LEVELS AND DETERMINANTS OF OUT-OF-POCKET HEALTH EXPENDITURES IN THE DEMOCRATIC REPUBLIC OF THE CONGO, LIBERIA, NAMIBIA, AND RWANDA

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Levels and Determinants of Out-of-Pocket Health Expenditures in the Democratic Republic of the Congo, Liberia, Namibia, and Rwanda

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Preface

The Demographic and Health Surveys (DHS) Program is one of the principal sources of international data on fertility, family planning, maternal and child health, nutrition, mortality, environmental health, HIV/AIDS, malaria, and provision of health services.

One of the objectives of The DHS Program is to analyze DHS data and provide findings that will be useful to policymakers and program managers in low- and middle-income countries. DHS Analytical Studies serve this objective by providing in-depth research on a wide range of topics, typically including several countries, and applying multivariate statistical tools and models. These reports are also intended to illustrate research methods and applications of DHS data that may build the capacity of other researchers.

The topics in the DHS Analytical Studies series are selected by The DHS Program in consultation with the U.S. Agency for International Development.

It is hoped that the DHS Analytical Studies will be useful to researchers, policymakers, and survey specialists, particularly those engaged in work in low- and middle-income countries.

Sunita Kishor
Director, The DHS Program

Abstract

This study uses data from the Demographic and Health Surveys to explore the levels and determinants of out-of-pocket health expenditures in four African countries—Democratic Republic of the Congo (DRC), Liberia, Namibia, and Rwanda. The analysis assesses the use of inpatient and outpatient services and estimated out-of-pocket expenditures for the care received in the most recent visit. The highest use of health care services was in Namibia (18% for inpatient care and 41% for outpatient care), and the lowest was in DRC (4% for inpatient care and 7% for outpatient care). Health care was provided predominantly by public health facilities, with private providers being used more for outpatient than inpatient care. Average out-of-pocket spending for health care was highest in Liberia and lowest in Rwanda. Health expenditures were highly skewed to large amounts, and many people received care but did not pay for the services. Individuals from poorer households generally had less out-of-pocket expenditure than wealthier individuals. Health insurance coverage stands out as an important factor affecting the magnitude of out-of-pocket health expenditure in all four countries, but the results are mixed. In DRC and Rwanda health insurance coverage was associated with lower out-of-pocket expenditures for both inpatient and outpatient care services, while in Liberia and Namibia it was associated with higher out-of-pocket expenditures. Our results provide evidence of a need to expand health insurance coverage, especially in countries with low use of health services and high out-of-pocket health expenditures.

Key words: Out-of-pocket health expenditures, health insurance, socioeconomic determinants, Democratic Republic of the Congo (DRC), Liberia, Namibia, Rwanda

Executive Summary

Out-of-pocket spending on health care constitutes a significant portion of household expenditure in many low- and middle-income countries. This study explored levels and determinants of out-of-pocket health expenditures in four African countries—the Democratic Republic of the Congo (DRC), Liberia, Namibia, and Rwanda—using nationally representative data from the Demographic and Health Surveys (DHS), focusing on outpatient and inpatient care.

Methods

The DHS surveys collect health expenditure data in a separate module, but the method of collecting information on inpatient and outpatient health care services may vary from one country to another. The study countries were selected based on the similarity in approaches for collecting data on health care costs in the most recent survey. The main outcome of interest was out-of-pocket payments for health care services received (laboratory test, consultations, and drugs/medication) for the most recent visit. Because out-of-pocket health expenditures are directly linked to health care utilization, the study analyzed the use of inpatient and outpatient services among all household members. Explanatory variables at the individual, household, and community levels that may affect use of health care services and out-of-pocket spending were determined based on Anderson and Newman's model of pre-disposing, enabling, and needing factors of health-care-seeking behavior. The correlates of health care utilization were modeled using logistic regression. Because many individuals who received health care reported zero expenditures, two-part models were used to model out-of-pocket health spending.

Results

Use of inpatient care ranged from 4% to 18% in the four study countries. Use of outpatient care was generally higher than inpatient care, ranging from 7% to 41%. DRC had the lowest levels of health care use and Namibia had the highest. Inpatient care was provided predominantly at public health facilities, while the use of private providers was more common for outpatient than inpatient services.

In Liberia, Namibia, and Rwanda the most commonly reported reason for seeking inpatient care was for sexual and reproductive health, at 8%, 20%, and 35%, respectively. In DRC more than one-third of individuals sought inpatient care for fever and malaria. For outpatient care, a wider range of reasons was reported. Among those, malaria was commonly reported in DRC and Liberia; preventive care was more commonly reported in Namibia and Rwanda than in Liberia and DRC.

Across all four study countries, the use of health care services was consistently associated with individuals' sex and age, and with the educational attainment level of the household head. Health insurance coverage increased the likelihood of using both inpatient and outpatient care services in Rwanda, where data on health insurance were available for all household members. Regional variation in the use of health care services remained statistically significant even after controlling for other variables.

Absolute levels of out-of-pocket spending on health care received during the last visit varied substantially across countries. Health expenditures were highly skewed to large amounts. The percentage of individuals receiving health care but not paying for it ranged from 3% in Rwanda to 44% in Liberia. Average cost of health care services was highest in Liberia followed by Namibia, DRC, and Rwanda. Spending on health services differed by type of provider. The average out-of-pocket expenditure for inpatient care in a public facility was half or less that of care from a private provider. Differences between public and private providers in health expenditures are less pronounced for outpatient than inpatient care. Individuals spent the most on inpatient care received due to an accident or injury.

Health insurance coverage stands out as an important factor affecting the magnitude of out-of-pocket expenditures in all countries, but the results are mixed. In DRC and Rwanda health insurance coverage was associated with lower out-of-pocket expenditures for both inpatient and outpatient care services, while in Liberia and Namibia it was associated with higher out-of-pocket payments. Poorer households generally spent less in absolute terms on out-of-pocket payments. Among other factors, sex and age were significantly associated with the level of out-of-pocket expenditures. Women tended to spend less than men, and cost of care generally increased with age.

Conclusion

Country use of inpatient care ranges from 4% to 18%, and use of outpatient care, from 7% to 41%. Health care provision primarily relies on public health providers. Out-of-pocket health expenditures vary substantially across countries. While the limited use of health services relates to many factors, cost is an important barrier to access. Our results suggest that expanding health insurance coverage, especially in Liberia and DRC, where service use is low and out-of-pocket health expenditure is high, may be conducive to lower out-of-pocket payments depending on the type and level of coverage. Evidence from existing studies demonstrates that risk pooling through health insurance can be one effective way for increasing use of health care and reducing the likelihood of high out-of-pocket health expenditures.

1.   Introduction

Universal health coverage—access to affordable and good-quality health services—is essential to human welfare and economic and social development. Financial protection is a key goal of universal health coverage (World Health Organization 2010). Health financing can be achieved through a variety of channels, including government budgets (e.g., taxes), donor funding, health insurance, and direct payments. In many countries direct payments, such as over-the-counter payments for medications and fees for doctors and services, are the main form of health financing (World Health Organization 2010). In many low- and middle-income countries (LMICs), out-of-pocket health payments represent a significant portion of household income expenditures. The incidence of catastrophic out-of-pocket health payments, defined by the World Health Organization (WHO) as exceeding 40% of household income[1], is linked to a vicious cycle of impoverishment because households have to scale back spending on other necessities such as food and children's education. Several studies have explored out-of-pocket health expenditures, and many have focused on catastrophic health expenditures. Documenting levels and determinants of out-of-pocket health expenditures can help inform public policies aimed at achieving universal health coverage.

This study explores health care utilization and out-of-pocket expenditures in four African countries—Democratic Republic of the Congo (DRC), Liberia, Namibia, and Rwanda—using nationally representative data from the Demographic and Health Surveys (DHS). We focus on outpatient and inpatient care. Outpatient care includes consultation or treatment sought from a health care provider, pharmacist, or traditional healer without hospitalization or an overnight stay. Inpatient care refers to hospitalization. The main outcome of interest is out-of-pocket health payments. Because out-of-pocket health expenditures are directly linked to the use of health care, the report provides up-to-date information on overall levels of health care utilization and out-of-pocket health expenditures by background characteristics of individuals and their households, as well as by type of provider and condition or illness. We model health care utilization using logistic regression and model out-of-pocket health expenditures using two-part models and generalized linear models. Existing studies frequently use sub-national or sub-district samples or address only one illness or condition. Additionally, the methods for defining and collecting expenditure data vary greatly across studies, prohibiting comparisons across settings or over time (McIntyre et al. 2006). This study contributes to the existing body of knowledge by using nationally representative data that are relatively comparable in their collection of health expenditure information and coverage of a range of illnesses and conditions.

1.1.   Overview of Out-of-Pocket Health Expenditures

Several recent studies have explored levels and determinants of out-of-pocket health expenditures in low- and middle-income countries, with a focus on catastrophic health spending. Out-of-pocket health expenditures include payment of cash or goods for direct health care services, such as medicines, consultation fees, and laboratory diagnostic tests. Out-of-pocket spending on health care can constitute a substantial portion of household expenditure. An analysis of World Health Survey data from 51 LMICs found health care expenditures accounted for 13% to 32% of total monthly household expenditure (Wagner et al. 2011). Other studies document a lower share of health care expenditures. One study found Kenyan households on average spend 5% of their annual budget on outpatient services and 2% on inpatient services (Chuma and Maina 2012). A study in Agincourt, South Africa, found that households experiencing illness spend about 5% of their total household expenditure on direct health care costs (Goudge et al. 2009). A cohort study in Pelotas, Brazil, found a large proportion of families spent more than 15% of their income on health care for their children (da Silva et al. 2015). Data from a national survey in India found out-of-pocket expenditure on health care constituted about 5% of total household expenditure (Garg and

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[1] WHO glossary of technical terms

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Karan 2009). In Rajshahi, Bangladesh, monthly out-of-pocket health care expenditure comprised 11% of total household expenditure (Rahman et al. 2013).

Health spending is considered catastrophic when a household has to reduce other spending to compensate for health expenditure. Catastrophic health expenditures can be calculated as the proportion of total income or effective income spent out-of-pocket on health care. Although WHO uses a 40% threshold for defining catastrophic health expenditures, the defined threshold for proportion of health expenditure qualifying as catastrophic health expenditures varies by study, typically ranging from 5% to 40% of income (Xu et al. 2003). The proportion of the population experiencing catastrophic health expenditures varies greatly by country, but also by survey and method of calculation (Raban, Dandona, and Dandona 2013; van Doorslaer et al. 2006; Xu et al. 2003).

1.2. Determinants of Out-of-Pocket Health Expenditures

Out-of-pocket payments for health services are related to a number of institutional and provider-level factors, including inefficiencies in the delivery of health care that range from over-prescription of antibiotics and injections, use of expensive medicines in place of cheaper alternatives, medical errors, and incorrect diagnosis or treatment (World Health Organization 2010). Individual and household characteristics also influence out-of-pocket health expenditure. The most commonly cited covariates include age, gender, education, household socioeconomic status, household location, type of illness or condition and its severity, type of health care provider (public versus private), and health insurance coverage.

1.2.1. *Age, gender, and education*

In general, existing literature indicates that out-of-pocket health expenditures are higher for older individuals, women, and the more educated. A cohort study in Pelotas, Brazil found average medical expenditure for children decreased from age 12 to 48 months (da Silva et al. 2015). An analysis of the determinants of out-of-pocket expenditures in China found that individuals age 65 and older were likely to have higher out-of-pocket expenditures compared to younger age groups (You and Kobayashi 2011). A study in eight provinces in China found that, excluding maternal health expenditures, women age 20-34 had higher curative health expenditures than men in the same age range, and women's expenditures were more sensitive to family income than men's (Gao and Yao 2006). On the other hand, a study of the determinants of out-of-pocket and catastrophic health expenditures in a rural community in India found that men were more likely to incur out-of-pocket health expenses than women (Brinda et al. 2012). In Brazil, better-educated mothers are more likely to report higher out-of-pocket expenditures for medicines and private health insurance for their children (da Silva et al. 2015). In India, two studies found higher household educational attainment was associated with increased spending on maternal health (Leone, James, and Padmadas 2013; Mohanty and Srivastava 2013). A positive association between level of education and out-of-pocket expenditure was found in a study of the determinations of out-of-pocket health payments for malaria among child under age 5 in Uganda (Orem et al. 2013).

1.2.2. *Socioeconomic status*

Household socioeconomic status is the household characteristic most commonly associated with variation in out-of-pocket health expenditure. However, the relationship between income or household socioeconomic status and out-of-pocket expenditure can be mixed. Studies in Kenya, Namibia, Nigeria, Albania, Bangladesh, and India found that poorer individuals and households had lower absolute out-of-pocket expenditures on health care than wealthier households, but the relative proportion of health care expenditure to total or non-food household expenditure was significantly higher in poorer households (Chuma and Maina 2012; Gustafsson-Wright, Janssens, and van der Gaag 2011; Hotchkiss et al. 2005; Karan, Selvaraj, and Mahal 2014; Onwujekwe et al. 2014; Rahman et al. 2013). Two studies in Brazil and India found that poorer households spent a greater proportion of their income on child health care (da Silva et al. 2015; Dongre, Deshmukh, and Garg 2010). In Kenya out-of-pocket costs for pediatric hospitalizations

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were statistically higher for poorer households compared with wealthier households (Barasa et al. 2012). On the other hand, an analysis of out-of-pocket expenditures in Nepal found a positive association between income and out-of-pocket health expenditures; income had a direct effect on out-of-pocket spending and had an indirect effect through provider choice (Rous and Hotchkiss 2003). A study in South Delhi, India, found that women in high-income areas spent approximately 10 times more on delivery and newborn care than those in lower-income areas (Dhar et al. 2009). In some contexts OOP payments do not appear to differ by households' income or socioeconomic status. An analysis of data from Burkina Faso, Kenya, and Tanzania showed no significant variation in delivery expenditures by wealth quintile (Perkins et al. 2009). A study in Cambodia suggested out-of-pocket spending was equitable in the country, largely due to widespread use of the private sector across socioeconomic groups (Dalal and Aremu 2013)(19). A systematic review of publications on out-of-pocket expenditure in China found no association between socioeconomic status and tuberculosis treatment costs (Long et al. 2011). A similar finding was recorded by another study of out-of-pocket payments in China, which found that except for the wealthiest 5%, spending on health care was the same across socioeconomic groups (You and Kobayashi 2011).

