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The Gender Health Gap in Ghana: Exploring the Role of Financial Inclusion

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This paper investigates the impact of financial inclusion on health and the gender-health differences in Ghana using microdata from the sixth wave of the Ghana Living Standards Survey (GLSS) and instrumental variable techniques. The findings reveal significant gender health differences, with women reporting lower health than men. Importantly, the study suggests that financial inclusion could be a powerful tool in reducing the gender-health gap, as individuals with higher financial inclusion levels report better health. Furthermore, there is no significant health difference across genders for people with a higher level of financial inclusion. These findings have novel and important policy implications, highlighting the potential of financial inclusion in addressing the gender-health gap in Ghana.

Keywords: Gender, Financial inclusion, Health gap, Developing countries, Ghana

JEL Classifications: J16, G2, I12

1 Introduction

Gender health inequality has long been a pressing issue for policymakers and academics in developing countries. Despite numerous policy interventions, gender disparities persist in various aspects of life, particularly in health, where men often have more favourable outcomes.

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The existing literature establishes that women report more illnesses, experience worse health outcomes, and utilise health care services more frequently than men, despite their longer life expectancy (Takahashi, Jang Kino and Kawachi, 2020; Zhang, d'Uva and Doorslaer, 2015; Chun, Khang, Kim and Cho, 2008). While many attempts have been made to empirically explain this phenomenon, the role of financial inclusion (FI) is yet to receive empirical attention. Financial inclusion, defined as the access to and effective use of a variety of suitable financial services by adults, including mobile money services (Demirgüç-Kunt et al., 2018; Demirgüç- Kunt et al., 2017), has been shown in previous research to improve health (eg. Sarma and Pais, 2011; Koomson and Ibrahim, 2018; Njiru and Letema, 2018; Li, 2018; Gyasi et al., 2019; Stein and Yannelis, 2019; Inoue, 2019; Matekenya et al., 2020). Specifically, Koomson and Ibrahim (2018) noted that access to and usage of financial services may encourage households to start household enterprises to earn extra income that can be invested in health for the households. Gyasi et al. (2019) also opined that FI cushions against and hinders health-related challenges, especially in later life.

Financial inclusion is increasing steadily in developing countries. For example, data from the Bank of Ghana (2016) has shown that between the period 2007-2014, there has been an increment of over 113% in the number of bank branches in Ghana, showing a rise of about 514 additional bank branches in bank branch penetration. At the same time, there were positive developments in primary indicators of FI. For example, the number of bank depositors per 1000 adults rose to about 501.2 in 2014 from 183.6 in 2005 (World Bank, 2017).

However, this increase seems to be skewed towards men. There is evidence of gender differences in financial inclusion, where females are largely excluded (Fanta and Mutsonziwa, 2016; Mndolwa and Alhassan, 2020; Ghosh, 2022). Specifically, in Cameroon, Ndoya and Tsala (2021) find a gap in all indicators of access to and use of financial products and services in favour of men. In the case of Ghana, Demirgüç-Kunt et al., (2018) indicated that about 62% of males have a transaction account compared to about 54% of females. Therefore, reconciling women's exclusion in the financial sector and the gender health gap, which is less favourable to women, suggests that their financial exclusion could potentially be a causal factor of the gender health-gap. Yet, empirical attention has not been given to FI's role in the gender-health gap. As a result, this study investigates the role of FI in the gender-health gap in Ghana for people between the ages of 18 and 75 years who are expected to be active in the financial sector. Specifically, using self-reported health measures, we first investigate to ascertain the health difference across genders as argued in the literature. It is important to confirm this before exploring the role FI plays. Further, using multidimensional FI measures, the paper investigates the health effects of FI. Finally, the paper investigates the role of FI in the gender-health gap.

We employ cross-sectional data from the sixth round of the Ghana Living Standard Survey (GLSS 6) and employ the OLS, binomial probit, and instrumental variable methods for this exercise. The GLSS 6 is used because of its widest countrywide coverage and allows subsample

modelling to further explore the gender differences in the FI-health gap relationship. The results confirm the health gap across genders in Ghana, with male individuals being more likely to be healthy than their female counterparts. Second, the results also show that FI has positive health effects, which potentially may play a role in closing the gender-health gap. Notably, while people with higher levels of financial inclusion are healthier than their counterparts with lower levels, the results indicate no significant health difference across genders for people with higher levels of financial inclusion. The rest of the paper is organised as follows: Section 2 presents a literature overview comprising the concept of financial inclusion, financial decision-making dynamics, overview of the health environment in Ghana and the link between FI and the gender-health gap. Section 3 discusses the data, model, and estimation strategy employed to achieve our stated objectives and description statistics. Section 4 contains the results and analysis. Finally, in section 5, we conclude.

2 Overview of Literature

2.1 The Concept of Financial Inclusion and Financial Decision-making Dynamics

Financial inclusion (FI) means that adults have access to and can effectively use a range of appropriate financial services. Such services must be provided responsibly and safely to the consumer and sustainably to the provider in a well-regulated environment. At its most basic level, financial inclusion starts with having a deposit or transaction account at a bank or other financial institution or through a mobile money service provider, which can be used to make and receive payments and to store or save money. Financial inclusion also encompasses access to credit from formal financial institutions that allow adults to invest in educational, health and business opportunities, as well as the use of formal insurance products that allow people to better manage financial risks.

