1031	0.095	871.6
Public health insurance	(8a)	0.012*** [0.005]			No	1038	0.017	1059.1
	(8b)	0.011** [0.005]	0.074*** [0.028]	13.5%	No	1038	0.024	1053.1
	(8c)	0.010* [0.005]	0.080*** [0.028]	14.2%	Yes	1031	0.035	1059.4

Notes: Logit coefficients in cells, standard errors in brackets. All coefficients are displayed as marginal effects calculated at the mean of all covariates. Standard errors are clustered on center level (m=70). All models control for the GPS and area fixed effects. Additional mediators included in models c: wealth, subjective health, distance to health facility, social support, marital status, number of children, religiousness, risk preferences, average education and knowledge level in center and direct peer group. P-value: * p≤0.1, ** p≤0.05, *** p≤0.01.

Specific health knowledge indicators capture respondent's knowledge related to single health practices/behaviors. They largely confirm the results obtained using the general knowledge index lending support to our findings. The specific knowledge measures were generated using information from different (partly combined) items. All specific knowledge measures are either binary or were dichotomized at the median (the following numbers in parentheses refer to the used items, see table C1):

- 1) Exercising: Respondent was aware that regular exercising helps preventing hypertension (22)
- 2) Fruit consumption: Respondents agreed that they know a lot about healthy eating (11)
- 3) Keeping a diet: Respondent knew that keeping the right diet and maintaining a good weight can help preventing hypertension (22)
- 4) & 5) Check-up: Knowledge about lab tests (1-6). The 6 items were summed up and dichotomized at the median
- 6) Breast self-examination: Respondents could explain what breast self-examination is (10)
- 7) Family planning: Respondent could name at least one family planning method (7)
- 8) Public health insurance: Knowledge about insurance (26-28). The 3 items were summed up and dichotomized at the median.

Appendix D: Research Instruments for Main Survey in April 2015

The main survey was conducted in April 2015 using different research instruments. The following instruments are included in the appendix:

- Main Questionnaire for interviews with KDCI clients (18 pages)
- Additional questionnaire for interviews with clients in treatment group centers with a community health worker (3 pages)
- Additional questionnaire for “newcomers” who have not participated in the baseline survey in February 2014 (2 pages)

The other research instruments used can be found on the homepage of the author ([homepage/univie.ac.at/roman.hoffmann](http://homepage.univie.ac.at/roman.hoffmann)) or are available upon request:

- Questionnaire for baseline survey in February 2014 (18 pages)
- Special questionnaire for interviews with community health workers in April 2015 (18 pages)

Main Questionnaire: Client Beneficiaries

F1	Pakisulat ang mga sumusunod na impormasyon tungkol sa kalahok: [USE THE KDCI MEMBER LIST] <i>Please write down the following information about the respondent: [USE THE KDCI MEMBER LIST]</i>	
[F1.1]	Pangalan: <i>First Name:</i>	_____
[F1.2]	Apelyido: <i>Last Name:</i>	_____
[F1.3]	Respondent ID Code: <i>(Not passbook ID number)</i>	_____
[F1.4]	Numero ng Telepono/Cell-phone: <i>Landline/Cellphone No.:</i>	_____

Sa tagapanayam: Una, bisitahin ang kalahok o respondent sa kaniyang tirahan na natukoy. Kung wala ang kalahok, ipag-tanong sa kaniyang mga kapitbahay, kapamilya, o barangay kung saan siya mahahanap.

Dear Interviewer: First, visit respondent at the address provided. If respondent cannot be found, try to find the person by asking neighbors, barangay hall officials/records, and family members that can be reached.

	ID ng Inter-viewer <i>Interviewer ID</i>	Petsa ng Pagbisita <i>Date of Visit</i>	Oras ng Pagdalaw <i>Time of Visit</i>	Oras na nata-pos ang pa-nayam <i>Ending time of interview</i>	Lugar kung saan gi-nanap ang panayam <i>Place where interview was conducted</i>	May iba pa bang may edad na kaharap nang ginanap ang panayam? <i>Were other adult persons present during interview?</i>
	[F2.1]	[F2.2]	[F2.3]	[F2.4]	[F2.5]	[F2. 6]
<i>Ex.</i>	<i>12</i>	<i>04/18/15</i>	<i>1:10pm</i>	<i>2:50pm</i>	<i>at home</i>	<i>no</i>

F3	GPS measures: Please note longitude, latitude, and altitude								
	Longitude:		[F3.1]	Latitude:		[F3.2]	Altitude:		[F3.3]

F4	Mga puna ng tagapanayam (kung may pangangambalang naganap o kung hindi naganap ang panayam) Interviewer Comments (if disturbances during interview occur or if respondent cannot be interviewed)

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[INTERVIEWER: PLEASE ENSURE THAT THE INTERVIEW IS CONDUCTED IN PRIVATE]

Sa Kalahok,

Ang panayam na ito ay bahagi ng isang pag-aaral ng dalawang pamantasan sa Vienna, Austria kasama ang Kasagana-Ka Development Center Inc. tungkol sa kalusugan at mga pananaw kaugnay nito. Nais po naming maunawaan ang iba't ibang paraan ng pagpapabuti ng kalusugan sa komunidad. Malaki po ang maitutulong niyo sa paglahok sa panayam na ito. Aabutin ng isa (1) hanggang isa't kalahating (1.5) oras ang pagsagot dito. Matapos nito ay makatatanggap po kayo ng PHP50. Puwede po kayong magtanong sa gitna ng panayam o hindi sumagot sa kahit anong tanong.

Bilang kalahok, dumaan po kayo sa sistema ng pagpili mula sa lahat ng mga Client Beneficiaries (CBs) ng Kasagana-Ka. May 1100 na CBs ang kakapanayamin sa loob ng isang (1) buwan. Karamihan po sa mga kalahok ay amin na pong nakapanayam noong nakaraang taon. Ang panayam na ito ay tutulong po sa ating mapag-aralan ang mga pagbabago sa inyong sitwasyon at pag-uugali tungkol sa kalusugan mula noong nakaraang taon hanggang ngayon.

[ATTRACT RESPONDENT'S ATTENTION] Lahat po ng inyong tugon sa pag-aaral na ito ay ituturing na kumpidensyal. Hindi po ihahayag ang pangalan niyo kaugnay ng inyong mga sagot. Ang mga tagapanayam ay **HINDI** empleyado ng Kasagana-Ka at hindi po malalaman ng kahit sino sa Kasagana-Ka ang mga ibibigay niyong impormasyon. Mangyari po lamang na maging tapat at huwag po itago ang inyong mga opinyon. Sa tuwing sasagot ng mga katanungan, sikapin pong ibatay ang inyong mga tugon sa inyong sariling sitwasyon at mga pag-uugali. Huwag po ninyong alalahanin kung paano ito sasagutin ng iba o sa kung anong tingin niyong tama o maling sagot. Mahalaga po na matugunan ng tapat ang lahat ng katanungan.

Pagkatapos po ng pag-aaral na ito, ipaparating po namin sa lahat ng lumahok ang resulta sa pamamagitan ng Kasagana-Ka. Kung mayroon po kayong katanungan, maaari niyo kaming tawagan sa 0939-1984-626 o magpadala ng email sa manila.healthsurvey@gmail.com.

Sa ngalan po ng mga kabilang sa proyektong ito, taos-puso kaming nagpapasalamat sa inyo.

Dear study participant,

This survey is conducted as part of a non-commercial research project on health and health behavior by the University of Vienna (Austria) in cooperation with the Kasagana-ka Development Center Inc. (KASAGANA-KA). In particular, we are interested in finding ways to improve the health of community members. With this interview you can make an important contribution to the success of this study. Answering the survey questions will take approximately 60-90 minutes. You will receive PHP 50 after completing this questionnaire. Of course you can always interrupt the interview or skip a question.

As a respondent of this study you were randomly selected among all Kasagana-Ka client beneficiaries of your KASAGANA-KA center. In total, 1100 participants are interviewed in this month. The majority of our participants were already interviewed for the first time about a year ago. This follow-up study allows us to analyze changes in our respondents' health situation and behavior over the course of the last year.

[ATTRACT RESPONDENTS ATTENTION!] *All responses that you give during the study are anonymous and will be treated confidentially. Your name and address will not be saved together with your survey responses. The interviews are conducted by interviewers who are **not** staff-members of Kasagana-Ka and your individual information will not be accessible by Kasagana-Ka. Please do not hide any information or opinion from us. When answering the questions please do always think of your own situation and behavior. Do not base your answers on what you think others would answer, or what is right or wrong. It is very important that you answer honestly to all questions.*

After the completion of the study the results will be provided to the participants by KASAGANA-KA. If you have any questions or comments please contact us via e-mail (manila.healthsurvey@gmail.com) or call us under 0939-1984-626.

On behalf of all project members I would like to thank you very much for your support!

Bago mag-umpisa ang panayam, kailangan po naming makuha ang inyong pagsang-ayon.

Sumasang-ayon ako na lumahok sa pag-aaral na ito tungkol sa kalusugan ng aking komunidad. Nauunawaan ko na ang proyektong ito ng mga mananaliksik mula sa pamantasan ay walang kinalaman, sa kahit anong paraan, sa pribadong interes, pamamahala ng buwis, o sa kahit sino sa gobyerno ng Pilipinas. Sumasang-ayon ako na ang datos na aking ibibigay ay gagamitin para lamang sa pananaliksik at sa pagpapabuti ng mga alituntunin kaugnay sa kalusugan. Batid ko na ang impormasyon na ibibigay ko ay ituturing na kumpidensyal, at ang aking pangalan ay hindi isasama sa ulat ng pag-aaral na ito. Batid ko rin na ang tagapanayam ay hindi empleyado ng Kasagana-Ka at hindi malalaman ng Kasagana-Ka ang aking mga sagot. Maglalahad ako ng mga totoong impormasyon lamang.

Before starting with the interview, I would like you to confirm a short consent form.

I am willingly participating in this research activity about health in Metro Manila and surrounding areas. I understand that this research project is run by university researchers and that it is not related to any private interest, the tax administration, or anybody from the Philippine government. I agree that the data I am providing will be used only for scientific purposes and policy improvements regarding health. I understand that the information I provide is strictly confidential, and that my name will not be included in any report of the study. Also, I understand that the interviewers are not KASAGANA-KA staff members and that KASAGANA-KA is not able to trace back the given answers to the respondent. I will be providing truthful information.

Nauunawaan ko ang nabanggit sa taas at sumasang-ayon ako rito:

I understood the aforementioned and I agree to participate:

☐ Hindi No

☐ Oo Yes

1. Socio-Demographics: Personal Information

Nais ko pong magsimula sa ilang mga tanong tungkol sa inyong mga personal na katangian.
I would like to start with some questions concerning your personal characteristics.

	Ano po ang inyong pinagkakakitaan? Ano po ang inyong kasalukuyang kalagayan sa paghahanap-buhay? [READ ANSWERS] [MA] <i>What do you do for living? What is your current employment status? [READ ANSWERS] [MA]</i>	
[1.1]	1. May trabaho at sahod <i>Employed for pay</i>	
[1.2]	1. May sariling pinagkakakitaan, sariling sikap <i>Self-employed</i>	
[1.3]	1. May trabaho subali't kabahagi ng negosyo ng pamilya <i>Working, but not for pay at a family-owned job or business</i>	
[1.4]	1. Naghahanap, walang trabaho <i>Looking for work, unemployed</i>	[IF ONLY "NAGHAHANAP" GO TO Q3]
[1.5]	1. Estudyante <i>Student</i>	[IF ONLY "ESTUDYANTE" GO TO Q3]
[1.6]	1. Retirado <i>Retired</i>	[IF ONLY "RETIRADO" GO TO Q3]
	-77 Walang sagot / hindi alam <i>No reply/ don't know</i>	

Ilang oras po kayo naghahanapbuhay sa isang linggo (sa isang karaniwang linggo)? <i>How many hours do you usually work for income per week (in a "typical week")?</i>	
Humigit kumulang <i>about</i>	Oras kada linggo <i>hours per week</i>

Kasal po ba kayo? <i>What is your marital status?</i>	
1 Kasal <i>Married</i>	2 Live-in <i>Not married, live with partner</i>
3 Walang asawa <i>Single</i>	4 Hiwalay <i>Separated</i>
5 Balo <i>Widowed</i>	

Ano po ang inyong relihiyon? Isipin lamang po ang kasalukuyan niyong pinaniniwalaan. <i>What is your religion? Please think of your main confession.</i>	
1 No religion	IF 1 GO TO B
2 Roman Catholic	
3 Protestant (Lutheran, Baptist, etc.)	4 Protestant, Born again Christian
5 Iglesia ni Cristo	6 Muslim
7 Buddhist	8 Other [SPECIFY]: _____ [4.2]

Gaano po kayo kadalas magsimba? [READ ANSWERS] <i>How often do you go to church? [READ ANSWERS]</i>						
Araw-araw <i>Daily</i>	Maraming beses kada linggo <i>Multiple times a week</i>	Isang beses kada linggo <i>About once a week</i>	Isang beses kada dalawang linggo <i>Every second week</i>	Isang beses kada bu- wan <i>About once a month</i>	Isang beses kada 2 o 3 buwan <i>Every 2-3 months</i>	Hindi masyadong madalas <i>Less often</i>
1	2	3	4	5	6	7

Bukod sa pagpunta sa simbahan, gaano po kayo kadalas magdasal nang tuloy-tuloy na lampas sampung minuto? [READ ANSWERS] <i>Apart from going to the church, how often do you continuously pray for at least 10 minutes? [READ ANSWERS]</i>						
Araw-araw <i>Daily</i>	Maraming beses kada linggo <i>Multiple times a week</i>	Isang beses kada linggo <i>About once a week</i>	Isang beses kada dalawang linggo <i>Every second week</i>	Isang beses kada bu- wan <i>About once a month</i>	Isang beses kada 2 o 3 buwan <i>Every 2-3 months</i>	Hindi masyadong madalas <i>Less often</i>
1	2	3	4	5	6	7

Itinuturing niyo ba ang inyong sarili bilang isang relihiyosong tao? [READ ANSWERS] <i>Do you consider yourself a religious person? [READ ANSWERS]</i>			
Sobrang relihiyoso <i>Very religious</i>	Medyo relihiyoso <i>Somewhat religious</i>	Hindi masyadong relihiyoso <i>Not very religious</i>	Hindi relihiyoso <i>Not at all religious</i>
1	2	3	4

2. Kasagana-Ka Services

Ngayon, may ilang mga tanong naman po ako tungkol sa inyong karanasan sa Kasagana-Ka.
Now I have some questions concerning your experiences with Kasagana-Ka.