1.2.3. *Location*

Location—whether the household is in an urban area or a remote rural area—can influence out-of-pocket health care expenditure, although the direction of the association can vary. In Kenya a national study found that mean spending among those with illness was significantly higher in urban than rural areas, although rural households spent a larger proportion of their annual budgets on health care compared with urban households (Chuma and Maina 2012). In Nigeria mean out-of-pocket spending on health care was higher in urban than rural households (Onwujekwe et al. 2014). In Albania rural clients attending Primary Health Centers paid less in consultation fees than those attending similar facilities in urban areas, but rural clients paid more in consultation fees at polyclinics (Hotchkiss et al. 2005). In India rural households paid more than urban households for delivery and neonatal care, regardless of socioeconomic level or state of residence (Leone, James, and Padmadas 2013).

1.2.4. *Type of provider*

Health care expenditure also varies by type of provider. In general, seeking care from the private sector is associated with higher out-of-pocket health expenditures. A multi-country literature review found use of private facilities and hospitalization are both associated with high out-of-pocket health expenditures (Alam and Mahal 2014). An analysis of 39 World Health Surveys had similar findings (Saksena et al. 2012). One study in Bangladesh and two studies in India found that out-of-pocket expenditures for maternal health care were significantly greater in private facilities compared with public facilities (Bonu et al. 2009; Leone, James, and Padmadas 2013; Mohanty and Srivastava 2013; Rahman et al. 2012). A study in Kasulu, Tanzania found that delivery at a government facility was cheaper than at a mission facility due to higher out-of-pocket expenditures on consultation, drugs, and diagnostics at mission facilities (Kruk et al. 2008). In Bangladesh out-of-pocket expenditures for antenatal care (ANC), normal delivery, and cesarean section were much higher in private compared with public facilities due higher consultation fees and costs for medicines (Rahman et al. 2012). In India average out-of-pocket expenditures for antenatal care (ANC), delivery, and postnatal care were two to four times higher in private than public facilities (Leone, James, and Padmadas 2013). In Uttar Pradesh, India, mean out-of-pocket expenditures for neonatal illness were statistically greater in non-government clinics and dispensaries compared with government clinics, and mean expenditures were greater for those who were hospitalized (Srivastava, Awasthi, and Agarwal 2009). A study in Ethiopia on management of uncomplicated malaria found out-of-pocket expenditures were higher if more than one source of care was used, and average direct costs were higher for those using private versus public health facilities (Deressa, Hailemariam, and Ali 2007). In Ulanga District, Uganda individuals seeking malaria treatment in the private sector had 19% higher direct medial costs than those in the public sector, although the difference was not statistically significant (Mikkelsen-Lopez et al. 2013).

1.2.5. *Type of illness and severity*

More severe or complicated illnesses or conditions often result in higher out-of-pocket health expenditures. As mentioned above, hospitalization is associated with high out-of-pocket expenditure (McIntyre et al. 2006). In South Delhi, India cesarean sections resulted in higher out-of-pocket expenditures than normal deliveries, in both public and private facilities (Dhar et al. 2009). In Matlab, Bangladesh, households spent almost 10 times more on complicated deliveries relative to normal deliveries (Hoque et al. 2015). In Burkina Faso and Kenya, costs for complicated delivery were double the costs for normal delivery (Perkins et al. 2009). In Ecuador mean out-of-pocket expenditure for treatment of multidrug-resistant tuberculosis was over four times higher than treatment for non-resistant tuberculosis (Rouzier et al. 2010).

1.2.6. *User fees and health insurance coverage*

Removal of user fees, introduction of insurance schemes, and other interventions have the potential to reduce out-of-pocket expenditure for health care in low- and middle-income countries. User fees refer to any point-of-service charges required and can include payment for registration, consultation, drugs and medical supplies, and outpatient and inpatient health care services (Dodd et al. 2006). In Burkina Faso removal of user fees for children under age 5 reduced average out-of-pocket expenditure for care by more than 80% (Illou et al. 2015). However, catastrophic health expenditures for tuberculosis remained high in Burkina Faso even after the removal of user fees (Laokri et al. 2013). Studies in Indonesia, Laos, India, and Vietnam found that health insurance schemes reduced out-of-pocket spending for health care (Aji et al. 2013; Alkenbrack and Lindelow 2015; Fan, Karan, and Mahal 2012; Sepehri 2014)). In Mali, Ghana, and Senegal, participation in a mutual health organization (MHO) reduced the risk of catastrophic health expenditures for hospitalization, but not out-of-pocket payments for outpatient care (Chankova, Sulzbach, and Diop 2008). In India a community health insurance scheme halved catastrophic health expenditures due to hospitalization (Devadasan et al. 2007). However, in Vietnam an insurance scheme showed no significant effect on out-of-pocket spending, while in Zambia prepayment insurance schemes were associated with increased risk of catastrophic health expenditures (Ekman 2007; Nguyen 2012). A study in India illustrates that health insurance that only covered inpatient care provided illegible protection against poverty due to health spending (Shahrawat and Rao 2012). One study on the determinants of out-of-pocket payments in China found that health insurance increased out-of-pocket health spending (You and Kobayashi 2011).

Interventions other than insurance schemes can also affect out-of-pocket expenditure for health care. In Cameroon decentralization was associated with reduced prevalence of catastrophic health expenditures related to HIV management (Boyer et al. 2011). In Tanzania out-of-pocket health expenditures were lower at government facilities implementing integrated management of childhood illness and at facilities with cost-sharing schemes (Manzi et al. 2005).

1.3. Overview of Health Service Delivery, Health Care Spending, and Financing in the Study Countries

Government health expenditure is a core indicator of health financing systems, reflecting the relative contribution of public entities to total spending on health. It refers to resources collected and pooled by public agencies regardless of the source, so includes any donor (external) funding passing through these agencies. It also comprises health expenditures made by parastatals, extra-budgetary entities, and compulsory health insurance payments (World Health Organization). Appendix Table 1 illustrates the contributions of the public and private sectors to total health expenditures in the study countries. In all of the study countries except Namibia, the private sector accounts for close to two-thirds of total health expenditures.[2] Appendix Table 2 illustrates total health expenditure and out-of-pocket payments per capita in millions of constant 2010 US dollars (USD). While per capita health spending and out-of-pocket

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[2] Private sector spending includes out-of-pocket payments.

payments are relatively high in Namibia, the share of out-of-pocket payments as a percentage of total health expenditures is the lowest among the four countries. Except in Namibia, where direct payments by users account for only 7% of total health expenditures, the share of out-of-pocket spending is high, at 39% in DRC, 31% in Liberia, and 28% in Rwanda in 2014.

The level of health spending and the share of financing from the public and private sector and the burden of out-of-pocket payments vary by country, and this variation may be related to differences in the level of health care coverage and delivery of services. The following section provides an overview of health service delivery, mechanisms for health care financing, user fees, and insurance schemes in the four study countries.

DRC

About one-third of health facilities in the DRC are operated by faith-based organizations (FBOs) in partnership with the Ministry of Health (MoH). The lack of government support has resulted in some facilities becoming *de facto* privatized, with operating costs supported exclusively by user fees. Numerous NGOs support facilities at the local level. Parastatal companies once operated facilities, but few remain. Formal for-profit small clinics can be found in major cities. Informal providers, particularly drug sellers, are common in many urban and rural areas (Africa Region Human and Health 2005). Health care services are largely funded by external resources. In 2014, external donors covered about 37% of total health expenditure, with a focus on basic service delivery at the community and primary level, or on priority diseases. The level of government and donor funding for health care varies by health zone. For example, some zones receive no support or only salary support from the central government (Africa Region Human and Health 2005), and this can have implications on the quality and cost of care. The MoH enacted a policy to subsidiz,e and in some cases, remove fees for vulnerable groups such as sexual abuse survivors, indigents, and the elderly. MoH also supports waiving user fees during states-of-emergency in conflict zones, although this is not always enforced. Some NGOs have piloted health programs with subsidized or zero user fees for target groups, and in some cases, for the general population (Maini et al. 2014). Despite efforts to reduce direct payments by subsidizing or removing user fees, out-of-pocket spending accounts for 39% of total health expenditures. There are no major insurance schemes available in the DRC.

Liberia

In 2007 Liberia's national health plan stressed multi-sectoral involvement in the provision of health services, including NGO, FBO, and private providers (Republic of Liberia Ministry of and Social 2007). NGOs and private agencies support 90% of health care services (WHO Health Action in Crises 2005). However, health care utilization is low. For example, only 25% of the population has access to referral services (WHO Health Action in Crises 2005). Rural areas have fewer skilled staff and mid-to-high level staff are still scarce nationally (WHO African Health Observatory 2014a). External funding supports a little less than half of total health expenditures, and out-of-pocket spending by households accounts for about one-third of the total (WHO African Health Observatory 2014a). Donor funds predominantly support primary care services. Referral hospitals account for the greatest proportion of government expenditure (WHO African Health Observatory 2014a). Since 2007, all primary care services are provided free-of-charge in public health facilities (Republic of Liberia Ministry of and Social 2007; Yates 2009). The Liberian Health Equity Fund (National Insurance Scheme) was put on hold in the design phase due to the Ebola outbreak (ThinkWell 2016). The national insurance scheme was designed to cover free basic services with government funding and to offer a "mid-level" package of services for enrollees (Liberia Ministry of Health 2013).

Namibia

In Namibia the public sector provides services for the great majority of the population (85%), while facilities in the private sector cover the remainder. Since desegregation (following the abolition of apartheid), there has been a push toward increasing access to services in rural areas as part of a Primary Health Care (PHC) approach (WHO African Health Observatory 2014b).

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Public health facilities are financed primarily through taxation. Most private health care is funded through employer/employee contributions—implying that it is paid for through private insurance or contracts between businesses and health care providers and therefore is funded through monthly premium payments from employees and employer contributions (WHO African Health Observatory 2014b). Mission facilities operate with government contracts. The level of out-of-pocket health expenditure is low and declining (WHO African Health Observatory 2014b). Donor funding has increased since 2000 and accounts for 50% of Namibia's HIV/AIDS program (WHO African Health Observatory 2014b). Half of the country's total health budget is allocated to public and mission hospitals, health centers, and clinics. Only 4% of the budget is directed to primary health care programs. In 2010 one-third of health expenditures targeted HIV. Reproductive health care accounts for 10% of total health expenditures. About 54% of total health expenditures are related to inpatient and outpatient care, and 15% to public health programs (WHO African Health Observatory 2014b).

User fees vary by health facility and condition for receiving care (WHO African Health Observatory 2014b). HIV prevention and treatment services are provided at no cost (WHO African Health Observatory 2014b). Fee exemptions are provided for notifiable diseases, preventive and promotive services, and for children under age 5 and pregnant women (WHO African Health Observatory 2014b). A number of private and employer-contracted health insurance schemes operate in Namibia, including the Public Service Employees Medical Aid Scheme (PSEMAS) for civil servants. Insurance schemes are regulated through the Namibia Financial Institutions Supervisory Authority (Ministry of, Social, and Macro 2010). The government of Namibia has been evaluating the feasibility of moving to universal coverage through a national health insurance scheme (WHO African Health Observatory 2014b).

Rwanda

Rwanda has adopted a bottom-up approach for the delivery of public primary health care, with facilities financed and managed by communities (Sekabaraga et al. 2011). Faith-based organizations and NGO not-for-profit facilities are considered part of the public health system and are subject to government standards. About 40% of facilities are owned by FBOs or NGOs, and these are mostly health centers. The role of private-sector health facilities is small and is concentrated in urban areas, but recent policy states an interest in increasing their role in the provision of services (Republic of Rwanda: Ministry of Health 2008).

Between 2002 and 2007 public health spending in Rwanda increased threefold (Sekabaraga et al. 2011). The country has implemented three strategies to improve health financing: community-based insurance—"*Mutuelle de Santé,*" performance-based financing, and fiscal decentralization (Sekabaraga et al. 2011). The *Mutuelle,* which was initiated in 2004 and is heavily subsided by the government, offers low and sliding premiums, including no premium for the poorest 25%, and covers a wide range of preventive and curative care services as well as delivery care (Rosenberg 2012; Saksena et al. 2011). *Mutuelle* premiums cover 45% of public sector operating costs, with the remaining amount covered by external donor funding, which is mostly earmarked for health insurance (Rosenberg 2012). In 2008, about 85% of the population was covered by the *Mutuelle* (Sekabaraga et al. 2011). In 2012, 96% of the population was covered by health insurance. Increasing insurance coverage has reduced household out-of-pocket health expenditures (Sekabaraga et al. 2011).

2.   Data and Methods

This study used a logistic model to estimate the correlates of health care utilization. It also used two-part models and generalized linear models to assess the determinants of out-of-pocket heath expenditures for outpatient and inpatient care in the four African study countries.