Previous literature measures FI using various indicators, including a multidimensional FI index. In cross-country studies, measures such as the number of branches per adult (financial access), percentage of adults that own an account in regulated institutions (financial usage), and stock market access, among others, are often used (see, for example, Iddrisu and Turkson, 2020; Amidu et al., 2022). At the household level, the use of multidimensional FI measure is common (see Zhang and Posso, 2017; Koomson et al., 2020a; Churchill et al., 2020b; Koomson and Danquah, 2021) and may comprise ownership of bank or mobile money account, ownership of insurance, access to credit/loan, and receipt of financial remittance from the bank or through mobile money among others. This potentially implies the presence of endogeneity since FI may depend on the availability of and distance to financial institutions.

Financial decision-making is a fundamental process that plays a crucial role in both personal and business contexts. It involves choices regarding the allocation of resources, management of risks, and planning for future financial needs. For individuals, this means making informed

decisions about saving, investing, spending, and borrowing, all of which have a direct impact on financial stability and long-term prosperity (Khan et al., 2020; Opoku-Okuampa, 2024). Cultural factors significantly shape how people make financial decisions. Culture encompasses the shared values, beliefs, and norms within a society that influence how individuals view money, wealth, and financial risk. These cultural influences differ across societies and can profoundly affect financial decision-making. For instance, in cultures that prioritize collective well-being, financial decisions might be driven more by family and community needs, whereas in cultures that emphasize individualism, personal financial goals may dominate (Hofstede, 2018). Recognizing these cultural influences is vital for understanding financial behavior in specific contexts, such as Ghana.

In the Ghanaian context, the blend of traditional values, social norms, and contemporary economic practices creates a distinct environment for financial decision-making. Ghanaian society is deeply rooted in family ties, community networks, and religious beliefs, all of which can influence financial choices. An example is the practice of "susu," a traditional savings system that reflects the collective nature of financial behavior in many Ghanaian communities (Mensah, 2021). Additionally, religious convictions often guide attitudes toward wealth, debt, and risk, further shaping financial decisions. Depending on how these cultural elements interact with modern economic practices, they can either support or complicate sound financial decision-making.

2.2 Overview of the Health Environment in Ghana

The health and well-being of the Ghanaian population have improved in the last three decades. In1990, Ghanaians on average, when born, lived up to 57 years (life expectancy), out of every 1,000 women who were delivered 6 died (maternal mortality), of all babies born 9% died before age 1 (infant mortality) and 12% died before age 5 (under 5 mortality). By 2017, Ghanaians on average, when born, lived up to 64 years (life expectancy), out of every 1,000 women who were delivered 3 died (maternal mortality), of all babies born 4% died before age 1 (infant mortality) and 5% died before age 5 (under 5 mortality), (GSS, 2014 and 2017).

Overall, this improvement has been slow and far from the desired global targets. The changes observed represent an average improvement of 50% as against the desired improvement of 75% in the above indicators (MDG, 2015). Ghana has not achieved the desired level of health because we have not adequately addressed, in a comprehensive manner, all the key determinants of health. Historically, the major health problems affecting Ghanaians have been primarily communicable, maternal, perinatal and nutritional diseases. Ghana is now acknowledged as having a more complex burden of disease. This is evident across different age, gender, location, and socio-economic status groups in the country. For children, communicable diseases remain the major health conditions affecting them, with malaria prevailing. Maternal and neonatal health conditions remain a challenge, especially in rural areas

and amongst poor women. Non communicable diseases such as hypertension, strokes, cancers, diabetes, eye disorders, oral health conditions, those of genetic origin such as sickle cells, injuries, substance/medicine abuse and related conditions are increasing in prevalence. With an aging population, conditions such as musculoskeletal and neuro-degenerative disorders are increasing in prevalence. The burden of mental health is also rising, with an estimated prevalence for common mental health ailments (depression and anxiety) of 10%. 3% of the total Ghanaian population have some form of disability with visual or sight impairment being the most common. The above is further compounded by the complex interactions between conditions and the presence of co-morbidities (GSS, 2014).

This complex disease burden is influenced by risk factors such as the physical environment, education, socio-economic situation, population lifestyles and demographic characteristics of the Ghanaian population. These, in addition to the capacity of the healthcare delivery system to provide quality care, collectively determine the health and well-being of people living in Ghana (GBD, 2016). In recognition of the complex nature of the disease pattern and the increasing influence of other health risk factors on population health and well-being, Ghana must, whiles strengthening the healthcare delivery system, simultaneously address the other determinants of health.