Narinig niyo na po ba ang programang K-Kalusugan? <i>Have you heard of the K-Kalusugan program?</i>	
1 Hindi <i>No</i>	2 Oo <i>Yes</i>
[IF HINDI/NO GO TO Q 10]	

Ano pong mga serbisyo at produkto ang kasama sa programang K-Kalusugan? <i>Which services do you know that are offered as part of the K-Kalusugan program?</i>	
	-77 Don't know

	Ang K-Kalusugan po ay programa ng Kasagana-Ka na naglalayong mapabuti ang kalusugan ninyong mga CBs. Ikaw po ba o ang inyong kapamilya ay nakagamit nang maski anong serbisyo o produkto ng K-Kalusugan tulad ng Health Dev lab package? [MA] <i>K-Kalusugan is the Kasagana-Ka health program, which aims at improving the health of the client beneficiaries. Have you or one of your household members used any services of the K-Kalusugan program or any of the Health Dev lab packages yet? Multiple answers are possible. [MA]</i>	
[10.1]	1 Wala sa aking pamilya/kasama sa bahay ang gumamit na ng K-Kalusugan <i>Nobody in household used health program</i>	[IF WALA/ NO GO TO Q 13]
[10.2]	1 Nagamit ko na ang K-Kalusugan <i>Used health program personally</i>	
[10.3]	1 Nagamit na ng ibang kasama ko sa bahay ang K-Kalusugan <i>Other household member used health program</i>	

	[SHOW SHEET 1 – LAB PACKAGES] Alin po sa mga Lab Packages na ito ang nagamit niyo at ng inyong pamilya? Maaari pong higit sa isa ang sagot. [MA] [SHOW SHEET 1 – LAB PACKAGES] Which of the lab packages did you or another member of your household use? [MA]	
	[11.X.1] CB mismo ang nakagamit ng package <i>Used package personally</i>	[11.X.2] Nagamit ng aking pamilya <i>Other family members used package</i>
[11.1]	1. Package A (Window 1)	1
[11.2]	2. Package B (Window 1)	1
[11.3]	3. Package C (Window 1)	1
[11.4]	4. Package D (Window 1)	1

	Ilang beses niyo po o ng pamilya niyo nagamit ang mga lab packages at kailan? [ALSO NOTE ESTIMATES] <i>How many times have you or your family used the lab packages and when did you use them? [ALSO NOTE ESTIMATES]</i>									
	Personal usage [12.X.1] [12.X.2]				Household usage [12.X.3] [12.X.4]					
[12.1]	1 lab test		Buwan Month		Taon Year	1 lab test		Buwan Month		Taon Year
[12.2]	2 lab test		Buwan Month		Taon Year	2 lab test		Buwan Month		Taon Year
[12.3]	3 lab test		Buwan Month		Taon Year	3 lab test		Buwan Month		Taon Year

	[FOR NON-USERS]: Bakit hindi pa po kayo nagpapa-Health Dev lab test? [FOR NON-USERS]: Why have you not used the Health Dev lab tests yet?

	[SHOW SHEET 2 – SCALE A] [USERS OF THE LAB PACKAGE]: Batay po sa inyong karanasan sa Health Dev lab tests, paano po ninyo susukatin ang mga sumusunod na aspeto mula 1 “talagang hindi mabuti” hanggang 5 “talagang mabuti”? [NON-USERS OF THE LAB PACKAGE]: Batay po sa inyong mga narinig na karanasan ng iba sa Health Dev lab tests, paano po ninyo susukatin ang mga sumusunod na aspeto mula 1 “talagang hindi mabuti” hanggang 5 “talagang mabuti”? [SHOW SHEET 2 – SCALE A] [USERS OF THE LAB PACKAGE]: Thinking about your experiences with the Health Dev lab tests, how would you rate the following aspects on a scale from 1 “Very bad” to 5 “Very good”? [NON-USERS OF THE LAB PACKAGE]: From what you have heard about the Health Dev lab tests how would you rate rate the following aspects on a scale from 1 “Very bad” to 5 “Very good”?						
		Talagang hindi mabuti <i>Very bad</i>	Hindi mabuti <i>Bad</i>	Tama lang <i>Fair</i>	Mabuti <i>Good</i>	Talagang Mabuti <i>Very good</i>	Hindi alam / Walang tugon <i>Don’t know / No reply</i>
[14.1]	Dali ng pagpunta sa lugar kung saan isinasagawa ang mga lab tests <i>Reachability and accessibility of venue where tests are conducted</i>	1	2	3	4	5	-77
[14.2]	Oras na inilalaan para sa mga lab tests <i>Time taken for the tests</i>	1	2	3	4	5	-77
[14.3]	Tagal ng paghintay paghihintay <i>Waiting time</i>	1	2	3	4	5	-77
[14.4]	Personal na pakikitungo ng mga medical staff habang isinasagawa ang lab tests <i>Personal manner of the medical staff during testing</i>	1	2	3	4	5	-77

[14.5]	Pagiging pribado ng pagsasagawa ng lab tests <i>Privacy during testing</i>	1	2	3	4	5	-77
[14.6]	Presyo ng lab tests <i>Price of the lab tests</i>	1	2	3	4	5	-77
[14.7]	Pagiging kapaki-pakinabang ng lab tests para sa inyong/kanilang kalusugan <i>Usefulness of the lab tests for your/their health</i>	1	2	3	4	5	-77

	Mayroon po akong babanggiting mga lab tests. [1] Puwede po ba ninyong ipaliwanag kung paano ito isinasagawa? [2] Ano pong sakit ang maaaring makita sa test na ito? <i>Do you know the following medical tests that are performed during the health dev lab tests? [1] Can you explain the method to me and [2] name at least one disease that can be detected with the method?</i>						
--	--	--	--	--	--	--	--

		[15.X.1] Explanation						[15.X.2] Disease	
[15.1]	Electro Cardio Graph (ECG)	1	Don't know	2	Wrong explan.	3	Correct explan.	1	Knows disease
	[MIN. ACCEPTABLE ANSWER: ATTACH SOMETHING ON THE CHEST AND DETERMINES HEART DISEASE]								
[15.2]	Fasting Blood Sugar Test	1	Don't know	2	Wrong explan.	3	Correct explan.	1	Knows disease
	[MIN. ACCEPTABLE ANSWER: NEED TO FAST BEFORE BLOOD SAMPLE IS COLLECTED AND DETERMINES DIABETES]								
[15.3]	Urinalysis	1	Don't know	2	Wrong explan.	3	Correct explan.	1	Knows disease
	[MIN. ACCEPTABLE ANSWER: URINE SAMPLE IS COLLECTED AND DETERMINES UTI AND KIDNEY DISEASE]								

	[SHOW SHEET 3 – SCALE B] Sa tingin ninyo, gagamitin po ba ninyo (-ng muli) ang health dev lab tests sa susunod na 12 (labindalawang) buwan? Mangyaring subukang magbigay ng makatotohanang sagot. [SHOW SHEET 3 – SCALE B] Do you think you will personally undergo a health dev lab test (again) in the next 12 months? Please try to give a realistic answer.								
	Siguradong hindi gagamitin (-g muli) Will certainly not use it Siguradong gagamitin (-g muli) Will use it with certainty ← 0 1 2 3 4 5 6 7 8 9 10 →								

	Maliban sa health dev lab tests, ikaw po ba ay na-examine nitong nakaraang 12 (labindalawang) buwan simula April 2014 ng isang doktor o propesyunal na tagabigay ng medikal na serbisyo kahit na walang sakit o mga sintomas na nararamdaman? [NO PREGNANCY CHECK-UPS] <i>Apart from the health dev lab tests, were you examined in the last 12 months since April 2014 by a doctor or other health care provider for a medical or laboratory routine check-up without feeling sick or without having any symptoms? [NO PREGNANCY CHECK-UPS]</i>								
	1	Hindi	No	2	Oo	Yes, other check-up	IF HINDI/NO GO TO Q 19		

	Anu-ano pong mga tests ang ginawa sa inyong checkup? [READ ANSWERS] [MA] <i>Which tests were performed during the check-up? [READ ANSWERS] [MA]</i>									
	[18.1]	1	Urine sample		[18.2]	1	Blood sample			
	[18.3]	1	Blood pressure		[18.4]	1	Stool sample			
	[18.5]	1	Other tests:							

	Kailan po kayo huling nakuhanan ng blood pressure? [SELF-MEASUREMENT IS CONSIDERED] <i>When was your blood pressure measured for the last time? [SELF-MEASUREMENT IS CONSIDERED]</i>								
	Month:		[21.1]	Year:		[21.2]	IF > 6 MONTHS GO TO C		

	Nitong nakaraang anim na buwan simula October 2014, gaano kadalas po kayo regular na nakukuhanan ng blood pressure? [READ ANSWERS] <i>Approximately, how regularly was your blood pressure measured in the past 6 months since October 2014? [READ ANSWERS]</i>								
	Maraming beses kada linggo <i>Multiple times a week</i>	Isang beses kada linggo <i>About once a week</i>	Isang beses kada dala- wang linggo <i>Every second week</i>	Isang beses kada buwan <i>About once a month</i>	Isang beses kada 2 o 3 buwan <i>Every 2-3 months</i>	Hindi masyadong madalas <i>Less often</i>			
	1	2	3	4	5	6			

3. Neighborhood and Health Infrastructure

Pag-usapan naman po natin ang inyong barangay. Nais po naming malaman ang lagay ng sistemang pangkalusugan sa inyong komunidad. *After having talked about you as a person, I would like to shift the focus to the neighborhood you live in. Particularly, I am interested in the health infrastructure of your neighborhood.*

	Kung mayroong tanong o problema sa kalusugan ang isa sa inyong pamamahay, may kilala po ba kayong kapamilya, kaibigan, o kakilalang mas may alam tungkol sa kalusugan na pwedeng hingan ng mapagkakatiwalaan at tamang payo? Isipin lamang po ang mga taong kilala niyo ng personal. <i>If someone in your household had a question about a health problem, would you know somebody in your circle of family, friends and acquaintances who knows more about health than you do to ask for qualified advice or help? Please think only of persons you know personally.</i>					
	4. Wala No	5. Mayroon Yes	[IF HINDI/NO, GO TO Q 23]			
	Kung mayroon po kayong tanong o problema sa inyong kalusugan, kanino sa mga kapamilya, kaibigan, o kakilala niyo kayo pinakaunang hihingi ng mapagkakatiwalaan at tamang payo? Health professional po ba siya? <i>If you had a question whom among your family, friends and acquaintances would you ask for qualified advice first and is this person a health professional?</i>					
	Relationship [22.1]		Health professional? [22.2]			
			1 Health professional	2 Non-health professional		
	Ngayon naman po ay isipin niyo ang mga <u>kaibigan at kakilala</u> . Maliban po sa inyong mga kapamilya, mayroon po ba kayong malisip na taong... <i>Please think now of your friends and acquaintances, but not your relatives (such as your spouse). Among these is there at least one person who...</i>					
[23.1]	Palaging nagbibigay ng puna o payo tungkol sa inyong mga gawain at pag-uugali kaugnay ng kalusugan? <i>Often crizeses you or gives you advices on your health practices/behavior?</i>		1	Hindi No	2 Oo Yes	
[23.2]	Aktibo at regular na nagbabahagi sa inyo ng kaniyang kaalaman tungkol sa kalusugan at mga sakit? <i>Actively and regularly shares knowledge about health topics and diseases with you?</i>		1	Hindi No	2 Oo Yes	
[23.3]	Regular na naghihikayat sa inyong magpa-routine check-up, kahit walang sakit? <i>Encourages you regularly to undergo routine check-ups, even if you are not sick?</i>		1	Hindi No	2 Oo Yes	
[23.4]	Naghihikayat sa inyong magpatingin sa isang health professional kung kayo ay may sakit? <i>Encourages you to seek help from a health professional if you are sick?</i>		1	Hindi No	2 Oo Yes	
	Kung ikaw ay may problemang pangkalusugan, sino po sa mga miyembro ng inyong sentro ang maaari niyong hingan ng tulong o payo? <i>If you had a health problem, who among the other members of your KDCI center would you ask for help or advice?</i>					
	First name: [24.1]	Surname: [24.2]	-77 Don't know Don't know anyone			
	Ang personal health care provider ay isang propesyunal na kilala po kayong mabuti at pamilyar sa inyong medical history at kalusugan. Maaari po itong isang doktor, espesyalista, nars, pharmacist, <i>barangay health worker</i> (BHW) o kahit sino pong makapagbigay ng serbisyong pangkalusugan. Mayroon po ba kayong naiisip na taong maituturing niyong health care provider? Kung mayroon, sino? <i>A personal health care provider is a health professional who knows you well and is familiar with your medical history. This can be a general doctor, a specialist doctor, a nurse practitioner, a pharmacist, a health community worker, or another type of provider. Do you have one or more persons you think of as your personal health care provider? If yes, who?</i>					
	1. Wala No	2. Mayroon Yes, who? [USE SHEET 4- REACTION]		[25.2]		
	[SHOW SHEET 5 - SCALE C] Interesado po kaming malaman kung sinasalamang ng mga babanggitin kong pahayag ang inyong opinyon tungkol sa health infrastructure sa inyong Barangay. Ang health infrastructure po ay tumutukoy sa kahit anong serbisyong pangkalusugang natatanggap mula sa isang health worker mula sa pampubliko at pribadong organisasyon, o NGO. Sabihin lang po sa akin kung gaano kayo sumasang-ayon o di sumasang-ayon sa mga babanggitin pahayag. Sa inyong pag-sagot, mangyari pong maging tapat; walang tama o maling sagot. [SHOW SHEET 5 - SCALE C] We have prepared statements for you reflecting different opinions about the health infrastructure in your Barangay. We are interested how much these statements reflect your own situation. Please tell me if you strongly disagree, disagree a little, neither agree nor disagree, agree a little, or strongly agree with each statement. When telling me your opinion please be as honest and accurate as you can, there is no right or wrong answer. With health infrastructure we mean any service that is provided by either a professional or non-professional health worker from a public, private, or non-governmental organization.					
		Hindi talaga o Lubos na di Sang-ayon No, strongly disagree	Medyo hindi o Di sang-ayon No, disagree a little	Hindi sumasang-ayon o tumutol Neither agree nor disagree	Medyo oo o Sang-ayon Yes, agree a little	Oo talaga o Lubos na Sang-ayon Yes, strongly agree
[26.1]	Kung kayo ay may problemang pangkalusugan, alam niyo kung saan kukuha ng mapagkakatiwalaan at tamang payo ukol dito. <i>If you had a health problem, you would know whom to contact to get qualified advice.</i>	1	2	3	4	5
[26.2]	Hindi niyo kayang bayaran ang maayos na serbisyong pangkalusugan. <i>Good health care is not affordable for you.</i>	1	2	3	4	5