2.1.   Data

The data used in this study come from Demographic and Health Surveys (DHS). The DHS Program has been providing technical assistance in the implementation of more than 300 surveys spanning more than 90 developing countries. DHS surveys are a key source of nationally representative and comparative data on population and health indicators. The DHS collects standard information on household and respondent characteristics; environmental health; child health and nutrition; infant and child mortality; maternal health and morality; family planning, fertility, and fertility preferences; knowledge of HIV/AIDS; and women's empowerment.

The selection of countries for this study was carried out in two stages. In the first stage we reviewed data collected from 125 DHS surveys in 60 countries spanning South and Southeast Asia, Latin America and the Caribbean, and sub-Saharan Africa conducted between 1989 and 2016 to determine if the survey collected information on outpatient and inpatient care, health expenditures, and health insurance coverage. A total of 12 countries were identified using these criteria.[3] Country selection was further refined after careful review of the health expenditures modules for each of the 12 countries. At this second stage of country selection, the criterion of comparability was applied. The health expenditures module is country-specific and there is substantial variability in the way the data are collected and how questions are asked. For example, the Cambodia DHS combined inpatient and outpatient care; the Dominic Republic DHS collected total cost on inpatient care during the reference period without specifying whether these costs pertain to the most recent visit or all visits during the reference period, and collected outpatient care cost only for the most severe illness.

From among the 12 countries, we selected countries with the most recent survey data on health seeking behavior and health expenditures, and with largely comparable approaches for the sample selection for the health module and the reference period, in order to have consistency in the data across countries. This resulted with a smaller sample of four study countries—DRC, Liberia, Namibia, and Rwanda. The Rwanda DHS 2010 and DRC DHS 2013-2014 collected information on health seeking behavior and health expenditures for all members of the household who received inpatient care in the six months preceding the survey, and collected information on outpatient care in the four weeks preceding the survey. Detailed information was recorded for up to three outpatient visits and three inpatient admissions that occurred during the reference period. The Namibia DHS 2013 collected information for the last admitted household member for their most recent outpatient care that occurred in the four weeks preceding the survey and their most recent inpatient admission that occurred during the six months preceding the survey. The Liberia DHS 2013 identified all household members who reported receiving outpatient care, but collected detailed information for up to three outpatient visits for only one randomly selected household member from among those who reported receiving and paying for outpatient care in the four weeks preceding the survey. The Liberia DHS 2013 collected detailed information on inpatient care for up to three admissions for all members of the household who received inpatient care in the six months preceding the survey. In this study, to facilitate cross-country comparisons we limited analysis of outpatient and inpatient care and costs to the most recent visit or admissions.

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[3] These countries included: Afghanistan, Cambodia, Dominican Republic, DRC, Honduras, Liberia, Maldives, Mali, Namibia, Mozambique, Philippines, and Rwanda.

2.2. Definitions of Variables

2.2.1. *Dependent variables*

The study explored the health seeking behavior of individuals and the costs associated with seeking outpatient and inpatient care. The DHS collected data about inpatient care by asking the household survey respondent to list all household members who stayed overnight in a health facility during the past six months. The variable for inpatient care is dichotomous and coded 0 or 1. The DHS also asked the respondent to list all household members who received care in the last four weeks without being hospitalized or staying overnight, including family planning visits, prenatal or postnatal care, child health monitoring, from a health care provider, pharmacist, or traditional healer. The dependent variable for outpatient care is also dichotomous and coded 0 or 1.

For each health care visit, the DHS asked the household respondent to report how much was spent for inpatient treatment and services, including all costs for laboratory tests, drugs/medications, consultations, or other items related to the overnight stay. To obtain information about spending for outpatient care, the DHS asked the household respondent how much was spent for treatment and services, including consultation fees, drugs/medication, examinations, and other services.[4] In three of the four study countries, the expenditure data were collected and recorded in local currency, except for DRC, where data were converted and recorded in current US dollars (USD) using the exchange rate at the time of the survey.

We converted health expenditures from local currency to constant 2010 USD for consistency across countries. We used this approach rather than exchange rates because, while exchange rates convert to a common currency, they do not account for differences in the purchasing power of currencies in their national markets (World Bank 2016b). This conversion requires the purchasing power parity (PPP) factor, which is the number of units of a country's currency required to buy the same amounts of goods and services in the domestic market as a US dollar would buy in the United States.[5] The PPP is based on 2011 prices because this is the most recent year for which the most comprehensive data on the price of consumer goods and services is available from 199 countries.[6] To account for inflation between the survey year and 2011, the year for which PPP is based, the consumer price index (CPI) of the local currency for the survey month and the average CPI of the local currency in 2011 is required. The CPI is the most common measure of inflation and reflects changes in the cost to the average consumer of acquiring a basket of goods and services. The steps to convert health expenditure data collected in the country' local currency units (LCU) to constant 2010 USD (2011 PPP adjusted to 2010 US prices) are:[7]

1. Convert LCU at the time of the survey to LCU at 2011 prices, by dividing by the ratio of the CPI for the survey month to the average CPI for 2011.[8]

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[4] The DRC DHS 2010 included the cost of transportation in the total health expenditure. We subtracted transportation cost from the total out-of-pocket expenditures based on the itemized cost information.
[5] http://data.worldbank.org/indicator/PA.NUS.PPP.
[6] For more information on the International Comparison Program which compiles price and expenditure data and estimates of PPP, refer to the following:
http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/ICPEXT/0,,contentMDK:22377119~menuP K:6782100~pagePK:60002244~piPK:62002388~theSitePK:270065,00.html.
[7] Because health expenditure data were converted and recorded in current US dollars (USD) using the exchange rate at the time of the survey, we used the exchange rate to re-convert the cost data to local currency and followed the same steps outlined above to then convert the figures into 2010 constant US dollars.
[8] CPI available at http://data.worldbank.org/indicator/FP.CPI.TOTL.

2. Convert 2011 LCU to 2011 USD by dividing by the 2011 PPP conversion rate for the country's currency.[9]

3. Convert USD in 2011 prices to USD in 2010 prices by dividing by 1.032, which is the ratio of US CPI for 2011 to US CPI in 2010.[10]

2.2.2. *Explanatory variables*

We assessed the association between a number of individual, household, and community characteristics and whether or not individuals sought health care, and the out-of-pocket spending associated with this care. We based our selection of covariates for health care use on the model developed by Anderson and Newman (Andersen and Newman 1973). Anderson and Newman's model distinguishes between predisposing factors (e.g. age, sex, past illness, education, occupation, attitudes about health services, and knowledge about disease); enabling factors (e.g., income, health insurance coverage, access to health care providers; cost of health services, and other community level factors); and needing factors (e.g., disability, illness, diagnosis).

We controlled for a variety of variables including: sex, age and education of the individual who received care; whether the individual slept under a long-lasting insecticide-treated net (LLIN); whether the individual was covered by health insurance; sex, age, and education of the head of the household; the household wealth quintile; whether the household practiced correct water treatment; whether the household accessed an improved water source; whether the household used an improved, not shared sanitation facility; and the number of household members. We also included regional dummies and a measure of whether the household was located in an urban area (coded 0 or 1) based on country–specific definitions. The regional dummies are expected to capture variations in the availability and accessibility of care, doctors' fees, and price differences in health services. Our selection of these covariates was guided by Anderson and Newman's model, by empirical evidence from the literature (Brinda et al. 2012; Jung and Liu Streeter 2015; Orem et al. 2013; Rous and Hotchkiss 2003; Van Minh et al. 2013; You and Kobayashi 2011), as well as by the availability of data for the four study countries.

The sex, age, and level of the individual are predisposing factors for use of health care and are correlated with out-of-pocket health expenditures. Women, especially women of childbearing age, may be more predisposed to using health care services compared with men, and their expenditures may be more sensitive to income than is the case of men. Infants and younger children, women of childbearing age, and the elderly may be more inclined to seek health care services and their health expenditures may be higher than those of adolescents and working-age men. Individuals who are more educated are more likely to understand the benefits of preventative care or capable of identifying symptoms and seeking health care compared with individuals who are illiterate or less educated, and they are also more likely to be able to afford health care. Household water and sanitation facilities are also predisposing factors and are associated with the prevalence of morbidity and mortality, especially diarrheal disease, and therefore influence the likelihood of needing health care services. Correct water treatment includes chlorination, filtration, solar disinfection, or boiling. An improved water source is protected from outside contamination, particularly contamination from fecal matter, and includes water piped into dwelling, plot, or yard; public tap or standpipe; tube well or borehole; protected dug well; protected spring; or rainwater collection. An improved sanitation facility is not shared with other households and can be any of the following: flush or pour-and-flush connected to a piped sewer system or septic system; pit latrine or pit latrine on a slab; composting toilet; or a ventilated improved pit latrine.

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[9] PPP conversion factor, private consumption (LCU per international$), 2011 International Comparison Program. Available at http://data.worldbank.org/indicator/PA.NUS.PRVT.PP

[10] 2011 CPI annual average for US dollar = 224.939 (http://www.bls.gov/cpi/cpid05av.pdf), 2010 CPI annual average for US dollar= 218.06 (http://www.bls.gov/cpi/cpid10av.pdf). 224.939/218.06= 1.032.

The sex, age, and socioeconomic level of the head of household are enabling factors for the use of health services and are correlated with out-of-pocket health expenditures. Individuals living in households headed by educated, working-age men are be more likely to know about and to have access to health care services and to afford health care compared with those living in female-headed households or households headed by individuals without formal education or employment. The effects of insurance coverage, an enabling factor, on the cost of care is mixed; depending on the nature of the insurance scheme, it may create incentives for providers to require more testing and may result in higher payments, or it may lower direct payments from clients. Individuals who live in an urban area may be more likely to use health care services than those living in remote rural areas, where accessing clinics, hospitals, and health care providers may require travelling long distances. The availability of health care services, their quality, efficiency, and cost vary by region.

Malaria is a key disease in the study countries, and is needing factor. Individuals who sleep under a LLIN may be less likely to contract malaria and require health care. Individuals with health insurance may be more likely to seek health care than those without insurance coverage.

Our analysis also explored health care utilization and cost of care by provider type and reason for care. Public providers include government hospital, government health center, government health clinic, health post, community health worker, and other public health care providers such as maternity, mobile clinic. Private providers include private hospitals or clinics, pharmacies, doctors, mobile clinics, Planned Parenthood Associations, or any other types of providers in the private sector. Other service providers include shops, traditional practitioners, mobile vendors, black baggers or drug peddlers, among others. For inpatient care, we grouped reason for seeking care into the following categories: Pregnancy/delivery and postnatal care services; fever and malaria; and other illnesses. For outpatient care, we grouped reason for seeking care into the following categories: sexual and reproductive health care[11]; malaria; fever; diarrhea; respiratory illness; intestinal worms; accident or injury; vaccination/regular check-up/preventive care; and other illnesses.

2.3.   Statistical Methods

Analyzing health expenditures entails methodological challenges: data are heavily right-skewed due to the presence of outliers; there may be a large number of observations with zero costs; and data may be censored (Gregori et al. 2011). Different models are available to address skewness and excess zeroes, but no unique model is capable of dealing with all issues simultaneously (Gregori et al. 2011; Mihaylova et al. 2011). The choice of model depends on the data (Gregori et al. 2011), and simpler models are preferable to more complex models, as they have been proven effective (Mihaylova et al. 2011).

Log models are often used to deal with skewed data, but can lead to bias of ordinary least squares (OLS) estimators (Manning and Mullahy 2001). In generalized linear models (GLM) log models can lead to loss of precision, and lack of precision is an issue with health data because of the high variance in use and expenditures (Manning and Mullahy 2001). Log models are not robust to outliers and require back transformations to the raw scale (Gregori et al. 2011; Mihaylova et al. 2011). Transformation cannot be used if there are zeros in the data, and it is not ideal to replace a zero by adding a constant; the choice of constant is arbitrary, and this approach assumes that people with zero costs are similar to those with positive costs (Gregori et al. 2011; Mihaylova et al. 2011). To avoid back transformations, a GLM approach can be adopted and the identity-link can be specified (Mihaylova et al. 2011). Where there is a large number of zeros, a two-part model can be used (Mihaylova et al. 2011). Two-part models (sequential decision models) are appropriate when zeros are genuine rather than unobserved and participation and spending occur in sequential order (the individual uses health services and then pays out-of-pocket) (Humphreys 2013).

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[11] Sexual and reproductive health care refers to the following: family planning, prenatal care, delivery or postnatal care, and HIV/AIDS or STDs.

Hurdle models (joint decision models) are similar to two-part models but require that participation and consumption occur simultaneously (Humphreys 2013).

Because of the presence of cases with zero health costs, we adopted the approach of a two-part model to estimate the correlates of out-of-pocket expenditures for outpatient and inpatient care. In the first part we used a probit model to estimate the odds of having any health expenditures. In the second part we used a GLM model with the gamma distribution and log-link to estimate the magnitude of out-of-pocket expenditures because health expenditure data are highly skewed (Dodd et al. 2006). The two-part model does not address self-selection due to unobserved covariates. Therefore our results may be biased due to sample selection based on unobservable characteristics. Because the Liberia DHS 2013 collected information on health spending only for individuals who reported having any health expenditures, we use a GLM model rather than a two-part model to estimate out-of-pocket health expenditures.

3.   Results

This section starts with a description of the analysis sample by individual, household, and community background characteristics in each country. It then presents results on household members' use of inpatient and outpatient health care services in the reference period preceding the survey (six months for inpatient care and four weeks for outpatient care), including overall level of use, use by type of provider, and reasons for the last visit, as well as by background characteristics. Lastly, it shows results of the multivariate analysis for use of health care services and out-of-pocket health spending for the most recent inpatient and outpatient visit.