2.3 The link between FI and the gender-health gap

Financial inclusion (FI) is one of many developing countries' biggest challenges. Despite its welfare-improving effects (Demirgüç-Kunt et al., 2017; Mohammed et al., 2017; Koomson et al., 2020a), many developing countries still face difficulties getting their people included in the financial sector due to either financial illiteracy, inadequate financial infrastructure, or weak financial institutions. Financial inclusion can potentially facilitate the household's investments, including investment in health (Kuri and Laha, 2011; Abdul-Mumuni and Koomson, 2019). Previous research found that FI is associated with improvements in health among others (eg. Sarma and Pais, 2011; Koomson and Ibrahim, 2018; Njiru and Letema, 2018; Li, 2018; Gyasi et al., 2019; Stein and Yannelis, 2019; Inoue, 2019; Matekenya et al., 2020). For example, Koomson and Ibrahim (2018) noted that access to and usage of financial services may encourage households to start household enterprises to earn extra income that can be invested in health for the households. Also, FI cushions against and hinders health-related challenges, especially in later life (Gyasi et al., 2019).

Given the arguments on the importance of FI in the improvement of health, women, compared to men, are reportedly less included in the financial sector, particularly in developing countries (see Fanta and Mutsonziwa, 2016; Mndolwa and Alhassan, 2020; Ndoya and Tsala, 2021; Ghosh, 2022). Specifically, in Cameroon, Ndoya and Tsala (2021) find a gap in all indicators of access to and use of financial products and services in favour of men. Demirgüç-

Kunt *et al*. (2018) in Ghana find that about 62% of males have a transaction account compared to about 54% of females. At the same time, there are reports of gender health gaps which tend to be less favourable to women. Studies have shown that, compared to men, women report more illnesses and have worse health outcomes (Chun, Khang, Kim and Cho, 2008; Zhang, d'Uva and Doorslaer, 2015; Takahashi, Jang Kino and Kawachi, 2020). Reconciling their financial exclusion with their health deprivation presents an open empirical question regarding the role of FI on the gender health gap. Incidentally, this has not been given empirical attention in existing literature as (to the authors' knowledge) there is no empirical evidence on the FI-gender health gap nexus.

3 Model and estimation strategy

The empirical framework follows the work of Gangadharan and Valenzuela (2001), where health outcomes are assumed to be determined by the environment and income. Also, the health outcomes of a population improve as the standard of living improves. We incorporate FI into this relationship, giving its importance in income generation, health investment and improving living standards. The relationship between these variables and health outcomes is expressed as:

$$H = f(FI, I, E, W) \tag{1}$$

where H represents the health outcome of the population, FI represents their financial inclusion status, I is the income level, E represents the environment and W refers to other factors that could influence the population's health outcomes.

Transforming the functional relationship into an econometric model and representing it in a cross-sectional framework, we gradually build the model as follows:

We first investigate the gender-health gap and the health effects of FI as in equation (2) below,

$$healthy_i = \beta_1 + \beta_2 female_i + \beta_3 fi_i + \sum_{j=4}^{k} \beta_j X_{ij} + \mu_t + \varepsilon_i \tag{2}$$

Consequently, the full model is specified in equation (3) as follows,

$$healthy_i = \beta_1 + \beta_2 female_i + \beta_3 fi_i + \beta_4 (female_i * fi_i) + \sum_{j=5}^{k} \beta_j X_{ij} + \mu_t + \varepsilon_i \tag{3}$$

where $healthy_i$ is the health status of the individual i, $female_i$ is the gender of the individual i, fi_i is the financial inclusion status of the individual i, $(female_i * fi_i)$ is the corresponding interaction. X_{ij} is a vector of k variables controlling for individual and household characteristics that affect health outcomes, such as age, education, marital status, household income, type of household cooking and lighting fuels, household size and location

of the household, $\beta's$ are the parameter vectors, μ_t represents district fixed effects which control for unobserved district characteristics and ε_i is the random error term of the equation.

One key methodological issue of concern is the potential endogeneity that may bias the estimated effect of financial inclusion on health in our model. For this reason, our identification strategy relies on the use of instrumental variables. Estimation routines such as 2SLS-IV and IV-Probit are appropriate when accounting for endogeneity. Thus, our preferred methods are the 2SLS-IV and IV-Probit estimation. With non-linear models, it is difficult to find the marginal effect of an interaction term; therefore, as a robustness check and to help explain the interaction terms, we use the Ordinary Least Squares (OLS) and the 2SLS-IV estimations. Least squares, as a natural approach to estimation, makes explicit use of the structure of the model as laid out in the equations above. In addition, least squares, even for non-linear probability models, enjoy robustness compared to other estimators in the sense that even if the actual model is not a linear regression, the regression line fit by least squares is an optimal linear predictor for the dependent variable. Finally, under the very specific assumptions of the classical model, by one reasonable criterion, least squares will be the most efficient use of the data (Greene, 2003).