[26.3]	Minsan hindi niyo alam kung saan hihingi ng tulong kung may problemang pangkalusugan kayo o ang inyong pamilya. <i>Sometimes you do not know where to find help if you or somebody in your family has a health problem.</i>	1	2	3	4	5
[26.4]	Wala kayong tiwala sa kaalaman ng mga health professionals sa inyong komunidad. <i>You have no trust in the knowledge of the health professionals here in your community.</i>	1	2	3	4	5

[SHOW SHEET 5 – SCALE C] Sa bahaging ito, interesado po kami sa inyong mga kaibigan, kamag-anak, at kakilala. Sabihin lang po sa akin kung gaano kayo sumasang-ayon o di sumasang-ayon sa mga babanggiting pahayag. Sa inyong pagsagot, mangyari pong maging tapat; walang tama o maling sagot. Isipin niyo na hindi magkakaugnay ang mga pangungusap. [SHOW SHEET 5– SCALE C] In the following, we are interested in your network of friends, relatives, and acquaintances. How strongly do you agree or disagree with the following statements? Please tell me if you strongly disagree, disagree a little, neither agree nor disagree, agree a little, or strongly agree with each statement. Please be as honest and accurate as you can, there is no right or wrong answer. Think about each statement on its own.						
		Hindi talaga o Lubos na di Sang-ayon No, strongly disagree	Medyo hindi o Di sang-ayon No, disagree a little	Hindi sumasang-ayon o tumututol Neither agree nor disagree	Medyo oo o Sang-ayon Yes, agree a little	Oo talaga o Lubos na Sang-ayon Yes, strongly agree
[27.1]	Maraming tao kayong pinagkakatiwalaang tutulong sa paglutas ng inyong mga problema. <i>There are several people that you trust to help solve your problems.</i>	1	2	3	4	5
[27.2]	Wala po kayong mapagsabihan ng mga personal niyong problema. <i>There is no one that you feel comfortable to talk about intimate personal problems.</i>	1	2	3	4	5
[27.3]	Pakiramdam niyo, wala kayong mapagsabihan ng mga pribado niyong alalahanin at mga takot sa buhay. <i>You feel that there is no one you can share your most private worries and fears with.</i>	1	2	3	4	5
[27.4]	Mayroon kayong mahihingan ng payo tungkol sa pagdadala ng problema tungkol sa inyong kalusugan. <i>There is a person you can turn to for advice about handling problems with your health.</i>	1	2	3	4	5

6. Individual Health Constitution

Sa pag-aaral na ito, nais po naming maunawaan ang kalagayan ng inyong kalusugan at mga salik na kaugnay nito. Maaari pong sumagot nang tapat at huwag magmadali sa pagsagot. *In our research we are interested in your health constitution and factors contributing to it. I now would like to talk about your experiences with your health. Please answer honestly and take your time for each question.*

[SHOW SHEET 6 – SCALE D] Ang 0 ay nangangahulugan ng napakasamang kalagayan at ang 10 ay napakabuting kalagayang pangkalusugan. Paano po niyo bibigyan ng grado ang inyong kasalukuyang kalusugan? [SHOW SHEET 6 – SCALE D] Please think of a scale from 0 “Very bad health state” to 10 “Very good health state”. How would you classify your own health these days on this scale?											
Napakasamang kalagayan Very bad health Napakabuting kalagayan Very good health 0 1 2 3 4 5 6 7 8 9 10											

	[SHOW SHEET 7 – SCALE E] Kung ikukumpara sa nakaraang taon mula April 2014, masasabi niyo po bang lalong napabuti o lalong napasama ang pangkalahatang kalagayan ng inyong kalusugan? [SHOW SHEET 7 – SCALE E] Compared to one year ago since April 2014 would you say that your health situation overall improved or got worse?										
	Lalong napasama Got much worse Pareho lamang Stayed the same Lalong napabuti Got much better										

Nitong nakaraang dalawang taon simula April 2013, mayroon po ba kayong sakit na natuklasan sa pamamagitan ng inyong routine checkups kasama ang sa health dev lab tests? <i>Did you learn about a disease you have not been aware of through one of your routine check-ups in the past 2 years since April 2013 including the health dev lab tests?</i>						
1	Wala No	2	Mayroon Yes	-77	No routine check-ups	If HINDI/NO GO TO Q 32

[USE SHEET 4 – REACTION] [1] Anu-ano pong mga sakit ang natuklasan sa inyong routine check-ups [2/3] at kailan niyo po nalaman ito? [4] Ano po ang ginawa ninyo ukol rito? [PROBE] [5] Nagpakonsulta po ba kayo sa isang health professional tungkol sa inyong sakit pagkatapos ng inyong lab test? [USE SHEET 4 – REACTION] About which diseases did you find out in the routine check-ups and when did you find out about these diseases? What did you do about it? [PROBE] Did you consult a health professional concerning your disease <u>after</u> the lab test?						
		Description of disease condition	Month	Year	Reaction	Follow up
		[31.X.1]	[31.X.2]	[31.X.3]	[31.X.4]	[31.X.5]
[31.1]	Disease 1					1 Hindi No 2 Oo Yes
[31.2]	Disease 2					1 Hindi No 2 Oo Yes
[31.3]	Disease 3					1 Hindi No 2 Oo Yes
Sa kasalukuyan, mayroon po ba kayong sakit o karamdamang na-diagnose ng doktor? [PROBE] Anu-ano ang mga ito? <i>Do you currently have any diagnosed diseases? Which ones?</i> [PROBE] _____ _____						
Mayroon po ba kayong hypertension o high blood? <i>Do you have any problems with hypertension or high blood pressure?</i>						
	1 Mayroon Yes	2 Wala No	IF YES, ANSWER 34 ONLY FOR HYPERTENSION, OTHERWISE FOR MOST SEVERE DISEASE			
IF PERSON HAS NO DISEASE, GO TO Q 35. IF HAS HYPERTENSION ANSWER 34 FOR HYPERTENSION, OTHERWISE MOST SEVERE DISEASE						
[SHOW SHEET 2 – SCALE A] Sa bahaging ito, interesado po kami sa kung paano niyo hinaharap ang inyong [SAKIT]. May babasahin po akong mga aspeto ng pagharap sa sakit. Mangyari po lamang na sabihin sa akin kung paano niyo igagrado ang inyong abilidad sa pagharap sa inyong sakit mula 1 “talagang hindi mabuti ” hanggang 5 “talagang mabuti”. Mangyari po lamang na maging tapat; walang tama o maling sagot. Isipin na hindi magkakaugnay ang bawat aspeto na aking babanggitin. Isipin lamang ang inyong [SAKIT] sa pagsagot sa mga susunod na tanong. [SHOW SHEET 2 – SCALE A] We are interested in how well you are able to cope with your [DISEASE]. I will read to you a list with different aspects of how you can handle your disease. Please think only of [DISEASE] when answering the questions. Please tell me how you would rate your ability to handle the different aspect of your disease care on a scale from 1 “Very bad” to 5 “Very good”. Please be as honest and accurate as you can, there is no right or wrong answer. Think about each aspect on its own.						
			Talagang hindi mabuti Very bad	Hindi mabuti Bad	Tama lang Fair	Mabuti Good
[34.1]	Dalas ng pagpapatingin niyo sa inyong medical practitioner para sa paggaling ng inyong [SAKIT] <i>Regularity of seeing your medical practitioner(s) for [DISEASE] care</i>		1	2	3	4
[34.2]	Kaalaman niyo tungkol sa inyong [SAKIT] <i>Your knowledge about your [DISEASE]</i>		1	2	3	4
[34.3]	Pamamaraan niyo ng pagmamana ng inyong [SAKIT]. <i>Your self-management of [DISEASE] care</i>		1	2	3	4
[34.4]	Pagtatabi niyo ng mga records (resulta ng lab tests, reseta) tungkol sa inyong kondisyon at mga pagpapatingin na ginawa niyo para sa inyong [SAKIT] <i>Your record keeping about your medical condition and treatments related to your [DISEASE]</i>		1	2	3	4
May regular po ba kayong iniinom na gamot ngayon? [EXCLUDING VITAMINS] <i>Do you currently take any medicine regularly? [EXCLUDING VITAMINS]</i>						
	1 Wala No	2 Mayroon Yes	IF WALA/NO GO TO Q 38			
Para sa anong sakit/karamdaman regular niyong iniinom ang gamot? [EXCLUDING VITAMINS] <i>Against which symptoms or diseases do you regularly take medicine? [EXCLUDING VITAMINS]</i>						
	_____		1 Hypertension	IF 1, ANSWER Q37 ONLY FOR HYPER		
Isipin ang gamot na regular niyong iniinom para sa inyong [SAKIT] sa mga sumusunod na tanong: <i>Please think of the medicine that you have to take most regularly for your [DISEASE]:</i>						
[37.1]	Sinusunod po ba ninyo ang reseta ng inyong gamot? <i>Do you take your medicine as prescribed?</i>		1	Hindi	No	2 Oo Yes
[37.2]	May pagkakataon po bang nakalimutan niyong inumin ang inyong gamot? <i>Have you ever forgotten to take the medicine?</i>		1	Hindi	No	2 Oo Yes
[37.3]	Tinitigil po ba ninyo ang pag-inom ng inyong gamot sa tuwing bumubuti na ang inyong pakiramdam kahit na hindi pa po dapat? <i>When you feel better, do you sometimes stop taking your medicine before completing the prescribed course of treatment?</i>		1	Hindi	No	2 Oo Yes
[37.4]	Tinitigil po ba ninyo ang pag-inom ng gamot kapag lumala ang inyong pakiramdam? <i>Sometimes, if you feel worse when you take your medicine, do you stop taking it?</i>		1	Hindi	No	2 Oo Yes

[SHOW SHEET 8 & 9 – SYMPTOMS & CALENDAR] Meron po akong ipapakitang listahan ng mga sintomas at kalendaryo, pag-aralan po natin ang mga ito nang mabuti. Isipin ang huling pagkakataong nagkasakit kayo nang higit sa dalawang araw o paulit-ulit nitong nakaraang 12 (labindalawang) buwan simula April 2014. **[GIVE 30-45 SECONDS]**

[1] Ano-ano ang mga sakit o sintomas na naramdaman?
[2] Anong buwan nagsimula ang sakit o mga sintomas?
[3] Mga ilang araw po ninyo naranasan ang mga sintomas at sakit?
[4] [SHOW SHEET 10 – SCALE F] Kung susukatn po natin mula 0 hanggang 10, gaano kalala ang inyong karamdaman noong kayo ay nagkasakit?
[5] [USE SHEET 4 – REACTION] Ano po ang inyong ginawa upang gumaling sa sakit?

[INTERVIEWER REPEAT FOR PREVIOUS/ALL SICKNESSES]: Isipin naman ang iba mo pang naging sakit nitong nakaraang taon. **[IF DOES NOT REMEMBER ANY MORE SICKNESSES: SHOW SHEET 8 & 9 AGAIN]:** Maaari pong pakibalikan ang listahan ng mga sintomas sakaling may nakalimutang banggitin. Isama rin po natin pati mga hindi malalang pagkakasakit. **[AFTER HAVING NOTED ALL DISEASES → PROBE]:** May hiningan po ba kayo ng payo o tulong tungkol sa inyong [SAKIT/KARAMDAMAN]?

[SHOW SHEET 8 & 9] I am now going to show you a list with different symptoms and a calendar. Please consider them carefully. Please think back the last time you have been sick in the last 12 months since April 2014 for more than 2 days continuously or recurring. [X.1-5] Which symptoms did you experience when you felt sick for the last time? [GIVE 30-45 SECONDS] [2] In which month did the sickness start? [3] Approximately for how many days did the sickness including all symptoms last? [4] [SHOW SHEET 10 – SCALE F] How sick did you feel on the pain assesment scale from 0 to 10? [5] [USE SHEET 4 – REACTION] And how did you treat the sickness and what did you do? [INTERVIEWER REPEAT FOR PREVIOUS/ALL SICKNESSES: Think about the other sicknesses you had last year. [IF DOES NOT REMEMBER ANY MORE SICKNESSES:] Please try to go through the list of symptoms again thoroughly, in case you might have missed anything [SHOW CALENDER AND SYMPTOM SHEET]. Please do also consider mild sicknesses [AFTER HAVING NOTED ALL DISEASES → PROBING]: Did you ask anybody for advice or help about the [SICKNESS] you had?

