Adoption of Mobile Money for Healthcare Utilisation and Spending in Rural Ghana

Chei Bukari
cheibukari1@gmail.com

Isaac Koomson
ikoomso2@une.edu.au / koomsonisaac@gmail.com

NETWORK FOR SOCIOECONOMIC RESEARCH AND ADVANCEMENT	**WORKING PAPER**
NESRA	**nesra/wp/20/002**

Adoption of Mobile Money for Healthcare Utilisation and Spending in Rural Ghana

Chei Bukari [1]
Department of Applied Economics, School of Economics
University of Cape Coast
Cape Coast, Ghana
E-mail: cheibukari1@gmail.com

Isaac Koomson
University of New England Business School
University of New England, Australia
Network for Socioeconomic Research and Advancement (NESRA)
Accra, Ghana
E-mail: ikoomso2@une.edu.au / koomsonisaac@gmail.com

Abstract

In this chapter, the authors discuss the potential link between mobile money adoption and health outcomes, which has not received much attention in the existing literature. They empirically examine the effects of mobile money adoption on healthcare utilisation and spending of rural households in Ghana. Using data from the Ghana Living Standards Survey, the authors show that mobile money adoption enhances rural households' healthcare utilisation, a finding which is more pronounced in the case of female-headed households. The authors demonstrate that this finding is due to the positive association between mobile money use and the ability of rural households to spend on healthcare.

Key Words: Mobile money, healthcare utilisation, healthcare expenditure, rural, Ghana

---

[1] Corresponding author: cheibukari1@gmail.com

1.1 Introduction

Healthcare utilisation and spending are lower among rural households. This is largely due to the high costs associated with health expenditure and also because rural households are poorer and face higher levels of financial exclusion (Attia-Konan, Oga, Touré, & Kouadio, 2019; Demirgüç-Kunt, Klapper, Singer, Ansar, & Hess, 2018; Koomson, Annim, & Peprah, 2016; Kumar et al., 2011; Singh et al., 2018). Studies have also shown that the effects of lower health spending are more severe for rural, female-headed and uninsured households (Dhak, 2015; Mohanty et al., 2017).

Financial inclusion remains an avenue for households to obtain funds to spend on healthcare but despite the reported improvement in financial inclusion globally, limited progress has been made in various areas across developing countries (Demirgüç-Kunt et al., 2018; Koomson, Villano, & Hadley, 2020a). For instance, there is a rural-urban gap in financial inclusion, while the gender gap in financial inclusion could be narrower (Koomson, Villano, & Hadley, 2020b). Mobile money is argued to present an opportunity to reduce the gap for rural households and for women who have lower access to formal financial services (Demirgüç-Kunt et al., 2018; Donovan, 2012). Mobile-based financial services are quickly closing the financial inclusion gap with a billion of the unbanked now having access to a mobile phone (Pénicaud & Katakam, 2019). With the progress in financial inclusion largely attributed to the surge in mobile money activities (Demirgüç-Kunt et al., 2018), the adoption of mobile money accounts by rural households is expected to enhance their healthcare utilisation and spending.

Although some of the United Nations' Sustainable Development Goals (SDGs) have health-related targets, one goal, SDG 3, focuses specifically on ensuring healthy lives and promoting well-being for all at all ages. Specifically, target 3.8 of SDG 3 – achieving universal health coverage (UHC), including financial risk protection, access to quality essential healthcare services, and access to safe, effective, quality and affordable essential medicines and vaccines for all – is the key to attaining the entire goal as well as the health-related targets of other SDGs (World Health Organization, 2017; World Bank, 2017). Target 3.8 has two indicators – 3.8.1 on access to essential health services and 3.8.2 on the proportion of a country's population with catastrophic spending on health, defined as large household expenditure on health as a share of household total consumption or income. To obtain a clearer picture of those who are constrained in their spending and access to healthcare, it is important to simultaneously examine both healthcare utilisation and spending in a single study.

Unlike, the Millennium Development Goals, the SDGs are emphatic about the role of financial services in achieving these goals. This gives credence to financial services as a powerful tool for promoting empowerment, security, opportunity and equity which accelerate households' access to good health (Asongu, 2013, 2015; Prokopenko & Holden, 2001). Of great concern is the global evidence of 2.5 billion people who are "unbanked" and lack access to formal financial services

(Haas, Heymann, Riley, & Taddese, 2013; 2015). As a potential panacea to financial exclusion, mobile financial services now cover more than 60 percent of developing markets, reaching an estimated 299 million registered mobile money users, of which 103 million are estimated to be active (Pénicaud & Katakam, 2019). The value of total mobile money transactions grew by 21 percent from $26 billion in December 2016 to over $31.5 billion in December 2017. The percentage of providers who offer mobile money through a smartphone app has also increased from 56 percent in 2015 to 73 percent as of June 2017 (GSMA, 2017). Thus, there are now about 255 mobile money service platforms across 89 countries including Ghana and this has heightened competition in the financial markets leading to a corresponding piqued interest from a growing number of mobile network operators (MNOs). Along gender and location dimensions, "rural and female customers remain two of the hardest to reach groups and thus two of the most untapped commercial opportunities for mobile money providers" (GSMA, 2017, p.12).

This chapter examines the effect of mobile money account adoption on healthcare utilisation and spending in rural households. The differential effect of the expected outcome is also investigated for male- and female-headed households using sub-samples. The sub-sample analysis aligns with the aim of the SDG that seeks to "leave no one behind" and thus, advocates for indicators to be disaggregated by income, sex, age, race, ethnicity, disability, location and migratory status, wherever data allow (World Health Organization, 2016). The chapter expands the knowledge base on the link between mobile money and healthcare utilisation and spending, while establishing the gender and location-specific effect of mobile money adoption to engender evidence-based policy debates.