3.1.   Description of Household Members Included in the Analysis

In each country the DHS survey collected information for all household members on use of inpatient care services in the six months preceding the survey and use of outpatient care service in the four weeks preceding the survey. This analysis focused on *de jure* household members (usual residents of the household) and excluded *de facto*-only members (guests who stayed in the household last night) because the household interview respondent was expected to be less knowledgeable about *de facto*-only members' care seeking behavior and associated expenditures. The total number of *de jure* household members for whom information was collected ranged from 41,665 in Namibia to 96,337 in DRC. Table 1 shows the relevant background characteristics of the sample in each country.

The four countries shared a similar sex distribution among household members, a slightly higher percentage of males than females. Between 40% and 49% of household members were age 15-49. In all four countries younger groups (age 0-5 and 5-14) made up a substantial proportion of the household population, but only a small proportion of household members were age 50 or older. Educational attainment varied by country. In Liberia more than half of household members had no education, while in the other three countries individuals with no education accounted for one-third or less of the population. The highest percentage of household members with a secondary or higher education was in Namibia, at 39%, and the lowest was in Rwanda, at 9%. Use of treated mosquito nets the night before the survey also varied substantially across countries, from 4% in Namibia to 57% in Rwanda.

Although all four countries included health insurance information in their DHS surveys, the approach to collecting this information varied by country. In Rwanda a question about insurance was asked for all household members, while in DRC and Liberia the surveys collected information only for household members who received inpatient or outpatient care services. In Namibia health insurance information was collected for women age 15-49 and men age 15-64 who participated in individual interviews. Table 1, therefore, presents health insurance coverage only for Rwanda. More than two-thirds of household members in Rwanda reported coverage by health insurance in 2010, of whom most were covered by community-based health insurance. Recent experience of injury or illness was also collected for all household members in Rwanda but not in other countries. About 11% of household members in Rwanda reported experience of illness or injury in the four weeks before the survey.

Table 1 also presents select household characteristics of the sample in each country that are theoretically and empirically correlated with health seeking behavior and out-of-of-pocket health spending. In all four countries most individuals live in households headed by men, but in Namibia the percentage of female-headed households is nearly as high as the percentage headed by men, at 47% and 53%, respectively. In Liberia and Namibia about half of individuals live in households headed by a person with either no formal education or a primary education, and in Rwanda, 88%. In DRC the level of education is higher; about 60% of individuals live in households where the household head has a secondary education or higher. In DRC, however, only half of household members have access to improved water compared with 70-84% in the other three countries. Correct treatment of water is uncommon in the study countries, with the highest

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prevalence in Rwanda, where half of household members reside in households with correct treatment of drinking water. Similarly, in all four study countries access to an improved sanitation facility that is not shared is rare (DRC, 21%; Liberia, 25%; Namibia, 12%; and Rwanda 11%).

Table 1. Percent distribution of *de jure* household members by individual, household, and community background characteristics

	DRC		Liberia		Namibia		Rwanda	
	%	Number	%	Number	%	Number	%	Number
Individual characteristics								
Sex								
Male	48.6	46,867	49.9	23,074	47.7	19,873	47.4	26,327
Female	51.4	49,470	50.1	23,141	52.3	21,791	52.6	29,259
Age								
0-4	19.7	18,936	15.9	7,343	13.6	5,678	16.1	8,971
5-14	31.2	30,084	29.4	13,590	24.4	10,186	28.4	15,792
15-49	39.6	38,134	43.4	20,081	49.0	20,432	45.3	25,199
50-64	6.9	6,688	7.6	3,519	7.5	3,143	7.0	3,869
65+	2.6	2,493	3.5	1,635	5.3	2,196	3.1	1,742
Missing	0.0	1	0.1	47	0.1	30	0.0	12
Education								
None	32.7	31,463	51.3	23,731	26.7	11,137	34.2	19,029
Primary	38.4	36,951	24.7	11,418	33.3	13,888	56.8	31,590
Secondary or higher	28.7	27,697	23.8	11,016	39.0	16,262	8.7	4,848
Missing	0.2	226	0.1	51	0.9	378	0.2	118
Slept under a LLIN								
No	51.1	49,184	69.5	32,126	96.4	40,170	43.4	24,147
Yes	48.9	47,153	30.5	14,090	3.6	1,495	56.6	31,438
Health insurance coverage								
No	--	--	--	--	--	--	31.1	17,311
Yes	--	--	--	--	--	--	68.9	38,275
Experience of injury/ illness in last 4 weeks								
No	--	--	--	--	--	--	88.2	49,372
Yes	--	--	--	--	--	--	11.2	6,214
Household characteristics								
Sex of household head								
Male	79.6	76,654	64.7	29,893	53.2	22,162	71.9	39,980
Female	20.4	19,683	35.3	16,322	46.8	19,503	28.1	15,606
Age of household head								
<24	4.2	4,011	5.4	2,511	4.0	1,677	4.0	2,241
25-34	22.8	21,987	22.0	10,168	16.2	6,749	25.0	13,889
35-44	29.2	28,125	27.6	12,759	23.3	9,718	25.3	14,063
45-54	22.1	21,310	22.2	10,253	21.3	8,856	24.3	13,521
55-64	14.1	13,563	12.7	5,880	13.7	5,717	12.4	6,909
65+	7.6	7,341	10.0	4,636	21.3	8,875	8.9	4,945
Missing			0.0	8	0.1	52	0.0	18
Education of household head								
None	11.3	10,874	34.8	16,097	19.7	8,199	28.4	15,768
Primary	29.1	28,050	19.0	8,783	31.3	13,060	60.1	33,399
Secondary or higher	59.3	57,155	46.2	21,336	47.3	19,716	11.3	6,297
Missing	0.3	258			1.7	690	0.2	121
Household wealth status								
1st quintile	20.0	19,268	20.0	9,245	20.0	8,339	20.0	11,116
2nd quintile	20.0	19,290	20.0	9,234	20.0	8,331	20.0	11,119
3rd quintile	20.0	19,244	20.0	9,244	20.0	8,343	20.0	11,119
4th quintile	20.0	19,266	20.0	9,248	20.0	8,325	20.0	11,114
5th quintile	20.0	19,269	20.0	9,244	20.0	8,327	20.0	11,117

Continues

Table 1—*Continued*

	DRC		Liberia		Namibia		Rwanda	
	%	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**
Household characteristics								
Access to improved water								
No	49.6	47,823	29.7	13,739	16.0	6,658	26.4	14,685
Yes	50.4	48,514	70.3	32,476	84.0	35,007	73.6	40,900
Correct treatment of water								
No	96.3	92,741	88.4	40,851	91.0	37,907	49.9	27,736
Yes	3.7	3,596	11.6	5,365	9.0	3,758	50.1	27,849
Access to improved sanitation facility								
Non improved	58.9	56,713	57.4	26,520	54.1	22,531	24.3	13,488
Improved but shared	20.5	19,728	17.2	7,954	34.3	14,276	62.3	34,632
Improved not shared	20.7	19,896	25.4	11,741	11.7	4,858	13.4	7,465
Community-level characteristics								
Residence								
Rural	65.8	63,389	56.2	20,234	53.3	22,207	86.6	48,142
Urban	34.2	32,948	43.8	25,982	46.7	19,458	13.4	7,444
Region								
Kinshasa	8.9	8,614	--	--	--	--	--	--
Bandundu	15.8	15,227	--	--	--	--	--	--
Bas-congo	4.4	4,243	--	--	--	--	--	--
Equateur	13.7	13,198	--	--	--	--	--	--
Kasai-occidental	6.7	6,436	--	--	--	--	--	--
Kasai-oriental	10.4	10,018	--	--	--	--	--	--
Katanga	10.4	10,020	--	--	--	--	--	--
Maniema	3.4	3,299	--	--	--	--	--	--
Nord-kivu	8.5	8,208	--	--	--	--	--	--
Orientale	10.1	9,692	--	--	--	--	--	--
Sud-kivu	7.7	7,381	--	--	--	--	--	--
North Western	--	--	9.7	4,505	--	--	--	--
South Central	--	--	47.3	21,857	--	--	--	--
South Eastern A	--	--	6.4	2,940	--	--	--	--
South Eastern B	--	--	7.1	3,291	--	--	--	--
North Central	--	--	29.5	13,622	--	--	--	--
Caprivi	--	--	--	--	5.2	2,181	--	--
Erongo	--	--	--	--	7.4	3,083	--	--
Hardap	--	--	--	--	3.5	1,451	--	--
Karas	--	--	--	--	3.6	1,482	--	--
Kavango	--	--	--	--	10.3	4,308	--	--
Khomas	--	--	--	--	18.5	7,697	--	--
Kunene	--	--	--	--	3.1	1,288	--	--
Ohangwena	--	--	--	--	11.7	4,861	--	--
Omaheke	--	--	--	--	2.7	1,144	--	--
Omusati	--	--	--	--	11.6	4,829	--	--
Oshana	--	--	--	--	7.9	3,306	--	--
Oshikoto	--	--	--	--	8.4	3,483	--	--
Otjozondjupa	--	--	--	--	6.1	2,553	--	--
Kigali city	--	--	--	--	--	--	9.8	5,459
South	--	--	--	--	--	--	24.3	13,534
West	--	--	--	--	--	--	24.5	13,624
North	--	--	--	--	--	--	16.9	9,413
East	--	--	--	--	--	--	24.4	13,555
Total number of de jure household members		96,337		46,215		41,665		55,585

Table 1 also shows the distribution of household members by urban and rural residence and by region of the country. The majority of individuals live in rural areas in DRC (66%) and Rwanda (87%), while the samples are divided almost evenly between urban and rural areas in Liberia and Namibia.

3.2. Use of Inpatient and Outpatient Care Services

3.2.1. *Use of inpatient and outpatient care service, providers, and reasons for care*

Figure 1 presents the percentage of household members in DRC, Liberia, Namibia, and Rwanda who received inpatient care in the six months preceding the interview, and outpatient care services in the four weeks preceding the interview. In general, health care utilization is highest in Namibia and lowest in DRC. In Namibia 18% of household members sought inpatient care during the reference period, while the level was lower in the other three countries, at 4% in DRC, 5% in Liberia, and 4% in Rwanda. In all four countries outpatient care was more commonly reported than inpatient care. The highest level of outpatient care was in Namibia, at 41%, and the lowest was in DRC, at 7%. About one in every five Liberians and one in every 10 Rwandese received outpatient care in the four weeks before the survey.

Figure 1. Percentage of household members who received inpatient and outpatient care services during the reference period
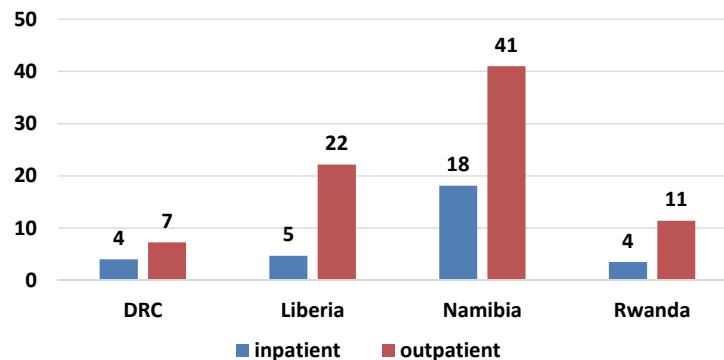
Figures 2 and 3 show the percent distribution of household members who received outpatient and inpatient health care services, respectively, by type of provider for the most recent visit. As Figure 2 shows, in DRC, Namibia, and Rwanda inpatient care was predominantly sought at public health facilities. In Rwanda almost all household members (97%) received their most recent inpatient care from a public health facility. Private health facilities such as private hospitals or private clinics were more commonly reported as the source of the most recent inpatient care in Liberia (at 41%) than in the other three countries.

In all four study countries the use of private providers for health care was more commonly reported for outpatient services. As Figure 3 shows, for example, 44% of household members in DRC and 65% in Liberia reported receiving the most recent outpatient care from a private provider. Although treatment in private sector facilities was more common for outpatient care than inpatient care in Namibia (20%) and Rwanda (15%), the public sector was still the primary provider of outpatient care. In some cases, individuals reported seeking care from other providers including shops, traditional practitioners, mobile vendors, black beggars or drug peddlers, and any other sources of care. Care from informal or traditional healers was more commonly sought for outpatient care in DRC (6%) and Liberia (14%) compared with the other two countries, where less than 1% of care was provided by this type of provider.

Figure 2. Percent distribution of household members who received inpatient care by providers of the most recent care visit
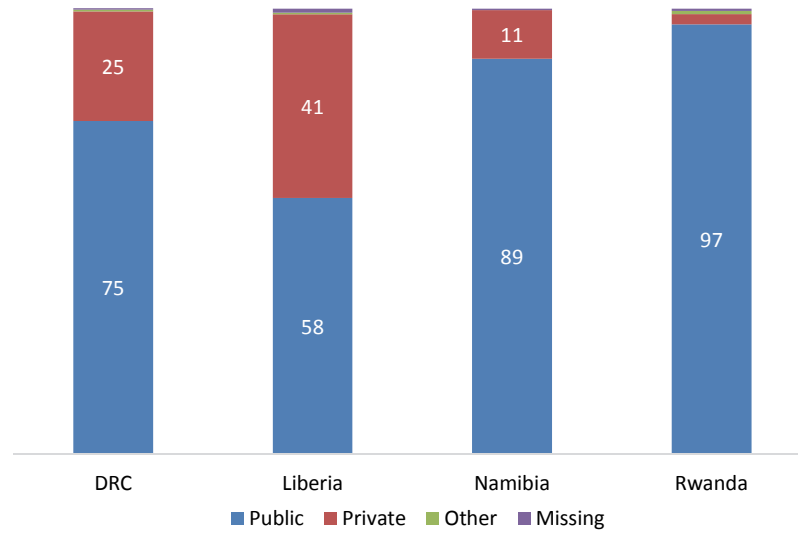
Note: Percent at 2% or lower not shown.