	Sickness identifier	Disease Condition & Symptoms	Month first experience	Duration of sickness in days?	Severity of sickness	Reaction [PROBE]	Consult Spontaneous	Consult After probing
		[38.X.1]	[38.X.2]	[38.X.3]	[38.X.4]	[38.X.5]	[38.X.6]	[38.X.7]
[38.1]	Sickness P1							
[38.2]	Sickness P2							
[38.3]	Sickness P3							
[38.4]	Sickness P4							
[38.5]	Sickness P5							
[38.6]	Sickness P6							
[38.7]	Sickness P7							
[38.8]	Sickness P8							
[38.9]	Sickness P9							
[38.10]	Sickness P10							

Noong nakaraang 12 (labindalawang) buwan mula April 2014, may miyembro po ba ng inyong tahanan ang nagkaroon ng sakit na higit sa dalawang araw? Kung oo, **[1]** Sino po ang miyembrong nagkasakit? **[2]** Anong buwan po siya nagsimulang magkasakit? **[3] [USE SHEET 4 - REACTION]** Ano pong ginawa niyo para gumaling siya sa kaniyang sakit? **[INTERVIEWER REPEAT FOR ALL SICKNESSES]**

In the past 12 months since April 2014 did another household member get sick at any time for more than 2 days? If yes ... [1] who was that household member?[2] In which month did the sickness start? [3] [USE SHEET 4 - REACTION] And how did you treat the sickness? INTERVIEWER REPEAT FOR ALL SICKNESSES

	Sickness identifier	Who? Relationship?	Month	Treatment - Reaction	Consult Spontaneous
		[39.X.1]	[39.X.2]	[39.X.3]	[39.X.4]
[39.1]	Sickness H1				
[39.2]	Sickness H2				
[39.3]	Sickness H3				
[39.4]	Sickness H4				
[39.5]	Sickness H5				
[39.6]	Sickness H6				
[39.7]	Sickness H7				
[39.8]	Sickness H8				
[39.9]	Sickness H9				
[39.10]	Sickness H10				

	Nitong nakaraang 12 (labindalawang) buwan simula April 2014, gaano kayo kadalasan humingi ng medikal na pangangalaga o payo para sa sarili o sa kasama sa bahay... [PERSONAL & HOUSEHOLD] <i>In the past 12 months since April 2014, how often did you seek medical care or advice [PERSONAL & HOUSEHOLD]</i>		
[40.1]	...sa health center sa inyong barangay? ...at the health center in your Barangay?		beses times
[40.2]	...sa ospital? ...at a hospital?		beses times

Narinig niyo na po ba ang K-Kalusugan Kadet o KKK? <i>Have you heard of K-Kalusugan Kadets or KKK before?</i>			
1	Hindi	No	2 Oo Yes
			[IF HINDI/NO GO TO Q 44]

Puwede niyo po bang ilarawan sa akin kung ano ang isang K-Kalusugan Kadet o KKK at kung ano ang kaniyang tungkulin? <i>Can you describe to me what a Health Kadet is and what her role is?</i>	
	- 77 Don't know

May health kadet po ba sa inyong sentro? <i>Does your Kasagan-Ka center have a health kadet?</i>	
1	Wala No
2	Mayroon Yes
- 77 Don't know	

Ang health kadet po ay miyembro sa inyong sentro na nakakatanggap ng community health training mula sa Kasagana-Ka. Interesado rin po ba kayong maging health kadet balang araw? <i>A health kadet is a member from your center who receives a short community health training by Kasagana-Ka. Would you personally be interested in becoming a health kadet one day?</i>	
1	Hindi No
2	Oo Yes

KKK. IF CENTER HAS HEALTH KADET (INDEPENDENT OF RESPONSE TO Q 43) CONTINUE WITH EXTRA QUESTIONNAIRE "KKK CENTER". DO NOT CONTINUE WITH "KKK CENTER" IF RESPONDENT IS A HEALTH KADET!

[USE SHEET 4 – REACTION AND SHOW SHEET 13 – SCALE I] Babasahin ko po sa inyo ang ilang kwento tungkol sa mga taong may iba't ibang antas ng problemang pangkalusugan. Isipin po ninyo na kayo ang taong nasa kuwento. Matapos kong basahin ang bawat kwento, nais ko pong malaman ang inyong opinyon tungkol rito at kung [1] gaano po kalala ang kanilang problemang pangkalusugan. [2] Ano po ang gagawin ninyo kung sa inyo po ito mangyari? Isipin po ninyo na ang tao sa kwento ay kapareho ninyo ng edad at kalagayan sa buhay. [SHOW SHEET 13–SCALE I] This next section requires additional concentration. I will read to you some stories about people with varying levels of health problems. I want you to try to think about these people's experiences as if they were your own. Once I have finished reading each story I would like to know how you view each story and how severe the experienced health problem or difficulty in your opinion is. [USE SHEET 4 - REACTION] How would you react to it? Think of the person in the story as someone who is of your age and socioeconomic background.				
		Severity	Reaction	Consult Spontaneous
		[45.X.1]	[45.X.2]	[45.X.3]
[45.1]	Tumama ang tuhod ni Anna sa mesa. Masakit ito sa una ngunit nawala rin agad ang sakit. Matapos ang tatlong araw, wala nang markang makikita sa kanyang tuhod. <i>Anna hit her knee on the table. In the first moment it is very painful, but the pain quickly goes away. After three days no more marks are visible</i>			
[45.2]	Nanghihina si Florentina nitong nakaraang dalawang linggo. Madalas siyang umuubong at may nararamdamang sakit sa dibdib at likod. Nang siya ay magtimbang, nabawasan siya ng dalawang kilo. <i>Florentina has been feeling very weak for the last 2 weeks. She coughs often and feels pain in her breast and back. She has lost about two kilos of her weight.</i>			
[45.3]	Dalawang araw nang may lagnat at nagtatae ang limang taong gulang na anak ni Maria. Sa pangatlong araw, uhaw na uhaw at nanunuyo na ang bibig ng bata. <i>Maria's 5 year old daughter has fever and diarrhea for 2 days. On the third day the child is very thirsty and has a dry mouth.</i>			
[45.4]	Madalas na nakararamdam ng lubos na pagkalungkot si Susana. Madalas siyang umiiyak at nawawalan ng pag-asa sa kanyang hinaharap. Pakiramdam niya ay pabigat siya sa iba. <i>Susana feels depressed most of the time. She weeps frequently and feels hopeless about the future. She feels that she has become a burden on others.</i>			

7. Health Behavior, Prevention, and Attitudes

Sa susunod na bahagi, pag-usapan naman po natin ang inyong pananaw at gawain kaugnay sa kalusugan.
In the next section of the survey I would like to talk to you about your health behavior and attitudes.

Ano ang inyong ginagawa upang kayo ay maging malusog at makaiwas kayo sa sakit? [PROBE] <i>In general, what do you do to stay healthy and to prevent diseases? [PROBE]</i>	

	Tuwing kailan po kayo madalas maghugas ng kamay? Kung maaari, magbigay po ng eksaktong sagot. [PROBE] <i>After or before which activities do you usually wash your hands? Please be as precise as possible.[PROBE]</i>					
	Itinatabi po ba ninyo <u>sa bahay</u> ang mga tala tungkol sa inyong medical history, resulta ng mga pagpapagamot, o kahit anong impormasyon o dokumentasyon kaugnay sa inyong kalusugan? [PROBE IF THEY USE KDCI HEALTH DIARY] <i>Do you keep records at home about your medical history or about health treatments, that is any information, documentation related to your personal health and medical treatments e.g. about medical check-ups? ? [PROBE IF THEY USE KDCI HEALTH DIARY]</i>					
	1 Hindi No	IF NO GO TO Q 50	2 Oo Yes	Gumagamit po ba kayo ng Kasagana-Ka health diary? <i>Do you use a Kasagana-Ka health diary?[48.2]</i>	1 Yes, KDCI health diary 2 No, other record keeping	
	Pwede po ba ninyong ipakita sa akin kung saan niyo tinatago ang inyong health records? <i>Could you please show me the folder or place where you keep your health records?</i>					
[49.1]	Aabutin po ba kayo nang lampas tatlong minuto para maipakita sa akin ang lugar kung saan ninyo itinatabi ang inyong mga health records? <i>Would it take you longer than 3 minutes to show me the place or folder where you keep your health records?</i>				1 Hindi No 2 Oo Yes IF YES GO TO Q 50	
	[INTERVIEWER DO NOT READ OUT LOUD THE FOLLOWING QUESTIONS]					
[49.2]	Gaano katagal bago naipakita ng kalahok ang mga materyal? <i>How long did it take the respondent to find/show the materials?</i>				Seconds	
[49.3]	Nakatago ba ang mga materyal sa isang folder/envelope? <i>Are the materials kept in a folder/envelope?</i>				1 Hindi No 2 Oo Yes	
[49.4]	Gaano kaayos a ng mga materyal? <i>How well-organized are the materials?</i>				1 Very well 2 Somewhat 3 Not at all	
	Bukod sa mineral o bottled water, uminom po ba kayo ng tubig mula sa gripo nitong nakaraang tatlong araw? <i>Aside from drinking mineral or bottled water, did you drink water from another source, such as tap water, in the past 3 days?</i>					
	1 Hindi No 2 Oo Yes	[IF HINDI/NO, GO TO Q 52]				
	Dumadaan po ba sa proseso ang tubig bago ninyo ito inumin? [DO NOT READ ANSWERS] <i>Did you treat or filter the water in any way before you drank it? [DO NOT READ ANSWERS]</i>					
	1 Hindi No	2 Oo Yes	how? [51.2]	1 Proper filter 4 Boiling	2 Purified/Treatment solution 5 Other: _____	
	Regular o isang beses kada dalawang buwan po ba kayong naghahanap ng impormasyon tungkol sa kalusugan? (Halimbawa: impormasyon tungkol sa posibleng sakit o gamot) <i>Do you regularly at least once every 2 months actively seek information about health issues and topics, e.g. about health threats or treatments?</i>					
	1 Hindi No 2 Oo Yes	[IF HINDI/NO, GO TO Q 54]				
	Saan po kayo madalas nakakakuha ng mga impormasyon tungkol sa kalusugan? [DO NOT READ ANSWERS] [PROBE] <i>From which sources do you usually obtain information about health topics? [DO NOT READ ANSWERS] [PROBE]</i>					
	[53.1]	1.	TV	[53.2]	1.	Radio
	[53.3]	1.	Internet	[53.4]	1.	Newspaper, magazines
	[53.5]	1.	Health kadet	[53.6]	1.	Health professional / health center
	[53.7]	1.	Relatives friends, neighbors	[53.8]	1.	Other: _____
	Nitong nakaraang anim na buwan simula October 2014, may nakuha po ba kayong bagong impormasyon tungkol sa mga posibleng sakit na hindi po ninyo alam dati? Kung mayroon, para sa aling mga sakit? <i>Did you receive any new information about diseases or health threats in the past 6 months since October 2014 that you were not aware of before?</i>					
	1 Wala No 2 Mayroon Yes	for what diseases: _____ [54.2]				
	Ilang taon na po kayo? <i>How old are you?</i>					
	taong gulang years old					

[1] Anu-ano pong mga family planning methods ang alam niyo o narinig niyo? [2-5] Babasahin ko po sa inyo ang iba't ibang family planning methods [IF NECESSARY SHOW SHEET 14 - FP] . Kung okay lang sa inyo, maaari niyo po bang sabihin sa akin kung narinig, nagamit, [IF AGE < 50] at kasalukuyang ginagamit ang mga sumusunod na family planning methods. [1] Which family planning methods have you heard of? [2-5] I will now read you a list of different family planning methods [IF NECESSARY SHOW SHEET 14 - FP] . If you do not mind, could you please tell me if you have ever heard of the method, if you ever used it, [IF AGE < 50] and if you are currently using it?						
		[56.X.1]	[56.X.2]	[56.X.3]	[56.X.4]	
		Spontaneous?	Ever heard?	Ever used?	Current use?	
[56.1]	Pill	1	1	1	1	
[56.2]	IUD (Intrauterine Device)	1	1	1	1	
[56.3]	Injection/Injectable (Depo Provera/ Depo Trust / DMPA)	1	1	1	1	
[56.4]	Implant (NoRPLANT)	1	1	1	1	
[56.5]	Condom	1	1	1	1	
[56.6]	Pagpapatali Sterilization (Ligation, Vasectomy)	1	1	1	1	
[56.7]	Rhythm, Calendar Methods	1	1	1	1	
[56.8]	Basal Body Temperature	1	1	1	1	
[56.9]	Breastfeeding / LAM as family planning method (only)	1	1	1	1	
[56.10]	Billings Ovulation Method (BOM)	1	1	1	1	
[56.11]	Withdrawal	1	1	1	1	
[56.12]	Other: _____	1	1	1	1	

Nitong nakalipas na 12 (labindalawang) buwan, nakatanggap po ba kayo o naghanap ng impormasyon tungkol sa family planning methods? <i>In the past 12 months did you receive or actively seek information about family planning methods?</i>						
1. Hindi No 2. Oo Yes						

May nakausap po ba kayong ibang miyembro ng inyong sentro tungkol sa natural o artificial na family planning methods? <i>Have you ever talked to other members of your kasagana-ka center about family planning methods?</i>						
1. Wala No 2. Mayroon Yes						

Anu-ano ang maaari po ninyong gawin upang mapabuti ang kalusugan ng isang bagong panganak na sanggol edad 12 (labindalawang) buwan pababa? [NOT READ ANSWERS] [PROBE] <i>What can you do to improve the health of a newborn child of less than 12 months of age? [NOT READ ANSWERS] [PROBE]</i>						
[59.1]	1 Breasfeeding	[59.2]	1 Immunization	[59.3]	1 Vitamins	-77 Don't know
[59.4]	1 Check-up	[59.5]	1 Unang yakap Skin to skin contact			
[59.6]	1 Other: _____					

May alam po ba kayong mga paraan kung papaano magpapagatas ang isang nanay na may bagong silang na sanggol? [PROBE] Kung mayroon, anu-ano ang mga ito? <i>Do you know any techniques how mothers of newborn children can increase their milk production? [PROBE]</i>						
1	Wala None	2	Mayroon Yes	which ones?	_____	[60.2]

Ikaw po ba o ang iyong kasama sa bahay ay... <i>Are you or somebody else in the household currently ...</i>						
[61.1]	Buntis pregnant	1	Oo Yes	2	Hindi No	IF YES LEAVE EXTRA QUESTIONNAIRE PREGNANCY / ASK TO FILL OUT
[61.2]	Kapapanganak lamang having a baby < 12 months	1	Oo Yes	2	Hindi No	IF YES LEAVE EXTRA QUESTIONNAIRE NEWBORN / ASK TO FILL OUT