The remaining sections of this chapter are structured as follows: section 2 reviews the literature on mobile phone penetration, mobile money adoption and healthcare utilisation and spending. The methodology, discussed in section 3, includes data source, measurement of key variables and estimation technique. The analysis and discussion are presented in section 4. Section 5 concludes with some policy recommendations.

2.1 Literature Review
2.2 Mobile Phone Penetration
Mobile phone usage is undoubtedly one of the fastest-spreading technological innovations of the 21st century. From 2000-2018, mobile phone subscriptions increased by more than 1,500 percent in low- and middle-income countries—from 4 to 72 subscriptions per 100 inhabitants. This notwithstanding, there is a 10 percent gender gap in the ownership of mobile phones (Burjorjee & Bin-Humam, 2018). In sub-Saharan Africa (SSA), there is a 14 percent and 38 percent gender gap in the ownership and use of mobile phones, respectively, with women having the lower percentage share (Burjorjee & Bin-Humam, 2018; Rowntree, 2018). As access to mobile phones multiplies in developing markets, money transfer systems based on mobile money are being leveraged to tackle development challenges across many different sectors, including agriculture,

education, finance, and most importantly, health (Pénicaud & Katakam, 2019). Mobile money consists of financial transactions that are conducted using a mobile phone, where value is stored virtually (e-money) in an account associated with a SIM card. Individuals can deposit cash onto a mobile account, make transactions between accounts, and withdraw funds as cash. Mobile money transactions are compatible with basic phones and do not require internet access (Pénicaud & Katakam, 2019).

Like mobile phone ownership, mobile money is growing rapidly as a substitute for cash in both developed and developing countries (Flood, West, & Wheadon, 2013). More than 70 countries have implemented mobile money platforms as alternatives to traditional cash payment systems or formal financial services, the majority of which are located in sub-Saharan Africa. These systems enable funds to be deposited, transferred, and withdrawn electronically through mobile money accounts, bringing financial services to the previously underbanked (Demirguc-Kunt, Klapper, Singer, Ansar, & Hess, 2018; Kendall, Schiff, & Smadja, 2013; Rowntree, 2018)

2.3 Mobile Money Adoption and Healthcare

Notwithstanding the recent proliferation of mobile phone usage and uptake of mobile money in emerging markets, its use in the health sector remains limited and often, has not been brought to scale (Pénicaud & Katakam, 2019). While mobile money can provide a means for improving efficiency by enabling households to easily pay for healthcare fees and health insurance premiums, receive monies at low transaction cost from family, friends and co-workers to meet their health emergency needs, its adoption has been low (Haas et al., 2013). This notwithstanding, evidence from the literature depicts a bigger focus on diffusion of mobile money from the supply-side rather than household and individual adoptions (Baliamoune-Lutz, 2003; Donner, 2008; Donner & Tellez, 2008; Kshetri & Cheung, 2002).

Regarding households, mobile money is often the means of payment for services at health facilities, drugs at pharmacies, health service vouchers and insurance premiums where available, and for transport to access treatment (Asongu, 2013, 2015; Haas et al., 2013; Ky, Rugemintwari, & Sauviat, 2017; Suri, Jack, & Stoker, 2012). In response, regulators are now establishing more enabling regulatory framework for the provision of these mobile money services. Several countries including Colombia, India, Kenya and Liberia have undergone financial reforms in that regard. For instance, recently, in 47 out of 89 markets where mobile money is available, regulation allows both banks and non-banks to provide mobile money services in a sustainable way (Pénicaud & Katakam, 2019). Recognizing the potential of mobile-based financial services in bridging the financial inclusion gap and promoting good health and well-being, the SDGs are committed to accelerating the adoption and uptake of mobile money. This is due to its potential to increase financial inclusion, root out corruption, mitigate financial risk, and provide economic benefits to individuals and households (GSMA, 2014, 2017, 2018; Kendall et al., 2013; Mitręga-Niestrój, Puszer, & Szewczyk, 2018; Rowntree, 2018).

Mobile-based service providers are now expanding into neighbouring markets for mobile financial services by leveraging their strengths in mobile money to provide mobile insurance, mobile savings and mobile credit to customers who were previously financially excluded. To these unbanked, mobile money provides their financial service needs and empowers them to easily pay for services at health facilities, drugs at pharmacies, transportation and insurance premiums (Ahmed & Cowan, 2019; Haas et al., 2013; Ky et al., 2017). On another note, mobile money does not only allow one to easily pay for healthcare costs but also facilitates receipt of financial support from family, co-workers and friends at low transaction costs and risks in cases of health emergencies (Asongu, 2013, 2015; Haas et al., 2015). Beyond these benefits, mobile technologies are increasingly being used to enhance access to insurance, credit products and savings facilities to the underserved. This results in the deepening of the social and economic impact of mobile money in their lives (GSMA, 2014, 2017, 2018; Kendall et al., 2013). Mobile money adoption is similarly narrowing the rural-urban gap owing to its rapid increase in rural penetration and digitisation along agricultural value chains. About 15 percent of rural farmers receive cash payments from the sale of agricultural products and mobile money has reduced the risks, inefficiencies and inconveniencies in these payments. Classical examples are Ghana, Kenya and Zambia where the share of farmers receiving cash payments is twice the average for developing economies and where about 40 percent receive these payment into majority mobile money registered accounts (Demirguc-Kunt et al., 2018).

3.1 Methodology
3.2 Data
The chapter uses data from the seventh round of the Ghana Living Standards Survey (GLSS 7). The GLSS 7 is a nationally representative survey conducted by the Ghana Statistical Service from October 2016 to October 2017, with a two-stage stratified sampling method. In the first stage, 1,200 Enumeration Areas (EAs) were selected from the 10 regions in Ghana, using probability proportional to the population sizes. The second stage involved the selection of the 18,000 households from the 1,200 EAs. However, 14,009 households were completely interviewed. Table 1 shows the distribution of sample by location and gender of the household head. Out of the total number of households interviewed, 6,018 and 7,991 are from urban and rural areas, respectively. Also, 68.83 percent of these households (9,643) were headed by men with the remaining heads being women (GSS, 2018). In line with the focus of this chapter, the 7,991 rural households form the target sample for this study.