Following arguments in previous literature that financial inclusion may depend on financial literacy, adequate financial infrastructure, or strong financial institutions, the estimation of our empirical equations may suffer from endogeneity bias caused by measurement error or omitted variable bias. This is because inadequate financial infrastructure (such as bank branches) which leads to long distances to financial institutions, and lack of financial literacy may partly be responsible for financial exclusion. Existing studies identified that distance to the nearest bank branch affects FI, in the sense that longer distance to the nearest bank branch is associated with higher financial, in-kind and psychological costs, which worsens FI (Demirgüç-Kunt and Klapper, 2012; Koomson et al., 2020a; Churchill et al., 2020b). Also, studies that used distance as an instrument (eg. Churchill and Marisetty, 2019; Koomson et al., 2020a; Churchill et al., 2020b; Koomson and Danquah, 2021) supported its validity using microfinance and other forms of financial institutions' operational modalities in rural areas which have increased access to banks across locations. Reiter and Peprah (2015) noted that the provision of rural- and area-specific products by Ghanaian banks had been identified as playing a major role in ensuring success in the country's microfinance industry. The presence of endogeneity is suspected to lead to biased and inconsistent estimates of the relationship between FI and health outcomes (Koomson, Villano, Hadley, 2020a; Churchill and Marisetty, 2019). Therefore, we estimate instrumental variable (IV) regressions (two-stage least squares-2SLS and IV-probit) to account for any potential endogeneity and improve the empirical analysis. Our identification strategy relies on using instrumental variables as follows: (i) average distance to the nearest bank branch, (ii) number of bank branches in a district, (iii) a binary variable indicating the availability of at least one bank branch in a community (bank in community=1), and (iv) interaction terms

between the 'female' dummy and each of the above instruments. The IV models require the use of instruments that are relevant to the endogenous treatment variable (in our case, financial inclusion), but exogenous to the outcome variable (health). We employ IVs to satisfy the IV validity requirements of exogeneity and relevance. The choice of IVs is based on the assumption that shorter distance to the bank, more bank branches, or availability of a bank branch in a community encourage and promote financial inclusion (satisfying the relevance IV assumption). Additionally, there is no clear reason to expect distance to the bank, bank branches, or availability of a bank branch in a community to independently influence health outcome (satisfying the exogeneity IV assumption). In Ghana, particularly in rural areas, provision of financial services and other public infrastructure or community health services are mutually exclusive, while the former is provided largely by the private sector, the latter is the work of the central government. The use of IV helps us to address potential endogeneity issues while isolating the effect of financial inclusion on health.

3.2 Data

This study employs micro-level data from the sixth wave of the Ghana Living Standards Survey (GLSS), administered in 2012/2013. The GLSS is a nationally representative household survey, and the sampling frame for the survey is the population living in private households in Ghana. The sample frame above is divided into primary and secondary sampling units. The primary sampling unit is the census enumerated areas (EAs) formed within the then ten administrative regions of Ghana based on proportional allocation using the population in each region. On the other hand, the second sampling unit is the households living in each enumeration area. We considered survey 6 due to the wider coverage of households and availability of observations. The sixth round had a total of 18,000 households. Out of this, 16,772 were successfully interviewed, comprising a response rate of 93.2 percent. From the above survey, the main sample for this study is restricted to people aged 18 to 75 years. While this ensures that we center the study on financially active people, it is also consistent with Ghanaian laws, which set the legal age of bank account ownership to 18 years and above.

3.3 Variable measurement

Based on the information from the GLSS sample, we constructed the variables of interest for the empirical analysis. The health outcome variable is a binary variable (healthy) that takes the value 1 for individuals who reported not suffering from any illness during the last two weeks before the interview. Injury incidence is negligible, so excluded from the analysis. Unfortunately, this is the only health measure in the dataset we could rely on in the data. The survey specifically asks whether the individual has been ill of injured in the last two weeks. Other available health indicators such as chronic illness, hospitalization or disability in the

dataset are job specific, or pregnancy related. This is a potential limitation to the study. However, self-reported health measures have been widely used in previous literature (eg. Boadi and Kuitunen, 2006; Cundale et al., 2017). Thus, the use of self-reported measures is widely accepted and can provide accurate and efficient assessments of objective states (Cleary, 1997). We control for the gender of the individual, represented by the female binary variable (female=1).

Following previous literature (Zhang and Posso, 2017; Churchill and Marisetty, 2019; Koomson et al., 2020a; Koomson et al., 2020b; Churchill et al., 2020b; Koomson and Danquah, 2021), we use a multidimensional FI measure. Consistent with Koomson and Danquah (2021), the study considers four dimensions of FI (ownership of bank account; access to credit/loan; ownership of insurance; and receipt of financial remittance from the bank or through mobile money) as detailed in Table 1. Each dimension is equally weighted 0.25 and used to generate an individual financial inclusion score in line with equation (6) below.

$$fi_i = w_1 I_1 + w_2 I_2 + \cdots + w_n I_n \tag{4}$$

where fi_i is the individual financial inclusion score, I_i is a binary variable that is 1 if an individual satisfies the dimension i and 0 otherwise. w_i is the weight attached to the dimension i with $\sum_{i=1}^{n} w_i = 1$.

Also, to control for other factors that may influence individuals' health outcome, we include as covariates: (i) the log of equivalized household income, (ii) household energy poverty represented by main type of cooking fuel -'dirty cooking fuel' which is 1 for dung cake, kerosene, firewood, charcoal or any other biomass fuel and 0 for electricity and gas, and lighting fuel-'dirty lighting fuel' which is 1 for kerosene, candles, gas or any other biomass fuel and 0 for electricity (iii) the household size, with a minimum of 1-person household and a maximum

Table 1: Dimensions and weights for multidimensional FI

Dimensions & weight	Details
Bank account (0.25)	The individual has a bank account (a bank account includes savings, current, fixed deposit, or microfinance account).
Loan/Credit (0.25)	The individual has access to a loan/credit from a bank, microfinance institution or other formal institution.
Insurance (0.25)	The individual has access to medical, life, property, unemployment/income or family insurance.

of 22 members (iv) the age of the individual in years, where a minimum age of 18 and a maximum of 75 years was considered (v) controls for marital status (never married, married, cohabitating, divorce and widowed), (vi) indicators for educational level of the individual (no education, primary, middle, secondary and tertiary), (vii) the individuals' employment status and finally, (vii) whether the household is in an urban or rural area.