Alam niyo po ba kung ano ang breast self-examination? [PROBE, GIVE MINIMAL EXPLANATIONS] <i>Do you know what breast self-examination is? [PROBE, GIVE MINIMAL EXPLANATIONS]</i>						
1. Hindi No 2. Oo Yes				IF HINDI/NO GO TO Q 65		

[1] Maaari niyo po bang ipaliwanag ito sa akin? [2] Sa anong panahon po pinakamainam magsagawa ng breast self-examination? <i>[1] Can you explain it to me? [2] At which time should you practice breast self-examination?</i>						
Explanation [63.1]					Timing [63.2]	
1	Hindi No	2	Oo, mali ang paliwanag Yes, wrong explanation	3	Oo, tama ang paliwanag Yes, correct explanation	1 After menstruation
[MIN. ACCEPTABLE ANSWER: EXAMINATORY CHECK FOR CHANGES OR PROBLEMS IN THE WOMEN'S BREAST.HAS TO BE PERFORMED AFTER MENSTRUATION]						

	Nitong nakalipas na tatlong buwan simula January 2015, ginawa niyo po ba ang breast self-examination? <i>In the past 3 months since January 2015, did you once self-examine your breasts?</i>			
	1	Hindi No	2	Oo Yes

	Regular o isang beses kada linggo po ba kayong naglalaro ng sports o may pisikal na gawain na tumatagal nang 15 (labinlimang) minuto (tulad ng pagsayaw)? Kung oo, anong ginagawa mo? <i>Do you regularly at least once a week do physical training or sports for at least 15 minutes (including dancing)?</i>			
	1.	Hindi No	2.	Oo Yes, what kind of exercise: _____ [65.2]

	Gaano po kayo katangkad at ano po ang inyong timbang? <i>How tall are you and what is your weight?</i>			
	Height:	inches [66.1]	Weight:	pound [66.2] Height: Cm [66.3] Weight: Kg [66.4]

	Ilang araw po sa isang linggo kayo nakakakain ng mga sumusunod... <i>On how many days of a week do you normally eat at least once...</i>			
[67.1]	Prutas fruit?	on		araw kada linggo days of the week
[67.2]	Chichirya o matatamis Chips or sweets?	on		araw kada linggo days of the week

	[SHOW SHEET 5 - SCALE C] Mayroon pong iba-ibang pananaw ang mga tao tungkol sa kalusugan at pangangalaga nito. Nais po naming malaman kung gaano po kayo sumasang-ayon o di sumasang-ayon sa mga sumusunod na pahayag. Sabihin lang po sa akin kung kayo ay: lubos na di sang-ayon, di sang-ayon, hindi sumasang-ayon o tumututol, sang-ayon, at lubos na sang-ayon. Sa inyong pagsagot, mangyari po lamang na maging tapat; walang tama o maling sagot. [SHOW SHEET 5 - SCALE C] <i>People have different opinions and beliefs about health and health care. We have prepared statements for you reflecting different opinions and beliefs on health. We are interested on how strongly you agree or disagree on the following statements. Please tell me if you strongly disagree, disagree a little, neither agree nor disagree, agree a little, or strongly agree with each statement. When telling me your opinion please be as honest and accurate as you can, there is no right or wrong answer.</i>					
		Hindi talaga o Lubos na di Sang-ayon No, strongly disagree	Medyo hindi o Di sang-ayon No, disagree a little	Hindi sumasang-ayon o tumututol Neither agree nor disagree	Medyo oo o Sang-ayon Yes, agree a little	Oo talaga o Lubos na Sang-ayon Yes, strongly agree
[68.1]	Minsan nahihirapan kayong kumain ayon sa masustansiya at tamang diet. <i>Sometimes you have a hard time keeping a healthy diet.</i>	1	2	3	4	5
[68.2]	Marami kayong alam tungkol sa pagkain nang tama. <i>You know a lot about healthy eating.</i>	1	2	3	4	5
[68.3]	Madalas na hindi nakakatulong sa paggaling sa sakit ang pagpapatingin sa mga health professional. <i>Seeking help from health professionals often does not help in curing diseases.</i>	1	2	3	4	5
[68.4]	Kung magkakasakit kayo, magkakasakit kayo kahit anong gawin ninyo. <i>No matter what you do, if you're going to get sick, you will get sick</i>	1	2	3	4	5
[68.5]	Hindi kailangang magpa-checkup kung wala namang nararamdamang sakit. <i>If you do not feel sick, you do not need to go to a check.up</i>	1	2	3	4	5
[68.6]	Kung ito'y nakatakda para sa inyo, magiging malusog kayo. <i>If it is meant to be, you will stay healthy</i>	1	2	3	4	5
[68.7]	Bago kayo humingi ng tulong sa mga health professionals, susubukan niyo munang bigyang lunas o pagalingin ang inyong karamdaman. <i>Before seeking help from a health professional you try to cure diseases by yourself.</i>	1	2	3	4	5
[68.8]	Mababago niyo ang inyong kalusugan sa inyong mga gawi. <i>You are able to change your health through your behavior</i>	1	2	3	4	5
[68.9]	May kontrol kayo sa inyong kalusugan. <i>You are in control of your health.</i>	1	2	3	4	5
[68.10]	Ang magandang kalusugan ay nakasalalay sa magandang kapalaran. <i>Good health is largely a matter of good fortune.</i>	1	2	3	4	5

[68.11]	Anumang mangyari sa kalusugan niyo ay resulta ng kung anong ginagawa niyo <i>The main thing which affects your health is what you yourself do.</i>	1	2	3	4	5
[68.12]	Kapalaran ang nagtatakda kung kailan kayo gagaling sa inyong sakit <i>Luck plays a big part in determining how soon you will recover from an illness.</i>	1	2	3	4	5
[68.13]	Diyos lang ang bahala kung bubuti ang kalagayan ng inyong kalusugan. <i>Whether or not your health improves is only up to God</i>	1	2	3	4	5

8. Health knowledge

Pag-usapan po natin ngayon ang alam niyo tungkol sa kalusugan at kung paano maiiwasan ang sakit.

I would now like to talk to you about things you know about human health and health prevention

	[SHOW SHEET 2 – SCALE A] Paano po ninyo igagrado ang inyong sarili pagdating sa kaalaman tungkol sa sakit at mga lunas? [SHOW SHEET 2 – SCALE A] <i>How would you grade your knowledge about diseases and health treatments?</i>					
	Talagang hindi mabuti <i>Very bad</i> 1	Hindi mabuti <i>Bad</i> 2	Tama lang <i>Fair</i> 3	Mabuti <i>Good</i> 4	Talagang mabuti <i>Very good</i> 5	
	Sa mga sumusunod na tanong, interesado po kami sa inyong kaalaman tungkol sa iba't ibang sakit. <i>In the following I am interested in your knowledge about different diseases.</i>					
[70.1]	Alam po ba ninyo kung ano ang UTI <i>Do you know what UTI is and can you explain it to me?</i>	1	Hindi	No	2	Yes, wrong explanation
					3	Yes, correct explanation
		[MIN. ACCEPTABLE ANSWER: INFECTION OF THE URINARY TRACT]				IF NO GO TO 70.4
[70.2]	Nakakahawa po ba ito? <i>Is it a contagious disease?</i>	1	Hindi	No	2	Oo
					Yes	-77 Don't know
[70.3]	Paano po ito maiiwasan? [NOT READ ANSWERS][PROBE] <i>How can you prevent the disease?</i> [NOT READ ANSWERS][PROBE]	[70.3.1]	1	Drink enough water	[70.3.2]	1
		[70.3.3]	1	Genital hygiene before using the CR	[70.3.4]	1
		[70.3.5]	1	Wipe from front to back in shower or after using the CR	[70.3.6]	1
					[70.3.7]	1
		[70.3.8]	1	Other: _____		
						-77 Don't know
[70.4]	Alam po ba ninyo ba kung ano ang TB? <i>Do you know what Tuberculosis is?</i>	1	Hindi	No	2	Yes, wrong explanation
					3	Yes, correct explanation
		[MIN. ACCEPTABLE ANSWER: DISEASE THAT USUALLY ATTACKS THE LUNGS]				IF NO GO TO 70.9
[70.5]	Nakakahawa po ba ito? <i>Is it a contagious disease?</i>	1	Hindi	No	2	Oo
					Yes	-77 Don't know
[70.6]	Magkano po ang isang package ng gamot ng TB sa health center?				PHP	-77 Don't know
[70.7]	Alam po ninyo ang TB DOTS? Puwede niyo po bang ipaliwanag ito sa akin? <i>Do you know what TB DOTS is? Can you explain it to me?</i>	1	Hindi	No	2	Yes, wrong explanation
					3	Yes, correct explanation
		[MIN. ACCEPTABLE ANSWER: TB MEDICATION IS FREE AND ACCESSIBLE, Monitoring]				-77 Don't know
[70.8]	Anu-ano po ang mga sintomas ng TB? [NOT READ ANSWERS][PROBE] <i>What are symptoms of TB?</i> [NOT READ ANSWERS][PROBE]	[70.8.1]	1	Coughing	[70.8.2]	1
		[70.8.3]	1	Back Pain	[70.8.4]	1
		[70.8.5]	1	Fever	[70.8.6]	1
		[70.8.7]	1	Loss of Appetite	[70.8.8]	1
		[70.8.9]	1	Other: _____		
						-77 Don't know
[70.9]	Alam po ba ninyo kung ano ang hypertension o high blood at puwede niyo po bang ipaliwanag ito sa akin? <i>Do you know what hypertension is and can you explain it to me?</i>	1	Hindi	No	2	Yes, wrong explanation
					3	Yes, correct explanation
		[MIN. ACCEPTABLE ANSWER: <u>CONSISTENT</u> HIGH BLOOD PRESSURE]				IF NO GO TO Q 71
[70.10]	Nakakahawa po ba ito? <i>Is it a contagious disease?</i>	1	Hindi	No	2	Oo
					Yes	-77 Don't know
[70.11]	Paano po ito maiiwasan? [NOT READ ANSWERS][PROBE] <i>How can you prevent the illness?</i> [PROBE]	[70.11.1]	1	Right diet	[70.11.2]	1
		[70.11.3]	1	Enough rest	[70.11.4]	1
		[70.11.5]	1	Avoid smoking	[70.11.6]	1
		[70.11.7]	1	Other: _____		
						-77 Don't know

	Maaari po bang gumamit ng antibiotics para mapigilan ang pinsalang dulot ng viral infection tulad ng sipon o trangkaso? <i>Can you use antibiotics to reduce the harmful effects of a viral infection, such as a cold or flu?</i>		
	1 Hindi No	2 Oo Yes	-77 Don't know

	Ano pong problemang idinidulot ng palagiang paggamit ng antibiotics? <i>What is the problem if you take antibiotics too often?</i>		
	1 Threat of resistance	2 Other answer: _____[72.2]	-77 Don't know None / Wala

	Mayroon po ba kayong alam na mga sakit na maaaring makuha mula sa pakikipagtalik? Kung oo, ano-ano po ang mga ito? [PROBE] <i>Do you know any diseases you can get from having sex? If yes, which ones? [PROBE]</i>			
	1 Wala No 2 Mayroon Yes, which ones:	[73.1] 1 AIDS	[73.2] 1 Genital Warts	
[73.3] 1 Tulo Gonorrhea		[73.4] 1 Herpes		
[73.5] 1 Chlamydia		[73.6] 1 Syphilis		
[73.7] 1 Other: _____				

9. Household

Ang susunod na bahagi ay tutuon po sa inyong mga kasama sa bahay. Ang “kasama sa bahay” ay nangangahulugang lahat ng kasalukuyan at permanenteng kasama sa inyong bahay na nakikinabang sa inyong kita at kumikilala sa tagapagtaguyod ng pamilya. *The following section is focused on your household. By household we mean all people who permanently live together with you at the moment and who share their income and expenditures with each other and acknowledge the authority of a man or woman who is the head of household.*

	Sa kabuuan, ilan po ang inyong maituturing na kasama sa bahay kasama ang inyong sarili? <i>Altogether, how many persons including yourself live in your household at the moment?</i>	
		Tao Persons

	Ilan po sa mga ito... How many of these...		
[75.1]	... ang menor de edad (<18) ... are children below age 18?		Tao Persons
[75.2]	...ang inyong anak? ...are your own children?		Tao Persons IF CHILDLESS, GO TO Q79

	Ilang taon na po ang inyong bunsong anak? <i>How old is your youngest child?</i>	
		Taon Year IF YOUNGEST CHILD > 18 GO TO Q 79

	Isipin niyo ang inyong bunsong anak. Laban sa anu-anong mga sakit siya nabigyan ng bakuna? [INTERVIEWER: [77.X.1] RECORD FIRST SPONTANEOUS ANSWER. [77.X.2] THEN READ VACCINATIONS AND RECORD → ASK FOR VACCINATION PASS IF AVAILABLE] <i>Please think of your youngest child. Against which diseases did your youngest child receive vaccination?</i>					
		[77.X.1]	[77.X.2]		[77.X.1]	[77.X.2]
		Spontaneous?	After reading?		Spontaneous?	After reading?
[77.1]	Tetanus, diphtheria, and pertussis (DPT)	1	1	[77.5]	Polyo Polio	1 1
[77.2]	Tigdas, beke (MMR) Measles, Mumps, Rubella	1	1	[77.6]	Hepatitis (A,B,C)	1 1
[77.3]	Numonya Pneumococci	1	1	[77.7]	Rabis Rabies	1 1
[77.4]	Bacillus Calmette-Guérin (BCG) / TB	1	1	[77.8]	Influenza	1 1

	Nitong nakaraang 12 (labindalawang) buwan simula April 2014, mayroon po ba sa inyong mga menor de edad na anak ang nakapagpacheckup kahit walang sakit o sintomas ng pagkakasakit? <i>Did you have any of your children below age 18 undergo a routine lab examination in the past 12 months since April 2014 without feeling sick or having any disease symptoms?</i>	
	1 Waia No	2 Mayroon Yes