Table 1: Sample Composition of GLSS 7

	Total	Male	Female	Rural	Urban
Number of EAs	1,200	-	-	655	545
Number of Households	14,009	9,643	4,366	7,991	6,018

For number of households, male and female refer to male-headed and female-headed households

The GLSS 7 used five main questionnaires namely household; non-farm household; governance, peace and security; prices of food and non-food items; and community. In this chapter, we use responses from the household questionnaire, which solicits information on demographic characteristics; education and skills training; health and fertility behaviour; employment and time use of respondents; among others (GSS, 2018). The GLSS 7 also contains a section on households' access to financial services such as mobile money, credit, microinsurance, savings and remittance, as well as their use of financial services. This makes the GLSS 7 an ideal dataset for this Chapter.

3.3 Measurement of Healthcare Utilisation

Consistent with the literature, we measured healthcare utilisation as the number of household members that consulted a health practitioner or visited a health facility within the past 2 weeks before the survey (Arcury, Preisser, Gesler, & Powers, 2005; Carrasquillo, 2013). According to Carrasquillo (2013), healthcare utilisation refers to the use of healthcare services and can be measured as the number of health services used over a period of time divided by a population denominator (e.g. per 1000 persons). It can also be defined as the percentage of persons who use a certain service over individuals eligible for that service in a period of time (e.g. in the last 3 years) or an aggregate number without a denomination (Carrasquillo, 2013). Arcury et al. (2005) measured healthcare utilisation as combined visits to practitioners and facilities, separately determined for chronic care and regular check-up care visits in the year prior to the interview. Evidence from the GLSS survey shows that the proportion of injured/ill who utilised healthcare had declined between 2012/13 and 2016/17, and this was more pronounced in the rural areas (GSS, 2018).

3.4 Health Spending

Health spending is measured as the total health expenditure of the household, which mainly covers expenses on medical products/appliances; outpatient services; and hospital services. These dimensions have formed the core of total healthcare expenditure assessment in the GLSS (GSS, 2014).

3.3 Empirical Model Specification and Estimation Technique

The extant literature holds that, rural households' healthcare utilisation and spending are influenced by household characteristics, including adoption of mobile money accounts, household size and location; age and educational level of household head among other factors (Adaba, Ayoung, & Abbott, 2019; Azzani, Roslani, & Su, 2019; Mojumdar, 2018; Mothobi & Grzybowski, 2017).

The empirical model to be estimated is specified as;

$$Y_i = \alpha + \beta Z_i + \gamma X_i + \varepsilon_i \tag{1}$$

Where Y_i is healthcare utilisation or spending by household i. Healthcare utilisation is a count of the number of household members that consulted a health practitioner or visited a health facility while health spending captures total household health expenditure. Z refers to the ownership of mobile money account, defined as a binary variable which is 1 if a household head adopts mobile money account and 0 otherwise. X is a vector of household characteristics that affect household healthcare utilisation and spending including the age, employment status, education and marital status of the household head, as well as the size of the household. α, β and γ are parameters to be estimated while ε_i is a random error term. Appendix 1 presents definitions and measurement of these variables while appendix 2 gives their descriptive statistics.

A key methodological issue addressed in this chapter is the potential endogeneity of mobile money adoption (Abor, Amidu, & Issahaku, 2018; Munyegera & Matsumoto, 2016). Endogeneity is likely to arise for a number of reasons and, in this chapter, it is likely to emanate from reverse causality. For instance, households may adopt mobile money when they expect to electronically pay National Health Insurance Scheme (NHIS) premiums as is often the case in Ghana where households now renew their NHIS cards through mobile money. In this case, it is the nature of healthcare utilisation or spending that is driving mobile money adoption. On the other hand, adoption of mobile money accounts enable households to easily save and pay for healthcare costs; and receive (send) mobile money support from (to) families, co-workers and friends at low transaction cost and risk in cases of health emergencies (Asongu, 2013, 2015; Haas et al., 2015). Measurement errors and omitted variable bias are also likely. To address this potential endogeneity, we use distance to a mobile network (Abor et al., 2018) and mobile phone penetration as instruments (Aker & Mbiti, 2010) in a two-stage least squares (2SLS) estimation. We assumed that distance to a mobile network directly affects the ownership of a mobile phone, and thus adoption of mobile money by the household, but not the household's healthcare utilisation. On the other hand, we assume that mobile penetration will positively influence the ownership and adoption of mobile money by the household but not the household's healthcare utilisation. We expect that the only channels through which distance to a mobile network or mobile phone penetration will influence healthcare utilisation or spending is mobile money.