3.4 Descriptive Statistics

Table 2 presents a summary of the mean values of the variables used in the study, as discussed in section 3.3 above. Data in the table show differences in household demographics between males and females. The sample size under consideration is 22,606, of which 11,505 are males, comprising about 51% and 11,101 are females. There is a significant health difference across gender in favour of males. The percentage of those reported being healthy in the total sample is about 86%, with about 88.5% and 83.2% in the male and female sub-samples, thus a health difference of about 5.3%. On the financial inclusion indices, there are slight differences across gender in favour of males. FI for the total sample averaged 0.143, with averages of 0.147 and 0.140, respectively, for males and females.

For marital status, male heads record higher percentages of the following categories: never married and married compared to female heads. However, female heads are the highest in the cohabitating, divorce, and widowed categories. In terms of level of education, there is a significant difference in higher education attainment in favour of males. Precisely, females with no education and primary level education are more than their male counterparts. However, males record the highest in the middle, secondary and tertiary education level categories compared to females. Males, on average, are older and belong to households with larger sizes than their female counterparts. Again, out of about 47% of households in rural areas of Ghana, about 50% of males live in those households compared to about 45% of females.

Regarding employment and income, the percentage of employed males is slightly lower than employed females, although the difference is insignificant. This may partly drive the income and health investment differences in favour of females, with an average of GHS 128.381 equalized income and GHS 4.528 health expenditure.

Finally, on the type of cooking and lighting fuels used in households, which reportedly have effects on health, about 78% of males live in households that use 'dirty fuel' (dung cake, firewood, charcoal, etc., other than electricity and gas) for cooking compared to about 75% females. However, about 5% of females are in households that use 'dirty fuel' (kerosene, candles, gas, etc., other than electricity) for lighting compared to about 4% of males[1].

[1]The correlation between the independent variables is generally low (< 0.50). The low correlations between the variables suggests less collinearity among them which will not cause estimation issues.

Table 2: Descriptive Statistics

	Max.	Min.	Stand. Dev.	Total mean	Male mean	Female mean	T-test Difference
Sample				22,606	11,505	11,101	
Healthy	1	0	0.352	0.859	0.885	0.832	0.053***
Financial Inclusion	1	0	0.183	0.143	0.147	0.140	0.007**
Marital Status	4	0	1.054	---	---	---	---
Never married				0.341	0.391	0.289	
Married				0.459	0.469	0.449	
Cohabitating				0.098	0.091	0.105	
Divorce				0.067	0.039	0.096	
Widowed				0.035	0.010	0.061	
Education Level	4	0	1.142	1.894	2.043	1.739	0.304***
No education				0.156	0.123	0.190	
Primary				0.141	0.119	0.163	
Middle				0.436	0.447	0.425	
Secondary				0.187	0.214	0.161	
Tertiary				0.079	0.097	0.061	
Age	75	18	14.851	34.779	35.484	34.048	1.435***
Household Size	29	1	3.268	4.980	4.928	5.033	-0.105**
Rural	1	0	0.492	0.474	0.501	0.447	0.054***
Employed	1	0	0.496	0.558	0.556	0.559	-0.0037
Equalized Income	52143.96	31.655	2098.598	2153.996	2090.953	2219.333	-128.381***
Health Expenditure	5461.8	0	226.858	86.763	84.428	88.956	-4.528***
Dirty cooking fuel	1	0	0.363	0.766	0.778	0.754	0.024***
Dirty lighting fuel	1	0	0.213	0.043	0.041	0.046	-0.005*

'---' means not applicable.

*** p<0.01, ** p<0.05, * p<0.10 (Here, a simple t-test is performed by household head gender and revealed significant differences in the variables).

4 Empirical Results

4.1 Empirical Estimations and Discussions

This sub-section analyses the empirical results to examine the gender-health gap, the health effects of financial inclusion and the role that financial inclusion plays in the gender-health gap in Ghana. Table 3 presents the results of the Probit, IV-Probit, OLS, and 2SLS-IV regressions that use micro-level data from the sixth round of the Ghana living standards survey (GLSS), accounting for the respective households' income level, household size, type of main cooking and lighting fuel and location, as well as the individuals' age, education level, marital status, and employment status. To gradually build the health model, we begin by assessing the gender health and the health effects of financial inclusion; columns (1), (3), (5), and (7) are estimated using the financial inclusion variables together with the individual and household characteristics as specified in equation (2). Finally, in columns (2), (4), (6), and (8), we incorporate the role financial inclusion may play in the gender-health gap by estimating the full model with the interaction term, equation (3). All regressions are corrected for robust clustered standard errors, controlled for district effects.