	Ang mga sumusunod na tanong ay tungkol sa health insurance. <i>In the following I have some questions about health insurance.</i>				
[79.1]	Miyembro po ba kayo ng Phil Health? <i>Are you personally a registered member of Phil Health?</i>	1	Hindi	No	2 Oo Yes 3 Applied
[79.2]	[KUNG MIYEMBRO] Kayo po ba ay nagbabayad ng kontribusyon sa Phil Health? [IF MEMBER] <i>Are you paying contributions?</i>	1	Hindi	No	2 Oo Yes
[79.3]	Ang asawa niyo po ba ay miyembro ng PhilHealth? <i>Is your partner/spouse a Phil Health Member?</i>	1	Hindi	No	2 Oo Yes 3 Single
[79.4]	May health insurance po ba kayo mula sa ibang pribadong institusyon/organ- isasyon? [HINDI KASAMA ANG KASAGANA-KA O KMBA] <i>Are you personally insured by a private health maintenance organization?</i> [KASAGANA-KA OR KMBA DO NOT COUNT]	1	Hindi	No	2 Oo Yes
[79.5]	Bukod sa mga Philhealth Office, saan pa po pwedeng mag-apply para maging miyembro ng Philhealth? [NOT READ ANSWERS] <i>Through which channels can you apply for a Phil Health membership aside from going directly to the Phil Health Office?</i> [NOT READ ANSWERS]	[79.5.1]	1	Kasagana- Ka	[79.5.2] 1 Health Center
		[79.5.3]	1	Other: _____	
[79.6]	Kung kayo po ay miyembro ng Philhealth, sino po ang maaaring ninyong maging mga beneficiaries? [NOT READ ANSWERS] <i>If you are PhilHealth member, who can be covered with you through your membership as beneficiary?</i> [NOT READ ANSWERS]	[79.6.1]	1	Anak Children	-77 Don't know
		[79.6.2]	1	Asawa, Spouse	
		[79.6.3]	1	Magulang Parents	
[79.7]	Kailangan niyo po bang magpakita ng birth certificate para maka- pag-apply sa Philhealth? <i>Do you need to provide a birth certificate to become a Philhealth member?</i>	1	Hindi	No	2 Oo Yes -77 Don't know

A. Financial Situation and Restrictions

Bago po natin talakayin ang huling bahagi, pag-usapan po natin ang kalagayang pampinansyal ng inyong pamamahay. Pakitandaan po na lahat ng inyong sagot ay ituturing na kumpidensiyal.

Before coming to the last section, I want to talk to you about the financial situation of your household and financial restrictions that you experience in your everyday life. Please remember, all your answers are confidential.

	Pag-aari po ba ninyo itong bahay na inyong tinitirahan? <i>Do you/does your household own the house you are living in?</i>				
	1.	Hindi	No	2. Oo	Yes 3 Mortgage/Loan

	Pag-aari po ba ninyo itong lupang kinatatayuan ng inyong bahay? <i>Do you/does your household own the land on which this house you are living in is built?</i>				
	1	Hindi	No	2 Oo	Yes 3 Mortgage/Loan

	Meron po ba kayo ng mga appliances na ito sa inyong bahay? [ONLY WORKING APPLIANCES] <i>Does your household own any of the following vehicles and appliances? [ONLY WORKING APPLIANCES]</i>				
[82.1]	1	Bisikleta Bicycle (with and without sidecar)	[82.15]	1	Pressure cooker/turbo broiler/blender/other expensive specialized cooking gadgets
[82.2]	1	Motorsiklo Motorcycle/motorbike	[82.16]	1	TV, without cable connection
[82.3]	1	Sasakyan Car	[82.17]	1	TV, with cable connection
[82.4]	1	Dyip Jeep/jeepney/multicab	[82.18]	1	VCR (Betamax, VHS, VCD/DVD)
[82.5]	1	Water Dispenser	[82.19]	1	CD player, radio, cassette recorder
[82.6]	1	Plantsa Electric iron	[82.20]	1	Karaoke/Videoke
[82.7]	1	Electric fan	[82.21]	1	Computer, without internet access
[82.8]	1	Air conditioner	[82.22]	1	Computer, with internet access
[82.9]	1	Panahian Sewing machine	[82.23]	1	Washing machine
[82.10]	1	Kalan na gumagamit ng LPG o kuryente Gas (LPG)/electric stove	[82.24]	1	Kalan na gumagamit ng kerosene Kerosene stove
[82.11]	1	Refrigerator	[82.25]	1	Digital camera or video camera
[82.12]	1	Hurno na gumagamit ng LPG o kuryente Gas (LPG)/electric oven	[82.26]	1	Video games (playstation, xbox, etc)
[82.13]	1	Rice cooker	[82.27]	1	Smartphone, phone with touch screen
[82.14]	1	Microwave oven	[82.28]	1	Tablet PCs

	Magkano po ang nagagastos ng buong pamamahay kada linggo (upa, pagkain, para sa pag-aaral, baon, atbp.)? <i>How much does your household spend on average per week for living (rent, food, tuition, allowance, etc.)?</i>				
	about		PHP kada linggo PHP per week	-77	Hindi alam / walang sagot Don't know / no reply

Kung ipagsasama-sama ang lahat ng kinikita ng inyong pamamahay (kasama ang ipinapadala ng kasama sa bahay na OFW), magkano ang kabuuang kita nito kada linggo (yung wala pang ikinakaltas na buwis at ibang gastusin)? <i>Taking the income (before taxes) of all household members together (including OFW remittances), how much is the gross income (before taxes) of your household every week? (Without subtraction of any costs of living)</i>	
about	PHP kada linggo PHP per week -77 Hindi alam / walang sagot Don't know / no reply
May natitira po bang pera ang pamamahay kada buwan para ipunin at ipambayad para sa malalaking gastusin, maaaring para sa emergency o pambili ng lupa/bahay? Kung oo, magkano? [IF RESPONDENT SAYS THAT SHE IS NOT BUYING A HOUSE, ASK FOR HOW MUCH THEY SAVE IN GENERAL] <i>Does your household usually has an amount of money left over at the end of the month that you can save for larger purchases, which may be for emergency expenses or to acquire wealth? If yes, how much?</i>	
1. Wala No 2. Mayroon Yes Kung oo, magkano? If yes, how much? PHP kada buwan [85.2] PHP per month	
Halimbawa, mangangailangan po kayo ng Php10,000 para sa agarang pagpapagamot, makakayanan po bang makalikom ng ganitong halaga ang inyong pamamahay na hindi humihingi ng tulong sa iba? [READ ANSWERS] <i>Imagine you needed 10,000 PHP for an urgent medical treatment, would your household be able to come up with the money without external help? [READ ANSWERS]</i>	
1. Hindi No 2. Oo, baka kalahati Yes, about half of it 3. Oo, buong Php10,000. Yes, all of it	
Nitong nakaraang 12 (labindalawang) buwan, ikaw po ba o isa sa iyong kasambahay ay nagpasyang hindi magpagamot dahil sa dahilang pinansyal? <i>In the past 12 months, did you or a household member ever decide not to go to the doctor or seek medical treatment, help, or advice because of financial constraints?</i>	
1. Hindi No 2. Oo Yes	
Narinig niyo na po ba ang katagang "Climate Change"/Pagbabago ng klima? [PROBE, GIVE MINIMAL EXPLANATIONS] Puwede niyo po ba itong ipaliwanag sa akin? <i>Have you ever heard the term "Climate Change" and can you explain to me what it means? [PROBE, GIVE MINIMAL EXPLANATIONS]</i>	
1 Hindi No 2 Yes, wrong explanation 3 Yes, correct explanation 4 Yes, don't know how to explain IF NO GO TO Q 91	
[MIN. ACCEPTABLE ANSWER: EXTREME CHANGES IN WEATHER AND TEMPERATURE E.G. EXTREMELY STRONG TYPHOONS, UNPREDICTABLE WEATHER, RAIN IN DRY SEASON]	
[SHOW SHEET 15 - SCALE J] Sa inyong palagay, gaano kalubhang problema ng Pilipinas ang climate change/pagbabago ng klima? [SHOW SHEET 15 - SCALE J] <i>How serious a problem do you think climate change is for the Philippines?</i>	
Hindi malubhang problema Not a serious problem at all Malubhang-malubhang problema An extremely serious problem ← 0 1 2 3 4 5 6 7 8 9 10 →	
Ano po sa tingin niyo ang mga sanhi ng climate change/pagbabago ng klima? [READ ANSWERS. MULTIPLE ANSWERS POSSIBLE] <i>What do you think are the causes for climate change? [READ ANSWERS. MULTIPLE ANSWERS POSSIBLE]</i>	
[90.1] 1 Natural na proseso <i>Natural processes</i>	[90.2] 1 Gawa ng tao <i>Human activity</i>
[90.3] 1 Kagustuhan ng Diyos <i>Supernatural processes, God's will</i>	[90.4] 1 Other: _____
Mayroon po ba kayong ginagawa para maprotektahan/mapangalagaan ang kalikasan at maiwasan ang climate change/pagbabago ng klima? [PROBE] <i>Do you personally undertake any activities to protect the environment and to reduce climate change? [PROBE]</i>	
----- -----	- 77 No activities

10. Information about Kasagana-Ka center

Pag-usapan po natin ngayon ang tungkol sa inyong sentro at ang ugnayan niyo sa ibang mga miyembro ng sentro.
I would now like to talk to you about your Kasagana-Ka center and your relationship to the other center members.

[SHOW SHEET – KASAGANA-KA CENTER & USE SHEET - ANSWERS KASAGANA-KA CENTER] Bilang panghuli, may ipapakita akong listahan ng mga miyembro sa inyong sentro. Nais po naming malaman ang pakikitungo niyo sa mga miyembro ng inyong sentro.

[1] Puwede niyo po bang sabihin sa akin kung sino sa listahan ang itinuturing niyong malapit na kaibigan?
[2] Sino sa mga miyembro ang inyong nakikita kada linggo bukod sa pulong sa inyong sentro nang tuloy-tuloy na lampas 15 (labinlimang) minuto?
[3] Sino naman sa mga miyembro ang itinuturing ninyong lima sa pinakamatalik na kaibigan sa tanang buhay ninyo?
[4] Sino naman sa mga miyembro ang nakakausap ninyo tungkol sa inyong mga personal na problema tulad ng lagay ng iyong kalusugan?

[SHOW SHEET – KASAGANA-KA CENTER, USE SHEET - ANSWERS KASAGANA-KA CENTER] *I am now going to show you a sheet with the names of all members of your KASAGANA-KA center. I am interested in your relationship to the other center members. [1] Could you please tell me who of the members on this list you consider to be your personal friend? [2] And who of the members do you meet at least once every week besides the regular center meetings for at least 15 minutes continuously? [3] Who of the members do you consider to be one of your 5 best friends? [4] To whom of the members do you speak about your personal, intimate problems, such as your health situation?*

NEWCOMER

CHECK IF RESPONDENT IS A NEWCOMER: IF YES, CONTINUE WITH EXTRA QUESTIONNAIRE “NEWCOMER” AND THEN RETURN TO MAIN QUESTIONNAIRE AFTERWARDS

Maraming salamat sa inyong paglahok!

[INTERVIEWER: (1) PLEASE CHECK FOR COMPLETENESS, (2) PAY INCENTIVE,
(3) ASK FOR PARTICIPANTS SIGNATURE]

B. Interviewer Observations

PLEASE DO NOT READ

Ano ang iyong pagtingin sa katapatan ng kasagutan ng kalahok? *What is your evaluation of the honesty of the informant's answers?*

Mabuting-mabuti
Very good
1

Mabuti
Good
2

Katamtaman
Fair
3

Masama
Bad
4

Masamang-masama
Very bad
5

Gaano kalinis ang bahay ng kalahok?
What is the general condition of the house with respect to cleanness?

Maruming-marumi
Very dirty
1

Marumi
Dirty
2

Malinis
Clean
3

Malinis na malinis
Very clean
4

Napaliligiran ba ng basura ang bahay ng kalahok?
What is the general condition of the area immediately around the house with respect to garbage disposal?

Maraming basura
Lots of uncollected garbage
1

Medyo may ilang basura
Some uncollected garbage
2

Konting-konting basura
Very little garbage
3

Walang basura
No garbage visible
4

May mga hayop ba sa loob o malapit (<1 metre) sa bahay ng kalahok?
Are there any animals living inside or very close (<1 meter) to the house?