4.1 Analysis and Discussion

Figure 1 depicts the association between adoption of mobile money and payment of National Health Insurance Scheme (NHIS) Premiums. In general, the chi-square test indicates a stastistically significant association between mobile money adoption and payment of NHIS premiums (alpha level of 5 percent). We see that both adopters and non-adopters of mobile money possess some level of capacity to pay for NHIS premiums but the proportion of adopters who have paid are about 17 percent more than non-adopters. The implication is that owning a mobile money account enables the household to honour NHIS premium payments.
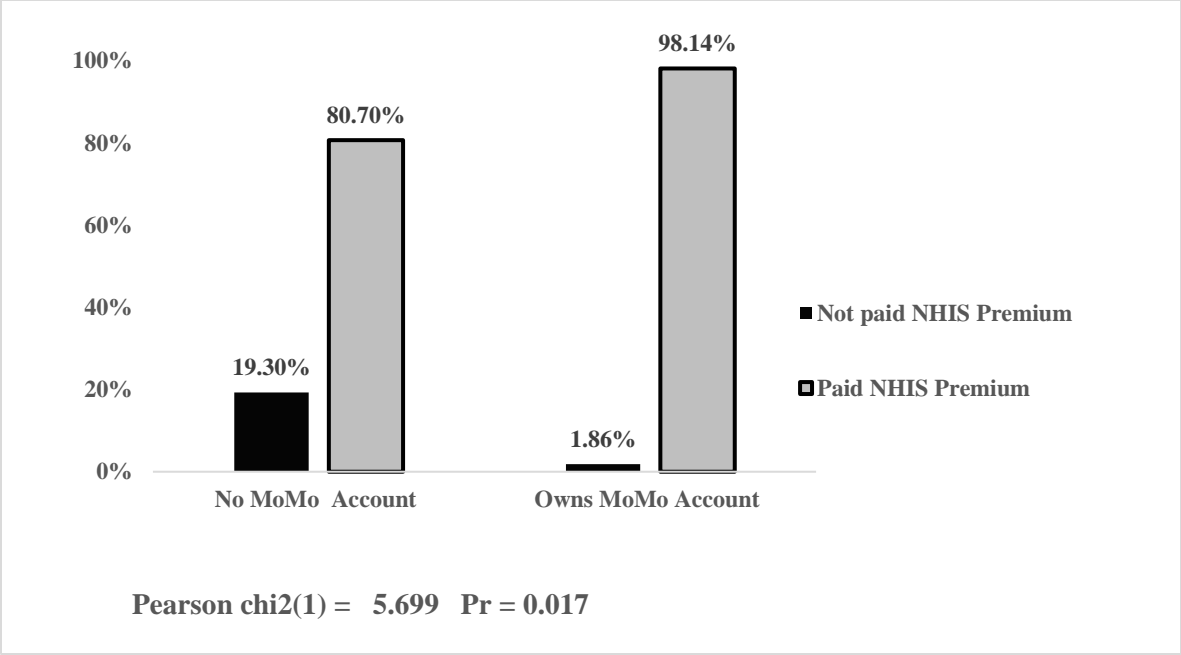
Figure 1: Chi-Square analsis of Mobile Money Accout Ownership and NHIS Premiums
MoMo: Mobile money

The estimated link between adoption of mobile money and healthcare utilisation is presented in Table 2. Both ordinary least squares (OLS) and 2SLS estimates are presented but emphasis is placed on the 2SLS estimates. This is due to the endogenous nature of mobile money adoption (see results of Hausman test under the last five rows of Tables 2 and 3). The OLS estimates indicate that households that adopt mobile money are 9.6 percentage points more likely to utilise healthcare. The first stage results also show that distance to a mobile network and mobile phone penetration are strong drivers of mobile money adoption. While distance to a mobile network negatively affects the use of mobile money, mobile phone penetration promotes mobile money adoption. This finding is consistent with the existing literature (Abor et al., 2018; Aker & Mbiti, 2010; Munyegera & Matsumoto, 2016). The Cragg-Donald Wald F statistics displayed in Table 2 are significant at the 5 percent level and imply that our instruments satisfy the relevance condition of not being weakly correlated with mobile money adoption (Stock & Yogo, 2005). The 2SLS results suggest that the endogeneity of mobile money adoption results in a downward bias in the OLS estimates because the 2SLS estimates are relatively bigger than the OLS estimates. In specific terms, households that adopt mobile money are 31 percentage points more likely to utilise healthcare. In male-headed households, adopters of mobile money accounts are about 29 percentage points more likely to utilize healthcare while this outcome is 62 percentage points in rural-headed households. Some potential explanation offered in the literature indicate that, adoption of mobile money accounts enables households to save and also receive remittance from relatives to be channelled into investments in healthcare (Haas et al., 2013; 2015; Ky et al., 2017). Unlike formal financial services, mobile money accounts are less biased against women so it gives

females greater access to finance to take advantage of economic opportunities, which go a long way to increase their incomes, and, consequently, healthcare utilisation. It can also be related to how adoption of mobile money expedites the receipts of monies from family members, friends, workmates or other acquaintances to help with health emergencies.

Apart from mobile money adoption, owners of NHIS policies are 44 percentage points more likely to utilize healthcare and this outcome is more pronounced in female-headed households that experience a 16.5 percentage-points higher likelihood. The implication is that, the effect of NHIS on healthcare utilisation is more positive among females then males. Household heads who expect to benefit from NHIS are 6.8 percentage points more likely to utilise healthcare and this outcome is about 5.5 percentage points higher among female- than male-headed households. Male-headed households' healthcare utilisation is 12.8 percentage points lower than that of female-headed households, which, in other words, implies that female-headed households utilise healthcare more, compared to male-headed ones. Other control variables like marital status and educational level of the household head have significant association with household healthcare utilisation.