Figure 3. Percent distribution of household members who sought outpatient care by providers of the most recent care visit
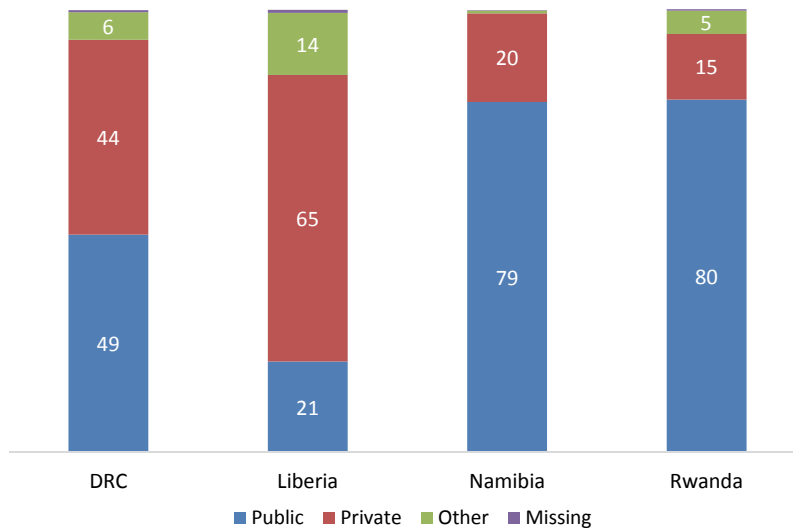
Note: Percent at 2% or lower not shown.

Reasons for the most recent inpatient admission and outpatient visit were collected for household members who received care. Response options provided to the respondent in the survey varied across countries. Figure 4 indicates that in all countries a large proportion of household members reported "other illness" without further disaggregation by type. In Liberia, Namibia, and Rwanda the second most commonly reported reason for inpatient care was sexual and reproductive health, at 8%, 20%, and 35%, respectively. In DRC more than one-third of individuals sought inpatient care because of fever and malaria. In all four countries a small percentage of individuals sought inpatient care because of accident or injury, ranging from 4% in DRC to 7% in Namibia.

Figure 4. Percent distribution of household members who sought inpatient care by reasons for the most recent care
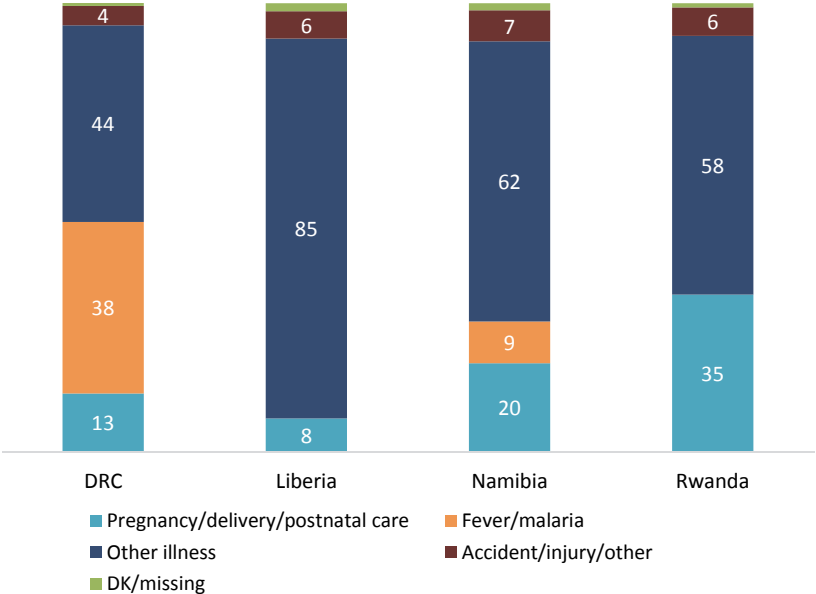
Note: Percent at 2% or lower not shown.

In all four study countries a wider range of reasons for care was reported for outpatient care than inpatient care. Figure 5 illustrates that malaria was a commonly reported reason for outpatient care in DRC (31%) and Liberia (40%). A notable proportion of individuals (DRC, 25%; Liberia, 14%; and Namibia, 14%) reported "fever" as the reason for their most recent outpatient visit, of which some cases could be undiagnosed malaria. In Rwanda and Namibia more than half of individuals listed "other illness" as the reason for the most recent outpatient care. Additionally, in Rwanda about 12% reported respiratory illness, and 11% reported intestinal worms. Preventive care is uncommon but was more commonly reported in Namibia (10%) and Rwanda (9%) than the other two countries. In all four countries reproductive health reasons were least commonly reported, at 2-4%, followed by diarrhea, at 3-6%.

Figure 5. Percent distribution of household members who sought outpatient care by reasons for the most recent care
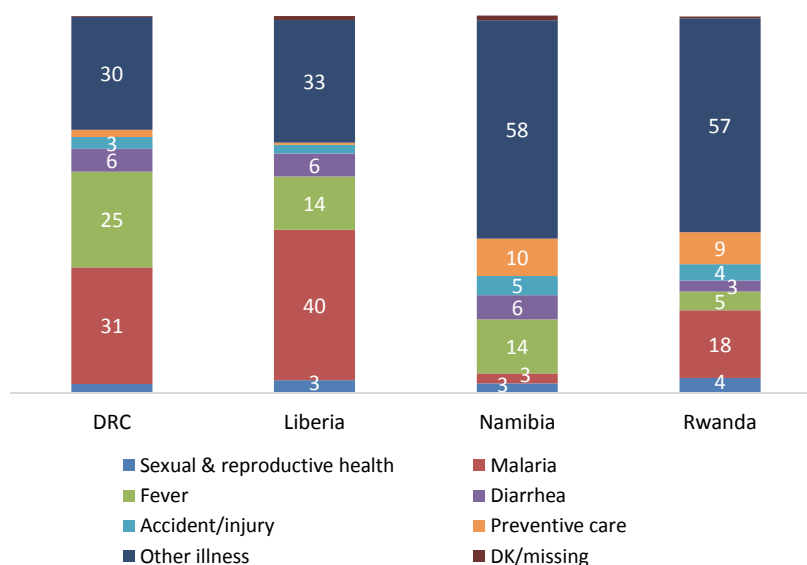
Note: Percent at 2% or lower not shown.

3.2.2. *Use of inpatient and outpatient care services by background characteristics*

Table 2 reports the percentage of household members who sought health care services in the specified reference periods preceding the survey (six months for inpatient care and four weeks for outpatient care) by individual, household, and community background characteristics.

In DRC differentials in use of health care services by background characteristics exist but are not substantial given the overall low level of use—4% for inpatient care services and 7% for outpatient care services. Female household members were more likely than men to receive both inpatient and outpatient care, although the gap is less than 2 percentage points. The youngest age group and oldest groups were more likely to receive both inpatient and outpatient care. For example, 10% of household members age 0-4 and 65+ received outpatient care in the four weeks preceding the interview. Individuals age 5-14 were least likely to receive health care services. Use of health care services also varied by individual educational attainment. Use of inpatient and outpatient care services was highest among individuals with no education. This may be partially due to the fact that, as Table 2 shows, a relatively large proportion of those receiving care consisted of household members age 0-5, who were unlikely to have received any education. Household members who slept under a mosquito net the night before the survey were more likely to seek inpatient and outpatient care.

Table 2. Percentage of household members who received health care services in the reference period preceding the survey by individual, household, and community background characteristics

	DRC		Liberia		Namibia		Rwanda	
	Inpatient	Outpatient	Inpatient	Outpatient	Inpatient	Outpatient	Inpatient	Outpatient
Individual characteristics								
Sex								
Male	3.2	6.8	4.1	20.5	17.8	39.8	2.2	10.1
Female	4.8	7.8	5.4	23.8	18.3	42.1	4.7	12.6
Age								
0-4	5.5	10.1	5.9	31.1	22.8	42.8	3.6	19.5
5-14	2.4	5.3	2.7	16.5	18.5	43.8	1.0	6.6
15-49	4.4	7.0	5.3	21.7	16.7	38.6	5.0	10.7
50-64	4.6	9.4	5.5	25.2	17.2	41.1	3.6	14.3
65+	5.5	9.5	7.8	27.6	17.9	46.1	5.0	17.6
Education								
None	5.1	9.0	4.8	24.6	20.3	41.3	3.6	14.8
Primary	3.4	6.0	3.9	18.4	18.2	43.3	3.4	9.3
Secondary or higher	3.7	7.3	5.4	20.9	16.4	39.0	3.9	11.8
Slept under a LLIN								
No	3.7	6.8	4.6	21.0	18.1	40.8	2.7	9.2
Yes	4.4	7.9	5.0	24.7	17.7	48.3	4.1	13.1
Health insurance coverage								
No	--	--	--	--	--	--	1.6	7.2
Yes	--	--	--	--	--	--	4.4	13.3
Experience of injury/ illness in last 4 weeks								
No	--	--	--	--	--	--	3.0	4.2
Yes	--	--	--	--	--	--	7.3	69.0
Household characteristics								
Sex of the head of the household								
Male	4.1	7.2	4.5	22.0	17.8	39.9	3.6	11.5
Female	3.8	7.8	5.1	22.5	18.4	42.3	3.2	11.3
Age of household head								
13-24	5.0	8.5	7.2	26.4	12.8	28.6	7.0	12.2
25-34	4.9	8.3	5.3	23.8	17.4	36.0	4.8	13.5
35-44	4.3	7.3	4.2	22.4	18.3	37.2	3.0	11.2
45-54	3.2	7.2	4.5	20.1	15.4	39.4	2.7	9.4
55-64	3.3	6.3	4.5	20.8	19.7	45.2	3.0	11.2
65+	3.6	6.3	4.4	22.0	20.7	50.3	2.9	11.7
Education of household head								
None	3.5	7.2	4.3	21.4	19.7	43.5	3.1	9.6
Primary	4.2	6.5	5.3	24.5	18.2	44.3	3.7	11.9
Secondary or higher	4.0	7.8	4.9	21.7	17.1	37.8	3.7	13.6
Household wealth status								
1st quintile	4.0	7.0	4.2	25.0	19.2	42.4	3.8	11.6
2nd quintile	3.6	7.2	4.9	22.9	18.7	39.6	3.7	10.4
3rd quintile	4.5	7.1	5.2	22.2	17.4	44.1	3.6	10.3
4th quintile	4.6	7.6	4.5	21.7	19.7	39.4	3.3	11.0
5th quintile	3.4	7.8	4.9	19.0	15.4	39.6	3.2	13.8

Continues

Table 2—*Continued*

	DRC		Liberia		Namibia		Rwanda	
	Inpatient	Outpatient	Inpatient	Outpatient	Inpatient	Outpatient	Inpatient	Outpatient
Household characteristics								
Access to improved water								
No	3.7	7.1	4.9	22.1	21.4	48.5	3.4	10.0
Yes	4.3	7.6	3.9	22.9	17.4	39.6	3.6	12.0
Correct treatment of water								
No	4.0	7.3	4.9	22.1	17.7	40.5	3.3	10.5
Yes	3.4	8.5	3.9	22.9	21.9	46.4	3.7	12.3
Access to improved sanitation facility								
Non improved	4.1	7.4	4.8	23.9	18.9	43.6	3.7	11.5
Improved but shared	3.8	6.8	4.5	17.8	17.4	39.0	3.5	11.2
Improved not shared	4.0	7.8	4.8	21.1	15.9	35.0	3.5	12.4
Community-level variables								
Residence								
Urban	3.6	8.4	4.6	20.6	17.6	36.6	3.3	13.5
Rural	4.2	6.8	4.9	24.1	18.5	44.9	3.6	11.1
Region								
Kinshasa	2.7	8.8	--	--	--	--	--	--
Bandundu	3.4	6.8	--	--	--	--	--	--
Bas-congo	3.8	8.2	--	--	--	--	--	--
Equateur	4.4	9.0	--	--	--	--	--	--
Kasai-occidental	3.9	11.2	--	--	--	--	--	--
Kasai-oriental	2.2	5.6	--	--	--	--	--	--
Katanga	3.1	6.2	--	--	--	--	--	--
Maniema	4.5	6.2	--	--	--	--	--	--
Nord-kivu	5.2	7.2	--	--	--	--	--	--
Orientale	4.8	5.1	--	--	--	--	--	--
Sud-kivu	7.8	7.3	--	--	--	--	--	--
North Western	--	--	3.8	22.7	--	--	--	--
South Central	--	--	4.7	20.9	--	--	--	--
South Eastern A	--	--	5.8	29.7	--	--	--	--
South Eastern B	--	--	6.6	29.8	--	--	--	--
North Central	--	--	4.5	20.5	--	--	--	--
Caprivi	--	--	--	--	18.8	47.8	--	--
Erongo	--	--	--	--	16.1	35.6	--	--
Hardap	--	--	--	--	17.2	25.1	--	--
Karas	--	--	--	--	17.0	40.6	--	--
Kavango	--	--	--	--	26.9	42.1	--	--
Khomas	--	--	--	--	14.8	32.7	--	--
Kunene	--	--	--	--	15.3	21.4	--	--
Ohangwena	--	--	--	--	16.5	51.4	--	--
Omaheke	--	--	--	--	14.5	36.9	--	--
Omusati	--	--	--	--	18.5	53.6	--	--
Oshana	--	--	--	--	18.6	42.4	--	--
Oshikoto	--	--	--	--	17.3	44.0	--	--
Otjozondjupa	--	--	--	--	21.4	36.9	--	--
Kigali city	--	--	--	--	--	--	3.4	13.9
South	--	--	--	--	--	--	3.1	13.7
West	--	--	--	--	--	--	4.5	10.4
North	--	--	--	--	--	--	3.3	10.3
East	--	--	--	--	--	--	3.1	10.0
Total	4.0	7.3	4.7	22.2	18.1	41.0	3.5	11.4

In terms of household characteristics, individuals in households with younger household heads were more likely to receive inpatient and outpatient care. Higher education level of the head of the household was also associated with more use of inpatient care, although an association was not obvious for outpatient care. Use of health care services was not substantially different by household wealth status, access to improved water sources, and access to improved sanitation facility. Use of health care services varied by region, from 2% in the Kasai-oriental region to 8% in the Sud-kivu region for inpatient care, and from 5% in the Orientale region to 11% in the Kasai-occidental region for outpatient care. Individuals in urban areas were more likely to use outpatient care but less likely to use inpatient care compared with those in rural areas.