May >5 hayop
Many animals (>5)
1

May 3-5 hayop
Some animals (3-5)
2

May 1-2 hayop
Few animals (1-2)
3

Walang hayop
No animals
4

EXTRA QUESTIONNAIRE: KKK CENTERS

K1	Pakisulat ang mga sumusunod na impormasyon: <i>Please note the following information:</i>			
	----- Respondent ID Code [K1.1]	----- Petsa ng panayam Interview Date [K1.2]	----- Kasalukuyang oras Current time [K1.3]	----- ID ng Interviewer Interviewer ID [K1.4]

KKK Centers

Mayroon pong health kadet sa inyong sentro. Siya po ay miyembro ng inyong sentro na sumailalim sa ilang araw ng training tungkol sa kalusugan. Sa bahaging ito, gusto po naming malaman ang inyong mga karanasan sa inyong health kadet. Ang impormasyong ibibigay ninyo ay hindi po gagamitin laban sa kaniya. Mahalaga pong makuha namin ang tapat niyong sagot kahit na magkaibigan kayo ng inyong health kadet. Ito naman po ay para sa pagpapabuti ng serbisyo sa inyo. *There is a health kadet working in your center. The health kadet is one of the other center members who underwent several days of health training. In this section we are interested in your experiences, if any, with the kadet. The information you provide us will not be used against the health kadet. For us it is very important that you give us your honest opinion even if the health kadet is your friend so that we are able to reach improvements.*

K2	Ano po ang pangalan ng inyong health kadet? <i>Can you tell me the name of the health kadet?</i>			
	First name: [K2.1]	Second name: [K2.2]	-77 Don't know	

INTERVIEWER: PLEASE TELL RESPONDENT NAME OF HEALTH KADET

K3	Alam niyo po ba kung saan nakatira ang inyong health kadet? <i>Do you know where the health kadet lives?</i>			
	1 Hindi No 2 Oo Yes	Kung oo, mula sa inyo, gaano kalayo lakarin ang bahay ng inyong health kadet? What is the walking distance to cadets' house in min?	Minutes [K3.2]	
K4	Humingi po ba kayo ng payo o konsultasyon sa inyong health kadet tungkol sa kalusugan at mga sakit? <i>Have you ever consulted the health kadet in your center to ask for health advice?</i>			
	1 Hindi No 2 Oo Yes	[IF NO GO TO Q K7]		

INTERVIEWER: PLEASE TAKE MAIN QUESTIONNAIRE Q 38 & Q39 AS REFERENCE

K5	Kanina, sinabi niyo po sa akin ang mga sakit na naranasan ninyo o ng inyong mga kasambahay nitong nakaraang taon. Pakitandaan pong muli ang mga panahong kayo ay nagkasakit [SUPPORT BY NAMING SYMPTOMS AND MONTH]. [1] Kinausap po ba ninyo ang inyong health kadet para sa pangagamot, konsultasyon o payong pangkalusugan? [2] Kung oo, ang health kadet po ba ang pinakauna niyong kinonsulta? [3] Gaano po siya nakatulong kung sukatin mula 1 hanggang 4? [SHOW SHEET 11 – SCALE G] [4] Pinayuhan niya po ba kayong magpatingin sa isang health professional katulad ng doktor o nars? INTERVIEWER: REPEAT FOR ALL PERSONAL AND HOUSEHOLD SICKNESSES <i>Before you told me about different sicknesses that you or another household member had in the past 12 months. Please think back when you felt for the last time [SUPPORT BY NAMING SYMPTOMS AND MONTH]. Did you contact the health kadet for treatment, consultation, or advice? If yes, was the health kadet the first health worker you consulted? How useful did you find her help on a scale from 1-4? [SHOW SHEET 11 – SCALE G] Did she advise you to contact a health professional, such as a medical doctor or nurse? INTERVIEWER: REPEAT FOR ALL PERSONAL AND HOUSEHOLD SICKNESSES</i>				
	Sickness Identifier (e.g. P1,H4) [K5.X.1]	Consulted kadet? [K5.X.2]	First person consulted? [K5.X.3]	Usefulness SCALE G [K5.X.4]	Referral [K5.X.5]
[K5.1]		1 Oo yes 2 Hindi no	1 Oo yes 2 Hindi no	1 2 3 4	1 Oo yes 2 Hindi no
[K5.2]		1 Oo yes 2 Hindi no	1 Oo yes 2 Hindi no	1 2 3 4	1 Oo yes 2 Hindi no
[K5.3]		1 Oo yes 2 Hindi no	1 Oo yes 2 Hindi no	1 2 3 4	1 Oo yes 2 Hindi no

[K5.4]		1 Oo yes 2 Hindi no	1 Oo yes 2 Hindi no	1 2 3 4	1 Oo yes 2 Hindi no
[K5.5]		1 Oo yes 2 Hindi no	1 Oo yes 2 Hindi no	1 2 3 4	1 Oo yes 2 Hindi no
[K5.6]		1 Oo yes 2 Hindi no	1 Oo yes 2 Hindi no	1 2 3 4	1 Oo yes 2 Hindi no
[K5.7]		1 Oo yes 2 Hindi no	1 Oo yes 2 Hindi no	1 2 3 4	1 Oo yes 2 Hindi no
[K5.8]		1 Oo yes 2 Hindi no	1 Oo yes 2 Hindi no	1 2 3 4	1 Oo yes 2 Hindi no
[K5.9]		1 Oo yes 2 Hindi no	1 Oo yes 2 Hindi no	1 2 3 4	1 Oo yes 2 Hindi no
[K5.10]		1 Oo yes 2 Hindi no	1 Oo yes 2 Hindi no	1 2 3 4	1 Oo yes 2 Hindi no
[K5.11]		1 Oo yes 2 Hindi no	1 Oo yes 2 Hindi no	1 2 3 4	1 Oo yes 2 Hindi no
[K5.12]		1 Oo yes 2 Hindi no	1 Oo yes 2 Hindi no	1 2 3 4	1 Oo yes 2 Hindi no

K6	Inirekomenda o pinayuhan po ba kayo ng iba pang miyembro ng inyong sentro na magtanong sa health kadet para sa pangggagamot o payong pangkalusugan/medikal? Kung oo, sino ang miyembrong nagrekomenda sa health kadet? <i>Did other members of your KDCI center recommended or advised you to ask the health kadet for treatment or advice?</i>				
	1 Hindi No	2 Oo Yes	who: _____ [K6.2]	-77 Don't know, don't remember	

K7	[SHOW SHEET 12 – SCALE H] Sa pangkalahatan, gaano po kayo kakontento/nasisiyahan sa serbisyo ng inyong health kadet? Maaaring magbigay lamang po ng tapat na sagot. <i>[SHOW SHEET 12 – SCALE H] Overall, how satisfied were you with the kadet's services? Please give us your honest opinion.</i>				
	Hindi Kontento <i>Not at all satisfied</i> Lubos na kontento <i>Completely satisfied</i>				

K8	[SHOW SHEET 2 – SCALE A] [USERS OF KDCI KADET SERVICES]: Batay po sa inyong karanasan sa inyong health kadet, paano po ninyo susukatin ang mga sumusunod na aspeto mula 1 “Talagang hindi mabuti” hanggang 5 “Talagang mabuti”? Sa inyong pagsagot, mangyari po lamang na isantabi ang inyong personal na pakikitungo sa health kadet. [NON-USERS OF KDCI KADET SERVICES]: Batay po sa inyong mga narinig na karanasan ng iba sa inyong health kadet, paano po ninyo susukatin ang mga sumusunod na aspeto mula 1 “Talagang hindi mabuti” hanggang 5 “Talagang mabuti”? Sa inyong pagsagot, mangyari po lamang na isantabi ang inyong personal na pakikitungo sa health kadet. [SHOW SHEET 2 – SCALE A] [USERS OF KDCI KADET SERVICES]: <i>Thinking about your experiences with the KDCI health kadet, how would you rate the following aspects on a scale from 1 “Very bad” to 5 “Very good”? Please rate the aspects independent of the personal relationship you might have with her.</i> [NON-USERS OF KDCI KADET SERVICES]: <i>From what you have heard about the KDCI health kadet how would you rate the following aspects on a scale from 1 “Very bad” to 5 “Very good”? Please rate the aspects independent of the personal relationship you might have with her.</i>						
		Talagang hindi mabuti Very bad	Hindi mabuti Bad	Tama lang Fair	Mabuti Good	Talagang mabuti Very good	Walang sagot/ Hindi alam no reply/ don't know
[K8.1]	Dali ng pagpunta sa tirahan ng health kadet <i>Reachability and accessibility of the kadet's house</i>	1	2	3	4	5	-77
[K8.2]	Mga paliwanag na ibinibigay ng health kadet <i>Explanations provided by the kadet</i>	1	2	3	4	5	-77
[K8.3]	Pagtugon ng kadet sa inyong mga iniindang sakit <i>Responsiveness of the kadet to your problems</i>	1	2	3	4	5	-77
[K8.4]	Medikal na abilidad (pagkamasusi, pagkamaingat, kagalingan) ng kadet tungkol sa kalusugan. <i>Medical skills (thoroughness, carefulness, competence) of the kadet.</i>	1	2	3	4	5	-77
[K8.5]	Oras na inilaan ng kadet sa pakikitungo sa inyo tungkol sa kalusugan <i>Time taken by the kadet for your treatment</i>	1	2	3	4	5	-77
[K8.6]	Personal na pakikitungo (pagiging magalang, sensitibo, magiliw) ng kadet <i>The personal manner (courtesy, respect, sensitivity, friendliness) of the kadet</i>	1	2	3	4	5	-77

K9	Kung magkakaroon po kayo ng problema sa kalusugan, hihingi po ba kayo [ng muli] ng payo mula sa inyong health kadet? <i>Would you ask the health kadet for advice or help [again] if you experience a health problem?</i>				
	1	Hindi	No	2	Oo Yes

K10	Ang inyong health kadet po ba ay... Has the health kadet ever...				
[K10.1]	Naghihikayat sa inyong magpa-health dev lab tests? <i>Encouraged you to take a health dev lab tests?</i>			1	Hindi No 2 Oo Yes
[K10.2]	Nagbabahagi ng impormasyon sa inyo tungkol sa kaniyang mga napag-aralan sa KKK training? <i>Shared information with you about some contents of her health kadet training?</i>			1	Hindi No 2 Oo Yes
[K10.3]	Nakikipagusap sa inyo tungkol sa inyong kalusugan at kung paano mapapabuti ito? <i>Talked to you about your health and ways to improve it?</i>			1	Hindi No 2 Oo Yes

K11	Paano po ninyo susukatin ang pagiging masigasig ng inyong health kadet sa pagtupad sa kaniyang mga tungkulin? [READ ANSWERS] <i>How motivated (enthusiastic) do you think the health kadet is in pursuing her health kadet function? [READ ANSWERS]</i>				
	Lubos na masigasig <i>Very motivated</i>	Masigasig <i>Motivated</i>	Medyo masigasig <i>Little motivated</i>	Hindi masigasig <i>Not at all motivated</i>	Hindi alam <i>Don't know</i>
	1	2	3	4	-77

K12	[SHOW SHEET 13 –SCALE H] Sa tingin po ninyo, gaano po kakontento/nasisiyahan ang ibang mga miyembro ng sentro sa serbisyo ng inyong health kadet? [SHOW SHEET 13 –SCALE H] <i>What do you think, how satisfied are the other center members with the kadet's services</i>				
	Hindi Kontento <i>Not at all satisfied</i> Lubos na kontento <i>Completely satisfied</i>				

K13	Isipin ang inyong personal na pakikitungo sa inyong health kadet. <i>I would now like you to think of your personal relationship to the health kadet.</i>				
	Ilang taon niyo na pong kakilala ang health kadet? (taon = 0 kung bababa sa 1 taon) <i>For how many years have you known the health kadet?</i>				Taon Years

K14	[SHOW SHEET 5 – SCALE C] Gaano po ninyo sasang-ayunan ang mga sumusunod na pahayag tungkol sa kadet sa panukat na 1 hanggang 5? [SHOW SHEET 5 – SCALE C] <i>How strongly do you agree with the following statements about the health kadet on a scale from 1 (strongly disagree) to 5 (strongly agree)?</i>				
[K14.1]	Marami kayong alam na personal tungkol sa inyong kadet. <i>You know a lot about your kadet and her private issues</i>			1	2 3 4 5
[K14.2]	Sa tingin niyo mas may alam ang inyong kadet sa kalusugan kumpara sa inyo. <i>You think your kadet knows more about health than you do.</i>			1	2 3 4 5
[K14.3]	Ayos lang sa inyong pag-usapan ang maseselang usapin kasama ang inyong kadet. <i>You do not mind discussing very private, intimate topics with your kadet (e.g issues in relationship)</i>			1	2 3 4 5
[K14.4]	Buo ang tiwala niyo sa inyong kadet. <i>You fully trust your kadet</i>			1	2 3 4 5
[K14.5]	Handa po kayong pautangin ang taong ito ng malaking pera, PHP 5000 halimbawa <i>You would lend this person a high amount of money, PHP 5000</i>			1	2 3 4 5
[K14.6]	Pinagdududahan niyo ang kakayahan ng inyong kadet. <i>You have some doubts about the ability of the kadet</i>			1	2 3 4 5
[K14.7]	Kung kayo ang masusunod, mas gugustuhin niyong humingi ng tulong sa isang health professional. <i>If you had the choice you would rather seek help from a proper health professional</i>			1	2 3 4 5

[RETURN TO MAIN QUESTIONNAIRE]

EXTRA QUESTIONNAIRE: NEWCOMERS

C1	Pakisulat ang mga sumusunod na impormasyon: <i>Please note the following information:</i>			
	----- Respondent ID [C1.1]	----- Interview Date [C4.2]	----- Current time [C4.3]	----- Interviewer ID [C4.4]
C2	Saan po kayo ipinanganak? Pakibanggit po ang munisipyo/lungsod/probinsiya at bansa kung sa labas ng Pilipinas <i>Where were you born? Please name city and country (if outside of the Philippines).</i>			
	[C2.1]	Munisipyo o Lungsod City	[C2.2]	Bansa Country
C3	Ilan pong anak ang ipinanganak niyong buhay? [LIVE BIRTH ONLY] <i>How many children did you give birth to in your life? [LIVE BIRTH ONLY]</i>			
		Anak Children		
C4	Mayroon po ba kayong anak na pumanaw bago umabot ng 18 taong gulang? <i>Did any of your children die before the age of 18?</i>			
	1. Hindi	No	2. Oo	Yes
	Kung OO, ilan sila? <i>If YES, how many of your children?</i>			Anak [C4.2] Children
C5	Anong edad po kayo nagsimulang kumita para suportahan ang sarili at/o pamilya? <i>At what age did you start working for money for the first time to support yourself and/or your family?</i>			
	Mula sa edad na			
	At the age of			
C6	Ano po ang inyong hanapbuhay? Pakipaliwanag ang inyong pangunahing gawain. <i>What is your main job activity? USE SEPARATE SECTIONS IF YOU HAVE MULTIPLE JOBS.</i>			
C7	Ikaw po ba ay nakapag-aral o nakatuntong sa paaralan? <i>Did you ever visit a school or receive any formal education?</i>			
	1. Hindi	No	2. Oo	Yes
	[IF HINDI/NO GO TO Q C10]			
C8	Ano pong pinakamataas na antas ng pag-aaral ang inyong narating? <i>What is your highest level of education?</i>			
	1.	Visited primary school (1 st -5 th grade)	2.	Primary school completed (6 th grade)
	3.	Lower secondary education (1 st or 2 nd year of high school)	4.	Upper secondary education (3 rd or 4 th year of high school)
	5.	Post-secondary education (technical or vocational) not at college/university	6.	Visited college (university education not completed)
	7.	Bachelor degree (lower college)	8.	Master or doctoral degree (upper college)
C9	Ilang taon po kayo nag-aral, kasama ang high school at kolehiyo? Huwag po isama ang taon na inulit. <i>How many years of schooling, including higher education have you completed? Please do not count the years in which you had to repeat a grade.</i>			
	In total		taon	years
C10	May mga babasahin po akong mga salita at tandaan niyo po ang mga ito. Pakinggan pong mabuti kasi hindi ko na po uulitin ang mga salita. Pagkatapos, itutuloy ko po ang pagtatanong. Mamaya, ipapaulit ko po sa inyo sa kahit anong ayos ang mga salitang nabanggit ko. [READ OUT THE ENTIRE LIST OF WORDS SLOWLY AND CLEARLY] Bus...Bahay... Silya... Saging... Araw...Ibon... Palda...Bigas...Unggoy...Pusa <i>Now, I am going to read a list of words and I want you to recall it. Please listen carefully as the set of words will not be repeated. When I have finished, I will continue with other questions. Afterwards I will ask you to recall aloud as many of the words as you can, in any order. [READ OUT THE ENTIRE LIST OF WORDS SLOWLY AND CLEARLY]</i> Bus...House...Chair...Banana...Sun...Bird...Skirt...Rice...Monkey...Cat			