Table 2: Effect Mobile Money Adoption on Healthcare Utilisation

	Full		Male		Female	
Healthcare utilisation	OLS	2SLS	OLS	2SLS	OLS	2SLS
Adoption of mobile money account	0.096*	0.310***	0.106	0.289***	0.057	0.620**
	(0.058)	(0.367)	(0.074)	(0.412)	(0.094)	(0.705)
NHIS	0.266***	0.441***	0.301***	0.338***	0.224**	0.503***
	(0.057)	(0.075)	(0.076)	(0.100)	(0.089)	(0.111)
Expected Benefits from NHIS	0.131**	0.068***	0.126***	0.024**	0.050*	0.079***
	(0.057)	(0.020)	(0.022)	(0.015)	(0.030)	(0.028)
Male	0.106***	-0.128**				
	(0.016)	(0.188)				
Household size	0.011	0.111**	0.036***	0.142*	0.034**	0.023**
	(0.009)	(0.055)	(0.011)	(0.102)	(0.015)	(0.037)
Marital status (base=never married)						
Married	0.143**	0.156**	0.027	0.143**	0.325**	0.240**
	(0.085)	(0.010)	(0.111)	(0.137)	(0.135)	(0.156)
Consensual	-0.176*	0.040	-0.224	0.139	-0.114	-0.079
	(0.102)	(0.127)	(0.138)	(0.181)	(0.156)	(0.175)
Separated	0.067	0.182	-0.037	0.180	0.224	0.186
	(0.120)	(0.143)	(0.215)	(0.267)	(0.154)	(0.175)
Divorced	-0.099	0.195	0.051	0.578*	-0.005	0.099
	(0.116)	(0.147)	(0.245)	(0.320)	(0.146)	(0.170)
Widowed	0.155	0.282**	-0.045	0.353	0.295**	0.255*
	(0.099)	(0.119)	(0.184)	(0.237)	(0.134)	(0.153)
Education (base=no education)						
BECE	-0.220***	-0.201**	-0.286***	-0.167	-0.123	-0.219*
	(0.072)	(0.084)	(0.094)	(0.117)	(0.111)	(0.131)
MSLC	-0.325***	-0.166**	-0.401***	-0.141	-0.149	-0.138
	(0.060)	(0.077)	(0.076)	(0.105)	(0.103)	(0.116)
SSS/Secondary	0.007	-0.089	-0.040	-0.075	0.030	-0.173
	(0.093)	(0.111)	(0.108)	(0.132)	(0.199)	(0.241)
Voc/Tech/Teacher	0.128	0.154	0.061	0.191	0.243	0.101

Table 2. (Continued)

	(0.101)	(0.119)	(0.124)	(0.153)	(0.180)	(0.210)
Tertiary	-0.160**	-0.251**	-0.275*	-0.238***	0.562	-0.032***
	(0.135)	(0.161)	(0.151)	(0.184)	(0.408)	(0.524)
Employment (base=public employee)						
Private Employee	0.007	0.109	-0.028	0.117	0.076	0.095
	(0.111)	(0.133)	(0.132)	(0.163)	(0.219)	(0.245)
Self-employed (non-agriculture)	0.001	-0.074	0.048	-0.031	-0.012	-0.141
	(0.109)	(0.129)	(0.144)	(0.176)	(0.194)	(0.224)
Self-employed (agriculture)	-0.039	0.042	-0.053	0.086	-0.026	-0.061
	(0.104)	(0.123)	(0.124)	(0.153)	(0.197)	(0.221)
Unemployed	0.260**	0.157	0.320**	0.137	0.211	0.136
	(0.120)	(0.144)	(0.154)	(0.191)	(0.209)	(0.238)
Retired	-0.097	0.084	-0.049	0.096		
	(0.331)	(0.392)	(0.345)	(0.421)		
Constant	0.739***	0.158	0.938***	-0.001	0.669***	0.452
	(0.145)	(0.202)	(0.180)	(0.281)	(0.248)	(0.294)
First stage						
Distance to mobile network		-0.004**		-0.004**		-0.034**
		(0.002)		(0.002)		(0.002)
Mobile phone penetration		0.020**		0.107**		0.062**
		(0.106)		(0.100)		(0.073)
Observations	2,050	2,050	1,193	1,187	857	857
R-squared	0.079	-0.292	0.095	-0.372	0.069	-0.191
Hausman		7.40(0.000)		5.81(0.005)		10.1(0.015)
Under identification test		6.95(0.030)		4.71(0.040)		4.99(0.036)
Weak identification test (Cragg-Donald Wald F statistic)		36.96		13.450		21.975
Stock-Yogo weak ID test critical values: 10% maximal IV size		19.93		19.93		19.93
Sargan statistic (over identification test of all instruments)		3.40(0.065)		0.56(0.554)		9.88(0.170)

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 3 presents result on the effect of mobile money on health spending. Again, the OLS estimates show that households that adopt mobile money spend 68.5 percentage points more on healthcare while the first state regressions also indicate that the instruments are significant drivers of mobile money adoption. Since the Cragg-Donald Wald F statistics are all significant at the 10 percent level, we conclude that the instruments are not weakly correlated with mobile money adoption (Stock & Yogo, 2005). Unlike the case of healthcare utilisation, the 2SLS results reveal that the endogeneity of mobile money adoption results in an upward bias in the OLS estimates in the full model while it leads to a downward bias in the male and female subsample estimates. Generally, household heads who adopt mobile money spend 31.7 percentage points more on healthcare. Across male-headed households, adopters of mobile money accounts spend 61 percentage points more than non-adopters while in female-headed households, adopters spend 80.5 percentage points more. Adoption of mobile money enhances the capacity of households to spend more on utilisation of healthcare services in terms of visit to clinics, consultations and medical expenses compared to non-adopters of mobile money (Ahmed & Cowan, 2019).

Beyond mobile adoption, health expenses are 34.5 percentage points lower for households that have NHIS and this healthcare expenditure-reducing effect of having NHIS is about 47 percentage points higher in female- than male-headed households. This is an indication that, in terms of healthcare spending, female-headed households benefit more from NHIS than male-headed households. Relative to those that have never been married, health expenditure for married household heads is 19.7 percentage points higher and this outcome is more pronounced for married female heads. Household health expenses are 36.2 and 24.1 percentage points lower among heads who have obtained secondary and tertiary education respectively, compared to heads who have had no formal education. This means that, having access to formal education exposes the individual to healthy life styles leading to a significant reduction in health expenditures.