While our Probit and OLS estimates may be economically meaningful, the issue of potential endogeneity bias remains. To improve the estimates and account for any potential endogeneity, the IV-Probit and 2SLS-IV regressions are presented in columns (3), (4), (7), and (8) of Table 3. The choice of instruments is supported by the corresponding tests, particularly for the 2SLS-IV, the F-statistics on the test for weak identification of the endogenous regressors (Fin. Inclusion index and Female*Fin. Inclusion) are reported as 29.842 (column 7) and 14.979 (column 8), for equations (2) and (3), respectively. These values exceed the Stock-Yogo (2005) critical values indicating that the endogenous regressors are strongly identified. Furthermore, the test statistics of under-identification and over-identification (Hansen J.), reported at the bottom of Table 3, columns 7 and 8, suggest that the instruments are relevant and the overidentifying restrictions are exogenous, respectively. Thus, the chosen instruments are well-identified. Finally, the endogeneity test rejects the null hypothesis of exogeneity, thus supporting the use of instrumental variables. As a result, the instrumental variable estimates (IV-Probit and 2SLS-IV) are our preferred estimates, as the results account for potential endogeneity and allow us to identify the causal effect of financial inclusion on health. In particular, we rely on the 2SLS-IV while the IV-probit results serve as robustness checks and also help with the interpretation of the interaction terms.

Table 3: Estimates of Equations (1) and (2) using Probit, OLS, IV-Probit and 2SLS instrumental variables (IV)

Dependent Variable: Health Status (healthy=1, illness=0)								
	Probit (dy/dx)		IV-Probit (dy/dx)		OLS		2SLS-IV	
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female	-0.055***	-0.0467***	-0.064***	-0.1040***	-0.0540***	-0.0461***	-0.0631***	-0.135***
	(0.00482)	(0.00593)	(0.006)	(0.049)	(0.00480)	(0.00593)	(0.00626)	(0.0496)
Fin. Inclusion index	-0.00179	0.0301	1.357***	1.215***	-0.00387	0.0236	1.335***	1.141***
	(0.0123)	(0.0183)	(0.314)	(0.346)	(0.0123)	(0.0154)	(0.307)	(0.316)
Female*F. Inclusion		-0.266**(c)		0.855(c)		-0.0550**		0.500
		(0.113)		(1.017)		(0.0241)		(0.339)
Under identification test							59.023(0.000)	59.125(0.000)
Hansen J (overid)							1.441(0.2300)	1.495(0.4736)
Endogeneity test							28.133(0.000)	30.083(0.000)
F-stat							29.842	14.979
District Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,606	22,606	22,606	22,606	22,606	22,606	22,606	22,606
R-squared					0.034	0.034	-0.464	-0.528
Wald test of exogeneity			32.18(0.000)	43.33(0.000)				

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. For the under-identification, Hansen J. (overidentification) and endogeneity tests, we report the test values with p-values in parenthesis. Also, For the exogeneity tests, we reported the chi sqr. test values with p-values in parenthesis. Other controls are; person's age, marital status, education level and employment status; household's size, income level, energy poverty level and location (rural or urban). Complete estimates are provided in Appendix I (OLS and 2SLS_IV) and II (Probit and IV-Probit, available from the authors on request).
(c) means coefficient is reported rather than marginal effects.

The results from Table 3 confirmed the health difference across gender. In line with the findings and arguments in the literature, including that of Iddrisu et al. (2025) in Ghana, Verbrugge (1989), Malmusi et al. (2012) and Zhang, d'Uva and Doorslaer (2015) in America, Spain, and China respectively, the coefficient of the gender dummy (Female) is negative and statistically significant at the conventional levels across all regressions in Tables 3. In each case, it indicates that females, on average, are more likely to report being ill compared to their male counterparts. Referring to the OLS estimates in column (5), the results suggest that females are about 0.054 percentage points less likely to report being healthy (not report illness) than males. The probable health difference became more pronounced after accounting for endogeneity in column (7), indicating corrections made to the bias of the OLS estimator. Based on the 2SLS-IV estimates in column (7), females are found to be about 0.063 percentage points less likely to report being healthy than their male counterparts, all else equal. This finding aligns with our expectations and is consistent with the existing literature, particularly Iddrisu et al. (2025) in Ghana.

Next, we analyse the health effects of financial inclusion. In line with the argument of previous literature (Sarma and Pais, 2011; Koomson and Ibrahim, 2018) and finding of Gyasi et al. (2019) in Ghana, the results of the IV estimates (IV-probit and 2SLS-IV) show (at 1%

significance level) that people who have higher level of financial inclusion are healthier than their counterparts who are less included. Here, the insignificance of the Probit and OLS results may be indicative of their anticipated bias. Referring to the 2SLS-IV estimates in column (7), people with higher levels of financial inclusion are about 1.34 percentage points more likely to be healthy than their counterparts with low financial inclusion, all else equal. This finding is intuitive since higher levels of financial inclusion may be associated with higher investment in health[2].