C11	Ano pong natapos o naabot na edukasyon ng inyong ina? [USE FEMALE CARETAKER IF MOTHER NOT KNOWN] <i>What is / was the highest level of education of your mother? [USE FEMALE CARETAKER IF MOTHER NOT KNOWN]</i>	
	1. No formal education	2. Visited primary school (1 st -5 th grade)
	3. Primary school completed (6 th grade)	4. Lower secondary education (1 st or 2 nd year of high school)
	5. Upper secondary education (3 rd or 4 th year of high school)	6. Post-secondary education (technical or vocational) not a college/university
	7. Visited college (university education not completed)	8. Bachelor degree (lower college)
	9. Master or doctoral degree (upper college)	-77 Don't know

C12	Ano pong natapos o naabot na edukasyon ng inyong ama? [USE MALE CARETAKER IF FATHER NOT KNOWN] <i>What is / was the highest level of education of your father? [USE MALE CARETAKER IF FATHER NOT KNOWN]</i>	
	1. No formal education	2. Visited primary school (1 st -5 th grade)
	3. Primary school completed (6 th grade)	4. Lower secondary education (1 st or 2 nd year of high school)
	5. Upper secondary education (3 rd or 4 th year of high school)	6. Post-secondary education (technical or vocational) not a college/university
	7. Visited college (university education not completed)	8. Bachelor degree (lower college)
	9. Master or doctoral degree (upper college)	-77 Don't know

C13	Marunong po bang bumasa at sumulat ang mga magulang niyo? <i>Are / were your parents able to read and write?</i>			
	1. Hindi No	2. Oo, si nanay Yes, my mother	3. Oo, si tatay Yes, my father	4. Oo, pareho sila Yes, both of them

C14	Ngayon, alalahanin po ang mga salitang binasa ko sa inyo. Pakibanggit pong muli ang mga ito, kahit hindi sunod-sunod. [DO NOT READ ANSWERS] <i>Now please try to remember the words that I have read to you some moments ago. Please try to recall as many of the words as you can in any order. [DO NOT READ ANSWERS]</i>			
	[C14.1] 1. Bus Bus	[C14.2] 1. Bahay House		
	[C14.3] 1. Silya Chair	[C14.4] 1. Saging Banana		
	[C14.5] 1. Araw Sun	[C14.6] 1. Ibon Bird		
	[C14.7] 1. Palda Skirt	[C14.8] 1. Bigas Rice		
	[C14.9] 1. Unggoy Monkey	[C14.10] 1. Pusa Cat		

C15	[SHOW SHEET 16 – SCALE K] Paano niyo po susukatin ang inyong sarili mula 0 hanggang 10: Sa kabuuan, mahilig po ba kayong makipagsapalaran o hindi? [SHOW SHEET 16 – SCALE K] <i>How do you see yourself on a scale from 1 to 11: Are you generally a person who likes to take risks or do you try to avoid taking risks?</i>	
	Hindi mahilig makipagsapalaran Very risk averse Mahilig makipagsapalaran Likes a lot to take risks	

[RETURN TO MAIN QUESTIONNAIRE]

Appendix E: Copyright Declaration

I declare that this dissertation was written by myself, unless otherwise stated in the text. All verbatim extracts have been distinguished by quotation marks, and all sources of information have been specifically acknowledged. None of the three chapters was used to obtain another university degree.

Hiermit erkläre ich, dass diese Dissertation von mir verfasst wurde. Alle wörtlichen Zitierungen wurden durch Anführungszeichen gekennzeichnet. Quellen, welche nicht wörtlich zitiert werden, sondern lediglich Ideen anderer Autoren widerspiegeln, wurden den in den Wirtschaftswissenschaften gängigen Zitierregeln gemäß kenntlich gemacht. Die drei Kapitel wurden nicht im Zusammenhang mit dem Erwerb eines anderen akademischen Abschlusses verwendet.

Appendix F: English Abstract for Thesis

In the world, substantial health inequalities both across social strata and geographical locations persist. Every year, several million people die from preventable or treatable causes with the poor in low- and middle-income countries being most severely affected. This dissertation studies the health situation of poor households in the Philippines and analyzes the potential impact of community health programs in achieving sustainable improvements. In the recent years, an increasing number of microfinance institutions (MFIs) got engaged in the development and implementation of integrated health programs in an attempt to extend health care to medically underserved populations. Yet, as of now, little is known about the impacts of such initiatives and the specific barriers faced by the implementing organization. This thesis focuses on the health program of the *Kasagana-Ka Development Inc.* (KDCI), a social development MFI, which provides essential health services and check-ups to its clients. As supportive element of the health program, KDCI has started to train *community health workers* (CHWs) from the client population who fulfill different tasks in their neighborhoods. In the first chapter of the thesis, the CHW program is evaluated using a cluster randomized controlled trial design. Besides evaluating the general impact of the initiative, I study the role of the health worker's competencies and motivation, her social networks, and the quality of the existing public health infrastructure in influencing program acceptance in the communities. The second chapter studies peer effects on the use of the check-ups offered by my partner organization. Using rich sociometric data, I employ a structural IV identification strategy to overcome the well-known challenges in the estimation of social interaction effects in non-experimental, cross-sectional settings. In addition, I study mechanisms that influence under which conditions peer effects are most likely to occur using retrospective information on the timing of the take-up. The final thesis chapter provides a test of the allocative efficiency hypothesis which offers a behavioral explanation for educational differences in health. According to this theory, the educated possess more health knowledge and information, allowing them to make better health choices. As an extension of previous studies, I construct a comprehensive index that captures different dimensions of health knowledge and employ a generalized propensity score matching approach to analyze the role of knowledge in explaining education effects on health lifestyle. The data for this thesis was collected in face-to-face-interviews in two survey waves in February 2014 (n=792) and April 2015 (n=1064). It provides useful lessons which are of high relevance not only for academic research, but also for development organizations and policy makers. Despite its geographical focus, the results of this thesis have more wide-reaching applicability and implications that go beyond the specific study context.

Appendix G: German Abstract for Thesis

Jedes Jahr sterben Millionen Menschen an vermeidbaren oder behandelbaren Krankheiten, wobei arme Bevölkerungsgruppen in Entwicklungsländern besonders stark betroffen sind. Diese Dissertation untersucht die Gesundheitssituation von armen Haushalten in den Philippinen und analysiert den möglichen Beitrag von Gesundheitsprogrammen zur Erzielung nachhaltiger Verbesserungen. In den vergangenen Jahren haben verstärkt Mikrofinanzorganisationen begonnen zusätzlich zu ihren finanziellen Angeboten Gesundheitsdienstleistungen anzubieten. Trotz dieses Trends gibt es bislang nur wenige Studien, die untersuchen, ob diese Initiativen erfolgreich sind und mit welchen Herausforderungen die Organisationen konfrontiert sind. Diese Dissertation beschäftigt sich mit dem Gesundheitsprogramm des *Kasagana-Ka Development Centers Inc.* (KDCI), einer nicht-kommerziellen Mikrofinanzorganisation, die in verschiedenen armen Stadtvierteln im Großraum der philippinischen Hauptstadt Manila tätig ist. Das Programm umfasst unterschiedliche präventive und kurative Maßnahmen, die nicht nur die lokale Gesundheitsinfrastruktur verbessern, sondern auch einen positiven Einfluss auf das Gesundheitsverhalten der KundInnen ausüben sollen. Eine unterstützende Programmkomponente, die in den kommenden Jahren stark erweitert werden soll, stellt die Ausbildung und Ausstattung von sogenannten *Community Health Workern* (CHW) dar. Bei diesen handelt es sich um respektierte BewohnerInnen der benachteiligten Viertel, die nach einer kurzen Ausbildung als Teil der lokalen Gemeinschaft Gesundheitsdienstleistungen anbieten und Erstunterstützung im Krankheitsfall leisten. Im ersten Kapitel der Dissertation wird das CHW-Programm mit Hilfe eines feldexperimentellen Forschungsdesigns evaluiert. Zusätzlich wird untersucht, welche Rolle die Motivation und Kompetenz der CHW, ihre sozialen Netzwerke in den Vierteln und die Qualität der vorhandenen Gesundheitsinfrastruktur für die Akzeptanz des Programms unter den armen ViertelbewohnerInnen spielt. Das zweite Kapitel der Dissertation analysiert Peer-Effekte und den Einfluss von sozialen Netzwerken auf die Nutzung von medizinischen Routineuntersuchungen, die im Rahmen des Gesundheitsprogramms meiner Partnerorganisation angeboten werden. Zur Vermeidung von statistischen Verzerrungen verwende ich Instrumentalvariablen, die die Schätzung von Netzwerkeffekten mit nicht-experimentellen Querschnittsdaten ermöglichen. Die Analyse basiert auf umfangreichen Netzwerkdaten, die die sozialen Strukturen der untersuchten Gemeinschaften widerspiegeln. Das letzte Kapitel der Dissertation überprüft schließlich den Einfluss von Bildung auf das Gesundheitsverhalten in den Vierteln und analysiert inwiefern Unterschiede im Gesundheitswissen Bildungseffekte erklären können. Für die Analyse wurde ein umfangreicher Wissensindex gebildet, der eine genaue Untersuchung des Einflusses des Gesundheitswissens auf das Verhalten ermöglicht. Die quantitativen Daten für diese Dissertation wurden in persönlichen Interviews mit den KDCI KundInnen im Februar 2014 (n=792) und April 2015 (n=1064) erhoben. Mit Hilfe innovativer Forschungsdesigns und -methoden leistet diese Arbeit einen wichtigen Beitrag zur aktuellen Entwicklungsforschung und -politik. Die erzielten Ergebnisse gehen über den Studienkontext hinaus und sind nicht nur von akademischen Interesse, sondern können auch als Grundlage zur Verbesserung von Gesundheitsmaßnahmen in Entwicklungsländern dienen.

Appendix H: English Abstracts for Single Chapters

Chapter 1: When Communities Participate in Primary Health Care: A Randomized Controlled Trial of a Community Health Worker Program in the Philippines

In many developing countries public health systems are confronted with a significant shortage in professional health workers, which is recognized as a major constraint to economic development and poverty reduction. Community Health Workers (CHWs) have been suggested as a cost-effective, inclusive solution to address the enduring shortage. In recent years, microfinance institutions (MFIs) have increasingly implemented small-scale health programs with CHW components. So far, little is known about the impacts and implementation barriers of these initiatives. In this paper we evaluate an MFI-led CHW program in the Philippines using a cluster-randomized controlled trial design. The intervention had a positive impact on the dissemination of specific information about the health program and health monitoring. However, there is no evidence for a positive effect on general knowledge and social support in the communities. Acceptance of the program in the communities is a key driver of program success. Apart from the CHW's motivation, her social networks in the neighborhoods and the existing alternative health infrastructure are the strongest determinants of program awareness and take-up by the community. Based on our results we discuss potential extensions and derive policy recommendations for community-based health programs in similar contexts.

Chapter 2: Following the Peers: The Role of Social Networks for Health Care Utilization in the Philippines

This paper studies peer effects on the use of essential health care services offered by a microfinance institution in impoverished neighborhoods in the Philippines. We apply a novel IV identification strategy to overcome the well-known challenges in the estimation of peer effects in non-experimental, cross-sectional settings. The strategy uses structural information from social networks and the existence of overlapping peer groups for an unbiased estimation. We find positive and substantial peer effects in the communities. An increase in program uptake of 10% in the peer group leads to a 6.6% increase in individual health care utilization. We estimate hazard models to further explore underlying mechanisms. Peer effects are found to be strongest immediately after first exposure to the intervention and to fade out over time. While the strength of the relationship with the peer does not seem to matter for the adoption decision, the peers' structural position in the network does. Interestingly, peers with fewer connections seem to have a particularly strong influence on individuals with a central position in the network.

Chapter 3: The Health Knowledge Mechanism: Evidence on the Link between Education and Health Lifestyle in the Philippines (joint work with S. Lutz)

Studies have found substantial differences in health-related behavior and health care usage between educational groups, which may explain part of the well-documented educational gradient in health. The allocative efficiency hypothesis offers a behavioral explanation for these reported differences. According to this theory, the educated possess more health knowledge and information, allowing them to make better health choices. We provide an empirical test of this mechanism using original survey data from the Philippines, a lower-middle-income country. As an extension of previous studies, we construct a comprehensive index that captures different dimensions of health knowledge. Applying a generalized propensity score matching approach, we find strong support for the allocative efficiency argument. Schooling significantly raises health knowledge levels and, through this channel, improves health lifestyle as an aggregate of different health behaviors. Overall, knowledge explains between 65% and 69% of the effect, which corresponds to twice the mediation strength of economic resources, suggesting an important role of this factor in explaining education effects on health decisions.