Table 3: Effect of Mobile Money Adoption on Household Total Health Expenditure

log(Health expenditure)	Full		Male		Female	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
Ownership of mobile money Account	0.685***	0.317***	0.465***	0.610**	0.104***	0.805***
	(0.073)	(0.998)	(0.090)	(1.314)	(0.124)	(1.465)
NHIS	-0.327***	-0.345***	-0.153*	-0.177*	-0.678***	-0.647***
	(0.065)	(0.081)	(0.080)	(0.101)	(0.112)	(0.131)
Expected Benefits from NHIS	0.011	0.014**	0.029	0.035**	-0.021	0.026***
	(0.019)	(0.021)	(0.023)	(0.027)	(0.031)	(0.033)
Male (ref=female)	0.018**	0.042**				
	(0.261)	(0.070)				
Household size	-0.007	-0.004***	-0.005	-0.000***		-0.017**
				(0.014)		(0.021)
	(0.001)	(0.011)	(0.011)			
Marital status (base=never married)						
Married	0.208**	0.197**	0.179	0.154**	0.252	0.242**
	(0.105)	(0.109)	(0.130)	(0.146)	(0.188)	(0.190)
Consensual	0.147	0.130	0.309*	0.273	-0.146	-0.146
	(0.138)	(0.146)	(0.175)	(0.199)	(0.229)	(0.230)
Separated	0.192	0.188	0.518**	0.499*	0.032	0.013
	(0.156)	(0.156)	(0.261)	(0.266)	(0.218)	(0.223)
Divorced	0.344**	0.311*	0.364	0.296	0.346*	0.378*
	(0.149)	(0.173)	(0.278)	(0.330)	(0.209)	(0.221)
Widowed	0.216*	0.196	0.195	0.151	0.215	0.227
	(0.119)	(0.130)	(0.214)	(0.243)	(0.186)	(0.189)
Education (base=no education)						
BECE	-0.076	-0.048	-0.081	-0.049	-0.073	-0.139
	(0.095)	(0.120)	(0.116)	(0.144)	(0.164)	(0.214)
MSLC	-0.032	-0.021	-0.031	-0.019	-0.112	-0.148
	(0.078)	(0.083)	(0.092)	(0.097)	(0.152)	(0.169)
SSS/Secondary	-0.397***	-0.362**	-0.412***	-0.367**	-0.298	-0.375**
	(0.116)	(0.150)	(0.128)	(0.174)	(0.281)	(0.325)
Voc/Tech/Teacher	-0.158	-0.138	-0.133	-0.113	-0.307	-0.382
	(0.128)	(0.139)	(0.148)	(0.157)	(0.254)	(0.299)
Tertiary	-0.288**	-0.241**	-0.344*	-0.291**	0.481	0.292**
	(0.176)	(0.218)	(0.189)	(0.233)	(0.529)	(0.661)
Employment (base=public employee)						
Private Employee	0.007	0.009	0.026	0.024	-0.117	-0.143
	(0.141)	(0.141)	(0.159)	(0.159)	(0.304)	(0.310)

Table 3. (Continued)						
Self-employed (non-agriculture)	-0.029	-0.006	-0.010	0.023	-0.173	-0.243
	(0.139)	(0.152)	(0.176)	(0.196)	(0.268)	(0.306)
Self-employed (agriculture)	0.068	0.063	0.127	0.112	-0.160	-0.188
	(0.129)	(0.130)	(0.147)	(0.153)	(0.268)	(0.276)
Unemployed	0.001	0.003	0.115	0.117	-0.250	-0.275
	(0.143)	(0.143)	(0.170)	(0.170)	(0.277)	(0.283)
Retired	0.647	0.634	0.705*	0.688		
	(0.413)	(0.414)	(0.415)	(0.419)		
Constant	0.555***	0.616**	0.364*	0.465	1.079***	1.021***
	(0.178)	(0.243)	(0.210)	(0.336)	(0.342)	(0.364)
First stage						
Distance to mobile network		-0.003***		-0.002**		-0.004**
		(0.001)		(0.001)		(0.002)
Mobile phone penetration		0.139***		0.139**		0.144**
		(0.043)		(0.054)		(0.070)
Observations	3,426	3,426	2,170	2,170	1,256	1,256
R-squared	0.439	0.434	0.418	0.409	0.491	0.478
Hausman		8.11(0.000)		5.41(0.030)		11.3(0.020)
Under identification test		18.28(0.000)		10.16(0.000)		9.03(0.010)
Weak identification test (Cragg-Donald Wald F statistic)		11.131		15.053		14.477
Stock-Yogo weak ID test critical values: 10% maximal IV size		19.93		19.93		19.93
Sargan statistic (over identification test of all instruments)		3.73(0.054)		7.84(0.576)		0.83(0.364)

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5.1 Conclusion and Recommendation

Despite an upsurge in the ownership of mobile phone and use of mobile money services in developing countries, its health benefits remain limited and has often not been scaled up. Adoption of mobile money can provide a means for improving efficiency by enabling households to easily pay for healthcare fees, NHIS premiums, and receive money with low transaction cost to meet their health needs. These benefits notwithstanding, mobile money providers identify rural households and female customers as the least beneficiaries (GSMA, 2017, p.12). Beyond these gaps, SDG 3 focuses specifically on ensuring healthy lives and promoting well-being for all at all ages through universal health coverage (UHC). This includes financial risk protection, access to quality essential healthcare services and access to safe, effective, quality and affordable essential medicines and vaccines for all. Premised on these, this chapter examined the effect of mobile money account adoption on healthcare utilisation and spending in rural households. The differential effect of the expected outcome is also investigated for male- and female-headed households using sub-sampled models. The sub-sample analysis aligns with the aim of the SDG to "leave no one behind" and thus, advocates for indicators to be disaggregated by income, sex, age, race, ethnicity, disability, location and migratory status, wherever data allow.