Finally, the results indicate that financial inclusion may play a role in the gender-health gap, in the sense that a higher level of financial inclusion can potentially reduce the health gap across gender. Specifically, in the IV-probit and 2SLS-IV estimates (columns 4 and 8), although the coefficient of the female dummy indicates that males with a lower level of financial inclusion are about 0.14 percentage points (column 8) less likely to report being healthy compared to their counterparts with a higher level of financial inclusion. The coefficients of the interaction term 'Female*F. Inclusion' are positive but statistically insignificant, indicating no significant health difference across gender for people with higher levels of financial inclusion.

Our measure of health outcome relies on a binary variable (healthy) that is 1 for individuals who reported not suffering from any illness during the last two weeks before the interview. Hence, to mitigate short-term health bias, we present estimates of IV-probit and 2SLS-IV using stratified age groups (18 to 35 years, 36 to 55 years and 56 to 75 years) as a robustness check in Table 4. This is because children and the aged are often susceptible to short-term shocks (e.g. flu) which can cause short-term health bias in the results. From Table 4, the instruments are well-identified except for the age group 56 to 75 years. Specifically for that age group, the test statistics of under-identification suggest that the instruments are not relevant and the endogenous regressors are weakly identified as indicated by the F-statistics values. Thus, estimates for the age group 56 to 75 years is not reliable.

The results from Table 4 are consistent with the full sample estimates in Table 3 above that, (i) there is a gender-health gap in Ghana, where females are less likely to report being healthy than their male counterparts, (ii) financial inclusion has adverse effects on individuals' health, as people with lower levels of financial inclusion report lower health, and finally (iii) our estimates suggest that financial inclusion may contribute to closing the gender-health gap.

As a robustness check of the health effects of financial inclusion across gender, we provided estimates for gender sub-samples in Table 5 (complete estimates of both Probit and Least Squares are in Appendices III and IV, which are available from the authors on request).

[2] Estimates of the effect of FI on heath expenditure are in Appendixes, which are available from the authors on request.

Table 4: Estimates of Equations (1) and (2) using IV-Probit and 2SLS instrumental variables (IV) for age strata

Dependent Variable: Health Status (healthy=1, illness=0)				
Independent Variables	IV-Probit		2SLS-IV	
18 years to 35 years	(1)	(2)	(3)	(4)
Female	-0.187***	-0.225	-0.048***	-0.085*
	(0.0338)	(0.195)	(0.007)	(0.050)
Fin. Inclusion index	3.765***	3.600***	1.000***	0.897***
	(0.611)	(0.995)	(0.309)	(0.338)
Female*F. Inclusion		0.266		0.260
		(1.335)		(0.349)
Under identification test			45.275 (0.000)	49.660 (0.000)
Hansen J (overid)			1.188 (0.276)	1.045 (0.593)
Endogeneity test			13.494 (0.000)	14.717 (0.00)
F-stat			22.961	12.614
District Effect	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Observations	13,399	13,399	13399	13399
Wald test of exogeneity	32.18(0.000)	43.33(0.000)		
36 years to 55 years	(1)	(2)	(3)	(4)
Female	-0.198***	-0.364	-0.083***	-0.192
	(0.0489)	(0.285)	(0.015)	(0.147)
Fin. Inclusion index	4.721***	4.168***	1.889**	1.558**
	(0.567)	(1.132)	(0.781)	(0.750)
Female*F. Inclusion		1.230		0.774
		(2.131)		(0.995)
Under identification test			12.977 (002)	8.343 (0.039)
Hansen J (overid)			1.528 (0.217)	2.137 (0.344)
Endogeneity test			10.368 (001)	9.326 (009)
F-stat			6.471	2.442
District Effect	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Observations	6,994	6,994	7004	7004
Wald test of exogeneity	11.94 (0.001)	13.76 (0.001)		
56 years to 75 years	(1)	(2)	(3)	(4)
Female	-0.211**	-1.002**	-0.113***	-0.876
	(0.104)	(0.418)	(0.033)	(0.678)
Fin. Inclusion index	4.418***	1.707	2.268	1.200
	(1.049)	(2.166)	(1.692)	(1.658)
Female*F. Inclusion		5.275**		4.668
		(2.521)		(4.084)
Under identification test			3.984 (0.136)	2.025 (0.567)
Hansen J (overid)			0.280 (0.597)	0.629 (0.730)
Endogeneity test			3.659 (0.056)	6.566 (0.038)
F-stat			2.021	0.537
District Effect	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Observations	2,198	2,198	2203	2203
Wald test of exogeneity	3.62 (0.057)	12.66 (0.002)		

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. For the under-identification, Hansen J. (overidentification) and endogeneity tests, we report the test values with p-values in parenthesis. Also, For the exogeneity tests, we reported the chi sqr. test values with p-values in parenthesis. Other controls are; person's age, marital status, education level and employment status; household's size, income level, energy poverty level and location (rural or urban).