In Liberia 5% of household members received inpatient care and 22% receive outpatient care. Differentials in the use of inpatient care by background characteristics were small. Similar to DRC, female household members and both the youngest and oldest age groups were more likely to receive inpatient care. Age and sex patterns for outpatient and inpatient care were similar. Regional variation in the use of outpatient care was considerable, ranging from 20% in North Central to 30% in both South Eastern regions.

Namibia had the highest use of inpatient and outpatient services, at 18% and 41%, respectively. The patterns in DRC were similar to those in Namibia in use of health service by age, sex, and education. In Namibia the insured were more likely to use outpatient services but less likely to use inpatient services. Unlike the other countries, Namibians in households headed by younger members were less likely to seek care compared with those in households headed by older members. Access to an improved water source and access to an improved sanitation facility that is not shared was associated with less use of inpatient and outpatient services in Namibia. In Namibia urban and rural differences were more prominent in the use of outpatient than inpatient care: 45% of rural residents compared with 37% of urban residents reported receiving outpatient care during the reference period.

In Rwanda differentials in use of health services were more notable for outpatient than inpatient care. Household members with health insurance were more likely than those without insurance to receive both inpatient care (4% versus 2%) and outpatient care (13% versus 7%). Recent experience of illness and injury was also associated with higher level of use of health care services. Variations associated with household and community characteristics were less remarkable in Rwanda than in the other three countries.

Tables 3-6 present the results of the logistic regression predicting the odds of using inpatient and outpatient health care in each of the study countries. In most cases, after adjusting for other explanatory variables the associations between the use of health care services and background characteristics are similar to those of the unadjusted (bivariate) associations described above. In general, female household members were more likely than men to seek both inpatient and outpatient care services. Children under age 5 and household members age 65 or older were more likely to receive both inpatient and outpatient care compared with other age groups. Generally, there was not a significant association between an individual's education level and use of health care services; however, the household head's higher educational attainment was associated with more use of inpatient care in DRC and more use of outpatient care in Liberia and Rwanda. In Rwanda, where data on health insurance were available for all household members, the analysis found that health insurance coverage increased the likelihood of using both inpatient and outpatient care services. A positive significant association between household wealth status and use of health care services was found only for inpatient care in Liberia, and for outpatient care in Namibia and Rwanda. After controlling for other covariates, urban-rural differences in use of health services were not significant except for outpatient care in DRC, where the odds of seeking outpatient care services among urban residents were 40% higher than for rural residents. In all countries regional variations in use of health care remained the same after controlling for other variables.

Table 3. Results of logistic regression predicting the odds of health care utilization, DRC DHS 2013

	Inpatient care		Outpatient care	
	OR	95% CI	OR	95% CI
Sex (ref.: male)				
Female	1.47***	1.34 - 1.63	1.15***	1.09 - 1.22
Age (ref.: 0-4)				
5-14	0.51***	0.42 - 0.61	0.57***	0.49 - 0.65
15-49	1.00	0.83 - 1.20	0.71***	0.62 - 0.82
50-64	1.28	0.99 - 1.66	1.11	0.94 - 1.31
65+	1.42*	1.07 - 1.90	1.19	0.92 - 1.56
Education (ref.: none)				
Primary	0.87	0.73 - 1.02	0.92	0.82 - 1.03
Secondary or higher	0.77*	0.63 - 0.94	0.90	0.79 - 1.03
Slept under a LLIN (ref.: did not sleep under an LLIN)	1.10	0.98 - 1.23	1.09	0.99 - 1.20
Female headed-household (ref.: male-headed)	1.01	0.84 - 1.22	1.05	0.94 - 1.19
Age of household head (ref.: <24)				
25-34	1.11	0.88 - 1.40	1.03	0.84 - 1.26
35-44	1.05	0.82 - 1.35	1.00	0.79 - 1.26
45-54	0.78	0.59 - 1.03	0.99	0.76 - 1.28
55-64	0.72*	0.54 - 0.95	0.78	0.61 - 1.01
65+	0.82	0.58 - 1.15	0.73*	0.53 - 0.99
Education of household head (ref.: none)				
Primary	1.41*	1.01 - 1.97	0.93	0.78 - 1.12
Secondary or higher	1.51*	1.07 - 2.14	1.10	0.92 - 1.33
Household wealth status (ref.: 1st quintile)				
2nd quintile	0.88	0.72 - 1.09	1.11	0.95 - 1.30
3rd quintile	1.05	0.79 - 1.41	1.09	0.93 - 1.27
4th quintile	1.01	0.77 - 1.32	1.03	0.85 - 1.26
5th quintile	0.95	0.68 - 1.31	0.86	0.63 - 1.16
Household practices correct water treatment (ref.: incorrect water treatment)	0.91	0.64 - 1.29	1.08	0.84 - 1.39
Household accesses an improved water source (ref.: unimproved water source)	1.13	0.96 - 1.33	1.01	0.85 - 1.21
Household sanitation facility (ref.: unimproved sanitation facility)				
Improved but shared	0.99	0.83 - 1.17	1.04	0.90 - 1.21
Improved not shared	1.08	0.92 - 1.27	1.08	0.94 - 1.24
Number of household members	1.00	0.98 - 1.02	0.96**	0.93 - 0.98
Urban (ref.: rural)	1.01	0.82 - 1.24	1.41**	1.13 - 1.75
Region (ref.: Kinshasa)				
Bandundu	1.33	0.91 - 1.96	0.77	0.55 - 1.07
Bas-congo	1.44*	1.00 - 2.06	0.98	0.74 - 1.30
Equateur	1.73**	1.16 - 2.56	1.10	0.82 - 1.47
Kasai-occidental	1.56*	1.09 - 2.23	1.38*	1.01 - 1.90
Kasai-oriental	0.83	0.54 - 1.28	0.63**	0.47 - 0.84
Katanga	1.18	0.81 - 1.73	0.72*	0.52 - 0.99
Maniema	1.69*	1.13 - 2.53	0.67*	0.47 - 0.95
Nord-kivu	2.07***	1.45 - 2.95	0.86	0.59 - 1.26
Orientale	1.88***	1.32 - 2.68	0.60**	0.43 - 0.85
Sud-kivu	3.22***	2.04 - 5.07	0.92	0.54 - 1.58
Total number of household members	96,337		96,337	

* p<0.05, ** p<0.01, *** p<0.001

Table 4. Results of logistic regression predicting the odds of health care utilization, Liberia DHS 2013

	Inpatient care		Outpatient care	
	OR	95% CI	OR	95% CI
Sex (ref.: male)				
Female	1.34***	1.17 - 1.52	1.20***	1.13 - 1.29
Age (ref.: 0-4)				
5-14	0.47***	0.36 - 0.60	0.49***	0.44 - 0.55
15-49	0.89	0.75 - 1.07	0.70***	0.62 - 0.78
50-64	0.98	0.73 - 1.31	0.86*	0.75 - 0.98
65+	1.58**	1.15 - 2.17	0.94	0.78 - 1.14
Missing	1.39	0.44 - 4.35	1.08	0.49 - 2.38
Education (ref.: none)				
Primary	0.91	0.78 - 1.08	0.83***	0.75 - 0.92
Secondary or higher	1.03	0.81 - 1.30	0.88	0.78 - 1.00
Missing	0.89	0.20 - 3.86	0.47	0.20 - 1.11
Slept under a LLIN (ref.: did not sleep under an LLIN)	1.05	0.88 - 1.25	1.20***	1.10 - 1.30
Female headed-household (ref.: male-headed)	1.11	0.95 - 1.28	1.08	0.96 - 1.21
Age of household head (ref.: <24)				
25-34	0.79	0.59 - 1.07	0.92	0.77 - 1.09
35-44	0.64**	0.47 - 0.88	0.9	0.75 - 1.09
45-54	0.70*	0.49 - 1.00	0.79*	0.66 - 0.95
55-64	0.68	0.46 - 1.01	0.81	0.64 - 1.03
65+	0.59**	0.41 - 0.85	0.84	0.67 - 1.06
Missing	1	1.00 - 1.00	1	1.00 - 1.00
Education of household head (ref.: none)				
Primary	1.23	1.00 - 1.51	1.22**	1.08 - 1.38
Secondary or higher	1.12	0.89 - 1.41	1.18*	1.03 - 1.34
Household wealth status (ref.: 1st quintile)				
2nd quintile	1.22*	1.04 - 1.43	0.99	0.86 - 1.14
3rd quintile	1.38**	1.12 - 1.70	1.07	0.91 - 1.26
4th quintile	1.18	0.85 - 1.66	1.12	0.87 - 1.43
5th quintile	1.36	0.95 - 1.95	1.07	0.79 - 1.44
Household practices correct water treatment (ref.: incorrect water treatment)	0.76*	0.60 - 0.95	1.09	0.95 - 1.26
Household accesses an improved water source (ref.: unimproved water source)	0.99	0.82 - 1.19	0.87	0.75 - 1.01
Household sanitation facility (ref.: unimproved sanitation facility)				
Improved but shared	0.88	0.71 - 1.10	0.73**	0.59 - 0.91
Improved not shared	0.96	0.79 - 1.16	0.85*	0.75 - 0.97
Urban	1.04	0.84 - 1.28	0.94	0.78 - 1.13
Region (ref.: North Western)				
South Central	1.19	0.89 - 1.59	1.02	0.80 - 1.29
South Eastern A	1.68**	1.23 - 2.31	1.48**	1.16 - 1.89
South Eastern B	1.88***	1.30 - 2.72	1.58***	1.23 - 2.02
North Central	1.15	0.86 - 1.55	0.9	0.71 - 1.13
Total number of household members	46,215		46,215	

* p<0.05, ** p<0.01, *** p<0.001

Table 5. Results of logistic regression predicting the odds of health care utilization, Namibia DHS 2013

	Inpatient care		Outpatient care	
	OR	95% CI	OR	95% CI
Sex (ref.: male)				
Female	1.01	0.95 - 1.08	1.05*	1.00 - 1.11
Age (ref.: 0-4)				
5-14	0.73***	0.65 - 0.82	0.94	0.86 - 1.03
15-49	0.79**	0.68 - 0.92	0.87*	0.76 - 0.99
50-64	0.92	0.79 - 1.07	0.92	0.81 - 1.03
65+	0.83**	0.72 - 0.95	0.94	0.84 - 1.05
Education (ref.: none)				
Primary	1.04	0.94 - 1.14	1.09*	1.01 - 1.18
Secondary or higher	1.02	0.89 - 1.16	1.09	0.98 - 1.21
Slept under a LLIN (ref.: did not sleep under an LLIN)	0.88	0.65 - 1.19	1.24	0.97 - 1.58
Covered by health insurance(ref.: uninsured)	1.04	0.88 - 1.22	1.19**	1.05 - 1.35
Female headed-household (ref.: male-headed)	1.02	0.87 - 1.19	1.02	0.91 - 1.14
Age of household head (ref.: <24)				
25-34	1.31	0.89 - 1.92	1.44*	1.08 - 1.91
35-44	1.23	0.83 - 1.82	1.34*	1.01 - 1.76
45-54	0.92	0.60 - 1.39	1.34*	1.00 - 1.78
55-64	1.11	0.72 - 1.72	1.59**	1.15 - 2.18
65+	1.24	0.80 - 1.90	1.72***	1.27 - 2.34
Education of household head (ref.: none)				
Primary	1.01	0.81 - 1.27	1.04	0.88 - 1.24
Secondary or higher	1.16	0.89 - 1.52	0.95	0.78 - 1.16
Household wealth status (ref.: 1st quintile)				
2nd quintile	0.97	0.75 - 1.25	1.09	0.90 - 1.32
3rd quintile	0.91	0.69 - 1.21	1.56***	1.25 - 1.94
4th quintile	1.06	0.73 - 1.54	1.83***	1.39 - 2.40
5th quintile	0.84	0.54 - 1.30	2.44***	1.72 - 3.45
Household practices correct water treatment (ref.: incorrect water treatment)	1.47**	1.17 - 1.86	1.25*	1.02 - 1.54
Household accesses an improved water source (ref.: incorrect water treatment)	0.88	0.69 - 1.11	0.85	0.69 - 1.06
Household sanitation facility (ref.: unimproved sanitation facility)				
Improved but shared	0.95	0.72 - 1.26	0.75*	0.60 - 0.94
Improved not shared	0.97	0.69 - 1.36	0.93	0.71 - 1.21
Number of household members	1.13***	1.10 - 1.16	1.06***	1.04 - 1.09
Urban (ref.: rural)	1.23	0.98 - 1.54	0.98	0.79 - 1.20
Region (ref.: Caprivi)				
Erongo	0.86	0.59 - 1.24	0.50***	0.34 - 0.73
Hardap	0.86	0.61 - 1.22	0.30***	0.21 - 0.44
Karas	0.85	0.59 - 1.22	0.63*	0.44 - 0.89
Kavango	1.21	0.87 - 1.68	0.69	0.47 - 1.01
Khomas	0.70	0.48 - 1.01	0.43***	0.30 - 0.62
Kunene	0.80	0.56 - 1.15	0.28***	0.19 - 0.41
Ohangwena	0.62*	0.43 - 0.90	1.00	0.70 - 1.43
Omaheke	0.73	0.51 - 1.06	0.61**	0.43 - 0.85
Omusati	0.86	0.63 - 1.18	1.01	0.71 - 1.44
Oshana	0.92	0.66 - 1.29	0.69*	0.50 - 0.95
Oshikoto	0.85	0.60 - 1.19	0.77	0.54 - 1.09
Otjozondjupa	1.09	0.75 - 1.58	0.55***	0.39 - 0.77
Total number of household members	41,665		41,665	