Addressing the potential endogeneity associated with mobile money, the findings from this chapter show that: (i) mobile money adoption enhances rural household healthcare utilisation and has a bigger effect in female-headed households (ii) mobile money improves rural households' ability to spend on healthcare and this benefit is experienced more by female-headed households. Regarding policy, there is a need to strengthen the fundamentals and adopt best practices to improve the quality of mobile money services to serve a broader ecosystem of users. Providers of mobile financial services should engage with regulators and standard setting bodies to create more enabling regulatory environments to allow these services to flourish and foster sustainable investment in the services that underpin a strong digital financial ecosystem. Government policy could be aimed at regulating the mobile financial sector to optimize the sector's potential contribution to universal financial inclusion.

References

Abor, J. Y., Amidu, M., & Issahaku, H. (2018). Mobile telephony, financial inclusion and inclusive growth. *Journal of African Business*, *19*(3), 430–453.

Adaba, G. B., Ayoung, D. A., & Abbott, P. (2019). Exploring the contribution of mobile money to well-being from a capability perspective. *The Electronic Journal of Information Systems in Developing Countries*, e12079.

Ahmed, H., & Cowan, B. W. (2019). *Mobile Money and Healthcare Use: Evidence from East Africa*. National Bureau of Economic Research.

Aker, J. C., & Mbiti, I. M. (2010). Mobile phones and economic development in Africa. *Journal of Economic Perspectives*, *24*(3), 207–32.

Arcury, T. A., Preisser, J. S., Gesler, W. M., & Powers, J. M. (2005). Access to transportation and health care utilization in a rural region. *The Journal of Rural Health*, *21*(1), 31–38.

Asongu, S. (2013). Mobile banking and mobile phone penetration: Which is more pro-poor in Africa? *African Governance and Development Institute WP/13/033*.

Asongu, S. (2015). The impact of mobile phone penetration on African inequality. *International Journal of Social Economics*, *42*(8), 706–716.

Attia-Konan, A. R., Oga, A. S. S., Touré, A., & Kouadio, K. L. (2019). Distribution of out of pocket health expenditures in a sub-Saharan Africa country: Evidence from the national survey of household standard of living, Côte d'Ivoire. *BMC Research Notes*, *12*(1), 25.

Azzani, M., Roslani, A. C., & Su, T. T. (2019). Determinants of Household Catastrophic Health Expenditure: A Systematic Review. *The Malaysian Journal of Medical Sciences: MJMS*, *26*(1), 15.

Baliamoune-Lutz, M. (2003). An analysis of the determinants and effects of ICT diffusion in developing countries. *Information Technology for Development*, *10*(3), 151–169.

Burjorjee, D. M., & Bin-Humam, Y. (2018). New insights on women's mobile phone ownership. *CGAP Working Paper*. Retrieved from https://www.cgap.org/sites/default/files/researches

/documents/Working-Paper-New-Insights-on-Womens-Mobile-Phone-Ownership-Apr-2018.pdf

Carrasquillo, O. (2013). Health Care Utilization. In M. D. Gellman & J. R. Turner (Eds.), *Encyclopedia of Behavioral Medicine* (pp. 909–910). https://doi.org/10.1007/978-1-4419-1005-9_885

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). *The Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution*. Retrieved from http://documents.worldbank.org/curated/en/332881525873182837/pdf/126033-PUB-PUBLIC-pubdate-4-19-2018.pdf

Dhak, B. (2015). Demographic change and catastrophic health expenditure in India. *Social Indicators Research*, *122*(3), 723–733.

Donner, J. (2008). Research approaches to mobile use in the developing world: A review of the literature. *The Information Society*, *24*(3), 140–159.

Donner, J., & Tellez, C. A. (2008). Mobile banking and economic development: Linking adoption, impact, and use. *Asian Journal of Communication*, *18*(4), 318–332.

Donovan, K. (2012). *Mobile money for financial inclusion*. Retrieved from http://elibrary.worldbank.org/doi/abs/10.1596/9780821389911_ch04

Flood, D., West, T., & Wheadon, D. (2013). Trends in mobile payments in developing and advanced economies. *RBA Bulletin*, 71–80.

GSMA. (2014). *State of the Industry Mobile Financial Services for the Unbanked*. Retrieved from https://www.gsmaintelligence.com/research/?file=8d7e56071f00f28571cae54f7673181d&download

GSMA. (2017). *State of the Industry Report on Mobile Money* (p. 33). Retrieved from https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/02/2018-State-of-the-Industry-Report-on-Mobile-Money.pdf

GSMA. (2018). *State of the Industry Report on Mobile Money* (p. 40). Retrieved from https://www.gsma.com/r/wp-content/uploads/2019/05/GSMA-State-of-the-Industry-Report-on-Mobile-Money-2018-1.pdf

GSS. (2014). *Ghana living standards survey: Main report*. Retrieved from Ghana Statistical Service, Accra. website: http://www.statsghana.gov.gh/docfiles/glss6/GLSS6_Main%20Report.pdf

GSS. (2018). *Ghana living standards survey round 7 (GLSS 7): Poverty trends in Ghana (2005 – 2017)*. Retrieved from Ghana Statistical Service, Accra. website: http://www.statsghana.gov.gh/docfiles/publications/GLSS7/Poverty%20Profile%20Report_2005%20-%202017.pdf

Haas, S., Heymann, M., Riley, P., & Taddese, A. (2013). Mobile money for health. *Bethesda, MD: Health Finance and Governance Project, Abt Associates Inc*.

Kendall, J., Schiff, R., & Smadja, E. (2013). Sub-Saharan Africa: A major potential revenue opportunity for digital payments. *Available at SSRN 2298244*.