Table 5: Estimates of Equations (1) and (2) using 2SLS-IV for gender Sub-Samples

Dependent Variable: Health Status (healthy=1, illness=0)						
	Female sub-sample		Male sub-sample		$\beta_{Female} = \beta_{Male}$	
Independent Variables	(1)	(2)	(3)	(4)	Z values	
	IV-Probit (dy/dx)	2SLS-IV	IV-Probit (dy/dx)	2SLS-IV	IV-Probit	2SLS-IV
Fin. Inclusion	**2.278*** (0.687)**	**2.263*** (0.662)**	**0.817*** (0.303)**	**0.843*** (0.310)**	**1.946**	**1.942**
Under identification test		22.677(0.00)		41.244(0.00)		
Hansen J (overid)		0.392(0.531)		0.217(0.641)		
Endogeneity test		24.779(0.00)		8.698(0.003)		
F-stat		11.492		20.836		
District Effect	Yes	Yes	Yes	Yes		
Other controls	Yes	Yes	Yes	Yes		
Observations	11,101	11,101	11,505	11,505		
R-squared		-1.248		-0.193		
Wald test of exogeneity	9.32(0.0023)		26.49(0.000)			

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. For the under-identification, Hansen J. (overidentification) and endogeneity tests, we report the test values with p-values in parenthesis. Also, For the exogeneity tests, we reported the chi sqr. test values with p-values in parenthesis. Other controls are; person's age, marital status, education level and employment status; household's size, income level, energy poverty level and location (rural or urban). Complete estimates are in Appendix III (OLS and 2SLS-IV) and IV (Probit and IV-Probit, available from the authors on request).

Relying on the IV estimates, these sub-sample estimates provided results consistent with that of Table 3. The coefficients remain positive and significant, suggesting that, in both sub-samples, people with a higher level of financial inclusion are more likely to be healthy than their counterparts with a lower level. For the female sub-sample, in column (1), those with a higher level of financial inclusion are about 2.28 percentage points more likely to be healthy.

Whiles in column (3), those with a higher level of financial inclusion are about 0.82 percentage points more likely to be healthy for the male sub-sample. It should be noted that a comparison of the coefficients across the two sub-samples does not suggest statistically significant gender differences in the magnitude of the estimated effects. The z values[3] provided in Table 5 were all below 1.96, thus, failing to reject the null hypothesis that $\beta_{Female} = \beta_{Male}$, and one cannot conclude that financial inclusion affects females differently than males.

5 Conclusion and Policy Implications

The link between financial inclusion and the gender-health gap has been under research in empirical literature. Previous literature suggests that financial inclusion promotes investments in health. It is also established in the existing literature that women report more illnesses, have

[3] Following the works of (Clogg et al., 1995; Paternoster et al., 1998), the formula $z = \frac{\beta_1 - \beta_2}{\sqrt{(SE\beta_1)^2 + (SE\beta_2)^2}}$ is argued to be appropriate for testing for the difference between two regression coefficients.

worse health outcomes, and exhibit higher health care utilization compared to men, despite their higher life expectancy. Financial inclusion is widely argued to help improve people's income level, and higher income level plays a significant role in maintaining better health outcomes. Incidentally, gender difference in financial inclusion exists where females are largely excluded, and this could be partly responsible for the health differences across gender. As a result, the current study contributes to the literature by exploring the role of financial inclusion in the gender-health gap in Ghana. Specifically, we used micro-level data from the sixth round of the Ghana Living Standards Survey (GLSS), restricted the sample to people between the ages 18 to 75 years and employed various identification strategies to investigate; (i) the gender-health gap using self-reported health measure, (ii) the paper investigates the health effects of FI using multidimensional FI measures, and (iii) the role of FI in the gender health-gap.

The findings suggested a confirmation of the gender health gap in Ghana, which tends to be biased towards females; thus, in Ghana, females are less healthy than males. Again, people who are financially included (have higher financial inclusion levels) are healthier than their less included counterparts. The implication is that people who use more financial services (such as own bank account, have access to credit/loan, have insurance cover and receive financial remittance from the bank or through mobile money) are healthier than those who use less services. Finally, there was an indication that a higher level of financial inclusion has the potential to reduce the health gap across genders, as there was no significant health difference across genders for people with a higher level of financial inclusion. In other words, there is no significant health gap across gender for people who use more financial services compared to those who do not. The study concludes that there is a gender health gap which tends to be less favourable to women in Ghana. Financial inclusion has positive health effects which may potentially contribute to closing the gender-health gap. Thus, policymakers of developing countries should be mindful that policies promoting financial inclusion may help address the gender-health gap in Ghana and other developing countries with similar characteristics. This is possible through improved access to financial services, especially for women, and conducting gender-focused financial literacy programs where women benefit the more. This is because, in Ghana, women as compared to men are less financially literate and are less able to access credit from financial institutions due to lack of landed properties to be used as collaterals. To do this, policy makers will have to partner with financial service providers to removed barriers to financial inclusion, such as stringent requirements for opening an account or acquiring loans, particularly for women who are known to lack landed properties as collaterals to access credit. They can also educate women on the benefits of financial inclusion as well as bring those services to their doorsteps, especially in the rural areas where there are no well-established financial institutions. Thus, expanding and supporting microfinance and other forms of financial institutions' (pro-poor) operational modalities in Ghana (e.g. mobile banking), especially in rural areas will improve access to banks across locations and facilitate financial

inclusion in the country. The limitations of this study are, first, the unavailability of panel datasets to help explore the relationship over time, secondly, unavailability of alternative health measures in the dataset for robustness checks, and finally, the sample size is small and may not be representative enough for the whole country.

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