* p<0.05, ** p<0.01, *** p<0.001

Table 6. Results of logistic regression predicting the odds of health care utilization, Rwanda DHS 2010

	Inpatient care		Outpatient care	
	OR	95% CI	OR	95% CI
Sex (ref.: male)				
Female	2.12***	1.91 - 2.36	1.30***	1.20 - 1.40
Age (ref.: 0-4)				
5-14	0.36***	0.29 - 0.46	0.38***	0.32 - 0.46
15-49	1.62***	1.35 - 1.94	0.45***	0.38 - 0.53
50-64	1.34*	1.04 - 1.73	0.45***	0.37 - 0.55
65+	2.41***	1.68 - 3.46	0.39***	0.29 - 0.52
Education (ref.: none)				
Primary	0.97	0.83 - 1.12	0.96	0.86 - 1.08
Secondary or higher	0.87	0.69 - 1.09	0.92	0.79 - 1.08
Slept under a LLIN (ref.: did not sleep under an LLIN)	1.18**	1.07 - 1.30	1.32***	1.19 - 1.46
Covered by health insurance (ref.: uninsured)	2.67***	2.28 - 3.13	2.02***	1.78 - 2.28
Ill or injured in last 4 weeks (ref.: not ill or injured)	2.09***	1.87 - 2.34	53.56***	45.86 - 62.57
Female headed-household (ref.: male-headed)	0.88*	0.78 - 1.00	0.96	0.86 - 1.08
Age of household head (ref.: <24)				
25-34	0.72**	0.59 - 0.88	1.08	0.86 - 1.36
35-44	0.52***	0.42 - 0.64	1.00	0.78 - 1.28
45-54	0.44***	0.35 - 0.56	0.92	0.72 - 1.16
55-64	0.44***	0.35 - 0.57	1.10	0.85 - 1.44
65+	0.31***	0.22 - 0.43	0.98	0.74 - 1.29
Education of household head (ref.: none)				
Primary	1.04	0.92 - 1.19	1.19*	1.03 - 1.37
Secondary or higher	1.09	0.87 - 1.36	1.27*	1.05 - 1.53
Household wealth status (ref.: 1st quintile)				
2nd quintile	0.89	0.76 - 1.04	0.98	0.83 - 1.15
3rd quintile	0.83*	0.71 - 0.98	0.98	0.82 - 1.17
4th quintile	0.74**	0.62 - 0.89	1.03	0.85 - 1.24
5th quintile	0.62***	0.50 - 0.78	1.29*	1.05 - 1.58
Household practices correct water treatment (ref.: incorrect water treatment)	1.08	0.97 - 1.21	1.09	0.98 - 1.22
Household accesses an improved water source (ref.: unimproved water source)	1.08	0.96 - 1.22	1.09	0.95 - 1.24
Household sanitation facility (ref.: unimproved sanitation facility)				
Improved but shared	1.01	0.88 - 1.15	0.90	0.77 - 1.06
Improved not shared	0.94	0.78 - 1.14	0.84*	0.70 - 1.00
Number of household members	1.00	0.98 - 1.03	0.98	0.96 - 1.00
Urban (ref.: rural)	0.89	0.70 - 1.12	0.97	0.73 - 1.28
Region (ref.: Kigali)				
South	0.77	0.57 - 1.05	1.56*	1.11 - 2.20
West	1.08	0.78 - 1.48	1.12	0.80 - 1.56
North	0.76	0.55 - 1.04	0.93	0.66 - 1.31
East	0.83	0.60 - 1.14	1.26	0.90 - 1.76
Total number of household members	55,585		55,585	

* p<0.05, ** p<0.01, *** p<0.001

3.3. Out-of-Pocket Health Expenditures

3.3.1. *Levels of out-of-pocket health expenditures*

Information on out-of-pocket health expenditures was collected for all household members who received health care services in DRC, Namibia, and Rwanda. As discussed earlier, in Liberia information on expenditures for outpatient care was collected from a household member randomly selected from among those who received and paid for care in the four weeks preceding the survey. In all four study countries expenditure data on inpatient care were collected for all household members who received care in the six months preceding the survey, regardless of whether they paid or not. Expenditures are reported in constant 2010 US dollars (USD for consistency across countries.

Table 7 summarizes out-of-pocket expenditures in constant 2010 USD for the most recent health care visit in each of the study countries. Spending on the most recent inpatient care varied enormously among the four countries. Out-of-pocket health expenditures were highest in Liberia. Devaluation of the local currency against the US dollar and high inflation have contributed to the low purchasing power of the Liberian dollar relative to the national currencies of the other study countries. The average out-of-pocket expenditure was 23 USD in Rwanda, 60 USD in DRC, 123 USD in Namibia, and 3,119 USD in Liberia. The distribution of expenditures had a wide range and was highly skewed to large amounts in all four countries. Half the household members who received inpatient care spent 3 USD in Rwanda, 5 USD in Namibia, 26 USD in DRC, and 1,480 USD in Liberia, which is less than half of the average spending in the respective countries. As Figure 6 shows, many individuals who received inpatient care did not pay for these services, ranging from 3% in Rwanda to 44% in Liberia.

Table 7. Summary of out-of-pocket health expenditures for the most recent health care services received among household members who received health services

	Inpatient services (constant 2010 USD)					Outpatient services (constant 2010 USD)				
	Mean	**Std. dev**	**Median**	**Minimum**	**Maximum**	**Mean**	**Std. dev**	**Median**	**Minimum**	**Maximum**
DRC	59.5	186.1	26.2	0.0	8001	16.9	54.9	7.3	0.0	3636.8
Liberia	3118.8	6439.8	1479.8	0.0	106542.8	1519.6	2678.5	739.9	0.0	43800.9
Namibia	122.6	693.2	5.0	0.0	13418.0	18.0	260.0	0.7	0.0	11740.9
Rwanda	22.7	131.9	2.9	0.0	3321.0	3.6	15.5	0.8	0.0	830.2

*Std. dev= Standard deviation

Figure 6. Percentage of household members who received health care services but reported zero expenditure for the most recent visit
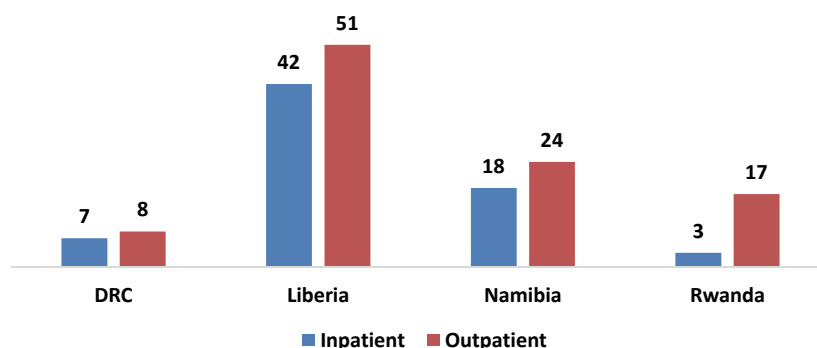
As expected, out-of-pocket spending on outpatient care was lower than spending on inpatient care in all countries. On average, household members who received outpatient care spent 4 USD in Rwanda, 17 USD in DRC, 18 USD in Namibia, and 1520 USD in Liberia for the most recent outpatient care visit in the four weeks before the survey. Outpatient expenditures also had a wide range and were highly right skewed (skewed to large amounts). A considerable percentage of household members received outpatient care but reported zero out-of-pocket payments for the most recent visit—highest in Liberia (44%), followed by Namibia (24%), Rwanda (17%), and DRC (8%).

3.3.2. Out-of-pocket health expenditures by providers and reasons

Type of provider (public versus private) and reasons for care can influence the magnitude of out-of-pocket health expenditures. Table 8 indicates that for both inpatient and outpatient care services out-of-pocket health expenditures were lowest when care was received from a public provider. For inpatient care, the average out-of-pocket expenditure for care received in a public facility was half or less that of a private provider. In Rwanda for example, average spending was 21 USD for the most recent inpatient care received from a public provider, while it was 100 USD for the care received from a private provider. Public-private differences in health expenditures are less pronounced for outpatient care than inpatient care. In DRC, where 44% of household member who received outpatient care reported a private provider, household members, on average, spent 19 USD for their most recent visit with a private provider compared with an average 16 USD for care received from a public provider. High use of private providers was also reported in Namibia, and average out-of-pocket expenditure associated with health care received in the private sector (8 USD) was substantially higher than the average cost of care in the public sector (3 USD). Similar differences were observed in Liberia. Average out-of-pocket spending for inpatient care at private-sector facilities (4,684 USD) was more than double that for care by public providers (2,024.8 USD). Average out-of-pocket spending for outpatient care at private sector facilities (1,717 USD) was nearly 1.5 times that of public providers (1,118 USD).

Table 8. Average out-of-pocket health expenditures for the most recent health care services, by type of provider

	DRC	Liberia	Namibia	Rwanda
	Constant 2010 USD	Constant 2010 USD	Constant 2010 USD	Constant 2010 USD
Provider for inpatient care				
Public	47.9	2024.8	32.6	20.7
Private	95.1	4684.0	950.9	100.9
Other	60.4	2340.7	2012.7	51.6
Average	59.5	3118.8	122.6	22.7
Provider for outpatient care				
Public	15.9	1117.7	2.5	2.0
Private	19.1	1716.8	88.0	10.0
Other	10.4	1165.8	90.4	9.2
Average	16.9	1519.6	18.0	3.6

Out-of-pocket expenditures varied by reasons for seeking care (Table 9). For inpatient care, individuals spent the most on care received due to an accident or injury, ranging from 93 USD in Rwanda to 4,932 USD in Liberia. Table 9 also shows that average spending for outpatient care was highest for accidents and injuries in DRC, Namibia, and Rwanda. In DRC, household members spent 18 USD on malaria-related services and preventive services, which was higher than the national average for outpatient care (17 USD). In DRC, Namibia, and Rwanda spending on outpatient costs for sexual and reproductive health related services was below average outpatient out-of-pocket costs at 13 USD in DRC, 16 USD in Namibia, and 0.9 USD in Rwanda. Out-of-pocket expenditures for malaria-related inpatient and outpatient care were lower than the average costs of care in all study countries except DRC, where out-of-pocket spending on outpatient care for malaria treatment was higher than the average cost of outpatient care in the country.

Table 9. Average out-of-pocket health expenditures for the most recent health care services, by reasons for care

	DRC	Liberia	Namibia	Rwanda
	Constant 2010 USD	Constant 2010 USD	Constant 2010 USD	Constant 2010 USD
Reasons for inpatient care				
Sexual and reproductive health	58.5	4530.9	132.4	13.7
Fever/malaria	39.3	--	48.0	--
Other illness	71.4	2716.8	112.5	20.7
Accident/injury	121.1	4931.9	271.4	92.8
Average	59.5	3118.8	122.6	22.7
Reasons for outpatient care				
Sexual and reproductive health	13.3	2029.1	15.7	0.9
Malaria	18.0	1297.4	2.5	2.9
Fever	10.8	923.2	8.2	1.8
Diarrhea	10.0	1110.6	4.4	2.2
Respiratory illness	--	--	--	3.1
intestinal worms	--	--	--	3.1
Other illness/other reason	21.9	3293.4	23.5	5.6
Preventative care	18.2	1958.2	5.1	0.1
Accident/injury	22.0	1196.7	39.2	5.4
Average	16.9	1519.6	18.0	3.6

3.3.3. *Out-of-pocket health expenditures by individual, household, and community background characteristics*

Table 10 indicates that out-of-pocket health expenditures differ by individual, household, and community background characteristics. In DRC men spent more than women on inpatient care but about the same for outpatient care. For both inpatient and outpatient care, out-of-pocket expenditure increased with age. Average out-of-pocket spending for children under age 5 was 43 USD for inpatient care and 12 USD for outpatient care, but more than double for those age 65 or older. Individuals with a secondary education or higher spent more than twice as much out-of-pocket compared with those without any education. Insurance coverage was associated with lower out-of-pocket health expenditures; household members with health insurance spent an average of 40 USD on the most recent inpatient care compared with 61 USD spent by those without health insurance. Similarly, individuals with health insurance spent an average of 8 USD for the most recent outpatient care compared with 17 USD spent by those without health insurance.

Individuals living in households headed by a member who was female, older, or more educated reported higher out-of-pocket expenditures than their counterparts, for both inpatient and outpatient care. Out-of-pocket spending for health care was positively associated with household wealth status. Members of the wealthiest households spent an average of 147 USD for the most recent inpatient care, almost triple the national average (60 USD), while members of the poorest group spent 29 USD, half the national average. Similarly, those in the top wealth quintile spent 35 USD for the most recent outpatient care, double the national average (17 USD), while the poorest group spent only 9 USD. Urban residents reported higher out-of-pocket spending on inpatient care than rural residents. Regional variation was noteworthy, ranging from 27 USD in the Kasai-occidental region to 251 USD in the Kinshasa region.