Koomson, I., Annim, S. K., & Peprah, J. A. (2016). Loan refusal, household income and savings in Ghana: A dominance analysis approach. *African Journal of Economic and Sustainable Development*, *5*(2), 172–191. http://dx.doi.org/10.1504/AJESD.2016.076095

Koomson, I., Villano, R. A., & Hadley, D. (2020a). Effect of financial inclusion on poverty and vulnerability to poverty: Evidence using a multidimensional measure of financial inclusion. *Social Indicators Research, 25*(4), 375–387. https://doi.org/10.1007/s11205-019-02263-0

Koomson, I., Villano, R. A., & Hadley, D. (2020b). Intensifying financial inclusion through the provision of financial literacy training: A gendered perspective. *Applied Economics, 52*(4), 375–387. https://doi.org/10.1080/00036846.2019.1645943

Kshetri, N., & Cheung, M. K. (2002). What factors are driving China's mobile diffusion? *Electronic Markets*, *12*(1), 22–26.

Kumar, A. S., Chen, L. C., Choudhury, M., Ganju, S., Mahajan, V., Sinha, A., & Sen, A. (2011). Financing health care for all: Challenges and opportunities. *The Lancet*, *377*(9766), 668–679.

Ky, S., Rugemintwari, C., & Sauviat, A. (2017). Does mobile money affect saving behaviour? Evidence from a developing country. *Journal of African Economies*, *27*(3), 285–320.

Mitręga-Niestrój, K., Puszer, B., & Szewczyk, \Lukasz. (2018). Mobile money services development: The case of Africa. *Studia Ekonomiczne*, *356*, 78–96.

Mohanty, S. K., Agrawal, N. K., Mahapatra, B., Choudhury, D., Tuladhar, S., & Holmgren, E. V. (2017). Multidimensional poverty and catastrophic health spending in the mountainous regions of Myanmar, Nepal and India. *International Journal for Equity in Health*, *16*(1), 21.

Mojumdar, S. K. (2018). Determinants of Health Service Utilization by Urban Households in India: A Multivariate Analysis of NSS Case-level Data. *Journal of Health Management*, *20*(2), 105–121.

Mothobi, O., & Grzybowski, L. (2017). Infrastructure deficiencies and adoption of mobile money in Sub-Saharan Africa. *Information Economics and Policy*, *40*, 71–79.

Munyegera, G. K., & Matsumoto, T. (2016). Mobile money, remittances, and household welfare: Panel evidence from rural Uganda. *World Development*, *79*, 127–137.

Organization, W. H. (2017). *Tracking universal health coverage: 2017 global monitoring report.*

Pénicaud, C., & Katakam, A. (2019). State of the industry 2013: Mobile financial services for the unbanked. *Gates Open Res*, *3*.

Prokopenko, M. V., & Holden, M. P. (2001). *Financial development and poverty alleviation: Issues and policy implications for developing and transition countries.* International Monetary Fund.

Rowntree, O. (2018). The mobile gender gap report 2018. *GSMA, Retrieved from Https://Www. Gsma. Com/Mobilefordevelopment/Programmes/Connected-Women/the-Mobile-Gender-Gap-Report-2018.*

Singh, T., Bhatnagar, N., Singh, G., Kaur, M., Kaur, S., Thaware, P., & Kumar, R. (2018). Health-care utilization and expenditure patterns in the rural areas of Punjab, India. *Journal of Family Medicine and Primary Care*, *7*(1), 39.

Stock, J. H., & Yogo, M. (2002). Testing for weak instruments in linear IV regression. NBER Technical Working Paper No. 284. Retrieved from https://www.nber.org/papers/t0284

Suri, T., Jack, W., & Stoker, T. M. (2012). Documenting the birth of a financial economy. *Proceedings of the National Academy of Sciences*, *109*(26), 10257–10262.

World Bank. (2017). *World Bank Annual Report* (p. 87). Retrieved from United Nations website: http://pubdocs.worldbank.org/en/908481507403754670/Annual-Report-2017-WBG.pdf

World Health Organization. (2016). *World health statistics 2016: Monitoring health for the SDGs sustainable development goals*. Retrieved from https://apps.who.int/iris/bitstream/handle /10665/ 272596/9789241565585-eng.pdf

Appendix 1: Definition and Measurement of Variables

Variable	Type	Definition/measurement	A priori sign
Total health expenditure	continuous	Total household health expenditure	
Healthcare utilisation	count	Number of household members that consulted a health practitioner or visited a health facility	
mobile money adoption	Dummy	mobile money =1 if a household owns mobile money account and zero if otherwise	+
NHIS	Dummy	NHIS=1 if a household members have valid NHIS cards and zero if otherwise	+
Savings (S)	Dummy	Savings=1 if a household have savings account, susu scheme, fixed deposit account and investment account except current account and zero if otherwise	+
Age	Continuous	Age of the household head	-
Dep	Continuous	Dependents (<18+>60 years)	-
Hhsize	Continuous	Household size	+
Male	Dummy	Sex of household head	+
Urban	Dummy	Place of residence whether urban or rural.	+
Expected benefits from NHIS	dummy	1 if a household members expected benefits and zero if otherwise	+/-
HHEdL	Categorical	Level of education of the Household head	+
HHEMPL	Categorical	Employment status of the Household head	+
Marital status	Dummy	Marital status of the Household head	+
Distance to mobile network	Continuous		+
Mobile phone penetration	Continuous		

Healthcare utilisation total household health expenditure are dependent variable.
All other variables are independent variables.

Appendix 2: Descriptive Statistics of the Variables Used

Variable	Obs	Mean	Std. Dev.	Min	Max
Total health expenditure	4,665	94.6702	364.0748	0	10307.6
Access to Healthcare	4,665	1.282	.960	0	6.401
mobile money	4,665	.181	.385	0	1
Distance to mobile network	4,665	8.835	5.732	.6	28.1
Mobile phone penetration	4,665	.827	.117	.419	1
NHIS	4,665	.864	.343	0	1
Male	4,665	.574	.495	0	1
Expected benefits from NHIS	4,665	2.737	1.344	0	6
Marital status	4,665	1.903	1.663	0	5
Employment status	4,665	3.371	1.910	0	7
Household size	4,665	3.795	2.555	1	19