In Liberia differentials in out-of-pocket spending by age and educational attainment were similar to DRC. Health insurance coverage was associated with lower out-of-pocket spending for inpatient care but higher out-of-pocket spending for outpatient care. Average out-of-pocket expenditure for inpatient care among individuals with health insurance was 1,721 USD compared with 4,178 USD among those with no insurance coverage. On the other hand, individuals without health insurance coverage on average spent 35% less (1,510 USD) for the most recent outpatient care than those without insurance (2,331 USD). There was no clear pattern between out-of-pocket health expenditure and age of the head of the household or educational attainment of the household head. Individuals from the wealthiest households spent the most compared with the other wealth quintiles. Living in urban areas was associated with higher out-of-pocket expenditure for both inpatient and outpatient care. Regional variation was more prominent for inpatient care than outpatient care; the former ranged from 1,575 to 3,540 USD, while the latter ranged from 1,115 to 1,266 USD.

Table 10 also indicates a few noteworthy findings in Namibia. Although men's out-of-pocket expenditures were higher than women's for inpatient care, women paid more than men out-of-pocket for outpatient care. Out-of-pocket health expenditures increase with age for both inpatient and outpatient care. Individuals with a secondary education or higher reported considerably higher out-of-pocket health expenditures—more than triple—compared with those with no education. Differences in health expenditures between the wealthiest and poorest groups are also substantial. Average out-of-pocket spending on the most recent inpatient care was 12 USD among the poorest group compared with 616 USD among the richest. For outpatient care, the range was from 2 USD for the poorest group compared with 50 USD for the wealthiest. Health insurance status was associated with higher health expenditures. Individuals covered by health insurance spent an average of 67 USD on inpatient care and 7 USD on outpatient care compared with 670 USD and 79 USD, respectively, among those not covered by health insurance.

Table 10. Average out-of-pocket health expenditures for the most recent health care services received, by individual, household, and community background characteristics

Background characteristics	DRC Inpatient (Constant 2010 USD)	DRC Outpatient (Constant 2010 USD)	Liberia Inpatient (Constant 2010 USD)	Liberia Outpatient (Constant 2010 USD)	Namibia Inpatient (Constant 2010 USD)	Namibia Outpatient (Constant 2010 USD)	Rwanda Inpatient (Constant 2010 USD)	Rwanda Outpatient (Constant 2010 USD)
Individual characteristics								
Sex								
Male	64.4	16.1	3013.9	1421.7	125.5	16.7	31.9	4.3
Female	56.4	17.6	3197.3	1605.3	120.0	19.0	18.9	3.1
Age								
0-4	42.8	11.8	1832.0	1042.2	93.5	9.5	12.5	2.5
5-14	52.8	13.0	2274.6	1354.6	59.6	17.0	25.5	2.5
15-49	67.4	18.9	3605.9	1649.4	143.8	18.7	20.0	4.1
50-64	68.6	30.7	3295.8	2304.5	214.2	33.3	66.3	5.5
65+	105.3	25.8	5805.3	1464.8	220.9	18.6	27.7	5.3
Education								
None	43.3	12.4	2632.2	1263.5	73.1	8.0	12.4	2.5
Primary	53.0	13.7	3014.2	1538.0	46.9	13.6	21.7	3.7
Secondary or higher	92.7	26.5	4146.6	1991.8	244.5	30.1	66.2	8.2
Insurance status								
No	60.5	17.3	3178.3	1509.8	66.5	6.8	23.3	5.0
Yes	40.1	8.3	1721.1	2330.7	669.9	78.8	22.6	3.2
Household characteristics								
Female-headed household								
No	58.4	16.8	3311.6	1561.3	168.7	27.9	22.3	3.7
Yes	64.0	17.6	2801.0	1444.4	72.8	7.5	23.9	3.2
Age of household head								
<24	28.6	8.8	2008.0	951.1	107.1	8.0	15.9	3.1
25-34	48.9	13.5	2934.9	1453.2	134.6	13.3	18.1	3.0
35-44	66.0	15.0	3582.5	1418.6	176.9	16.9	22.4	3.3
45-54	65.0	17.7	2903.3	1771.6	153.6	35.7	25.9	4.9
55-64	61.4	25.8	2418.8	1838.6	108.0	19.2	33.1	3.7
65+	79.2	26.4	4808.1	1637.0	53.9	8.5	30.4	3.6
Education of household head								
None	39.8	12.0	3238.5	1238.8	15.0	3.7	14.1	2.3
Primary	38.3	11.9	2402.5	1465.1	29.7	5.7	19.0	3.3
Secondary or higher	73.6	19.7	3361.3	1708.4	252.9	36.3	62.0	7.3
Household wealth status								
1st quintile	28.5	9.2	2434.4	1167.3	12.3	1.9	11.6	1.9
2nd quintile	36.6	10.3	3109.8	1256.7	17.8	25.8	10.7	2.3
3rd quintile	47.4	11.7	2444.8	1200.6	18.6	6.4	12.8	2.2
4th quintile	52.8	15.7	3018.5	1588.8	69.0	11.9	15.0	2.8
5th quintile	146.5	35.3	4556.1	2246.4	615.5	50.4	69.9	7.7

Continues

Table 10—*Continued*

Background characteristics	DRC		Liberia		Namibia		Rwanda	
	Inpatient	Outpatient	Inpatient	Outpatient	Inpatient	Outpatient	Inpatient	Outpatient
	(Constant 2010 USD)	(Constant 2010 USD)	(Constant 2010 USD)	(Constant 2010 USD)	(Constant 2010 USD)	(Constant 2010 USD)	(Constant 2010 USD)	(Constant 2010 USD)
Community-level variables								
Residence								
Rural	37.6	10.1	2577.8	1290.2	50.4	6.1	16.8	2.7
Urban	108.6	27.4	3526.5	1670.6	214.3	35.8	64.7	8.5
Region								
Kinshasa	251.2	44.3	--	--	--	--	--	--
Bandundu	49.6	13.6	--	--	--	--	--	--
Bas-congo	86.7	17.1	--	--	--	--	--	--
Equateur	45.6	12.1	--	--	--	--	--	--
Kasai-occidental	27.3	8.9	--	--	--	--	--	--
Kasai-oriental	54.3	13.9	--	--	--	--	--	--
Katanga	60.9	21.3	--	--	--	--	--	--
Maniema	54.9	17.9	--	--	--	--	--	--
Nord-kivu	47.7	11.1	--	--	--	--	--	--
Orientale	44.5	13.6	--	--	--	--	--	--
Sud-kivu	36.5	9.2	--	--	--	--	--	--
North Western	--	--	1575.4	1114.5	--	--	--	--
South Central	--	--	3575.8	1750.0	--	--	--	--
South Eastern A	--	--	2014.1	1226.5	--	--	--	--
South Eastern B	--	--	1893.8	1534.2	--	--	--	--
North Central	--	--	3540.1	1265.6	--	--	--	--
Caprivi	--	--	--	--	14.6	9.8	--	--
Erongo	--	--	--	--	213.4	14.8	--	--
Hardap	--	--	--	--	133.7	30.0	--	--
Karas	--	--	--	--	213.6	13.3	--	--
Kavango	--	--	--	--	29.0	4.5	--	--
Khomas	--	--	--	--	456.4	69.3	--	--
Kunene	--	--	--	--	28.5	17.3	--	--
Ohangwena	--	--	--	--	9.5	2.0	--	--
Omaheke	--	--	--	--	30.3	24.2	--	--
Omusati	--	--	--	--	49.0	2.1	--	--
Oshana	--	--	--	--	166.0	9.6	--	--
Oshikoto	--	--	--	--	45.1	10.2	--	--
Otjozondjupa	--	--	--	--	68.3	43.1	--	--
Kigali city	--	--	--	--	--	--	95.6	10.3
South	--	--	--	--	--	--	15.3	2.0
West	--	--	--	--	--	--	12.7	2.6
North	--	--	--	--	--	--	11.1	1.8
East	--	--	--	--	--	--	21.8	4.4
Total	59.5	16.9	3118.8	1519.6	122.6	18.0	22.7	3.6

In Rwanda women's out-of-pocket health expenditures were lower than men's for both inpatient and outpatient care. Out-of-pocket health expenditures for both inpatient and outpatient services increase with individuals' age and level of education and with household wealth quintile. Health insurance does not appear to make a substantial difference on individual expenditures for inpatient care, but it is associated with slightly lower expenditures for outpatient care. Despite the overall low level of spending on health care in Rwanda, the wealthiest group had much higher out-of-pocket spending than other wealth quintiles for both inpatient and outpatient care. Urban residents reported spending more than rural residents, on average. Individuals living in Kigali spent the most on both inpatient and outpatient care, at 96 USD and 10 USD, respectively, which is 3-4 times the national average.

3.3.4. *Multivariable analysis results of out-of-pocket health expenditures*

Two-part models were fitted for each country to assess the correlates of out-of-pocket expenditures for outpatient and inpatient care. The first part was a probit model to estimate the probability of having positive health expenditures (that is, any health expenditures at all). The second part was a generalized linear model (GLM) to estimate the magnitude of out-of-pocket expenditures. In Liberia, since information on health expenditure for outpatient care was available only for household members who had a positive expenditure, only the generalized linear model was used to model magnitude of expenditures on outpatient care. A two-part model was used for health expenditures for inpatient care in Liberia.

Table 11 shows the results of the two-part model for DRC. The results of the probit model indicate that only gender and health insurance status predict whether the household has positive health expenditures in the DRC. Net of other factors, women are more likely to have positive out-of-pocket payments for inpatient services than men (p<0.05), but gender differences for outpatient care are statistically nonsignificant. Net of other factors, those with health insurance are less likely to have positive out-of-pocket payments than those with no coverage (p<0.0001). The GLM results indicate that age of the individual, age of the household head, educational attainment of the household head, wealth status of the household, and urban residence are associated with higher out-of-pocket spending for both inpatient and outpatient care services, and these associations are statistically significant. Although women's out-of-pocket payments for inpatient care are lower than those of men (p<0.001), gender differences in out-of-pocket spending for outpatient care are statistically nonsignificant. Regional differences in the probability of having positive out-of-pocket health expenditures are statistically nonsignificant but, conditional on having positive expenditures, living in any other region than Kinshasa is associated with lower out-of-pocket health payments for both inpatient and outpatient care, and these differences are statistically significant.

Results for Liberia (Table 12) show that individual educational attainment increases the probability of positive expenditures for inpatient care, and this association is statistically significant. In Liberia as in DRC, having health insurance coverage decreases the likelihood of having positive expenditures for inpatient care, but unlike DRC, when there are expenditures individuals with health insurance spend more than those not covered by health insurance (p<0.05). Household wealth status is not significant in predicting either the probability of having positive expenditures or the level of the expenditure for the most recent inpatient care. Whereas the regional differences in the odds of having positive expenditures for inpatient care are statistically significant, conditional on positive expenditure, the magnitude of the out-of-pocket payments do not differ.

We used a GLM model to analyze outpatient out-of-pocket health expenditure in Liberia. Age of the individual and age of the household head are significantly associated with higher out-of-pocket spending. The association between health insurance and the magnitude of out-of-pocket payments for outpatient services is statistically nonsignificant. Compared with individuals from the poorest households, those from the fourth and fifth wealth quintiles spend more on outpatient care.

Table 13 shows the results of the two-part model for out-of-pocket expenditures in Namibia. Older household members are less likely to have positive expenditures for both inpatient and outpatient care. When they do have direct payments, however, they spend more out-of-pocket than younger individuals. Health insurance coverage is not associated with the probability of having positive expenditures. When spending does occur, people with insurance spend more than those without health insurance, for both inpatient and outpatient care. Conditional on incurring positive health expenditures, individuals from wealthier households tend to spend more.

Results for Rwanda (Table 14) indicate that region of residence is the main determinant of whether an individual has positive out-of-pocket expenditures for inpatient care. Individual characteristics also influence the chances of spending for outpatient care; women are less likely to have positive payments, and

the chances of positive expenditures increase with age. When out-of-pocket payments are made, they tend to be lower for individuals who are insured than those without insurance, both for inpatient and outpatient care. For both inpatient and outpatient care the magnitude of out-of-pocket spending does not differ by wealth status of the household, except among individuals in the richest quintile, who tend to pay more than those in the poorest quintile.

Table 11. Results of two-part models for out-of-pocket expenditures for the most recent health care services, DRC DHS 2013

VARIABLES	Inpatient				Outpatient			
	Probit		GLM		Probit		GLM	
	coef	95% CI	coef	95% CI	coef	95% CI	coef	95% CI
Sex (ref.: male)								
Female	0.18*	0.03 - 0.33	-0.15***	-0.24 - -0.06	0.08	-0.02 - 0.18	0.01	-0.06 - 0.08
Age (ref.: 0-4)								
5-14	0.00	-0.25 - 0.25	0.12	-0.07 - 0.31	0.05	-0.14 - 0.24	0.03	-0.09 - 0.15
5-49	0.17	-0.10 - 0.44	0.38***	0.21 - 0.55	0.01	-0.21 - 0.22	0.30***	0.16 - 0.45
50-64	-0.09	-0.42 - 0.25	0.65***	0.40 - 0.91	0.13	-0.14 - 0.40	0.59***	0.39 - 0.78
65+	0.31	-0.28 - 0.89	0.64***	0.30 - 0.99	-0.04	-0.43 - 0.34	0.38**	0.12 - 0.64
Education (ref.: none)								
Primary	0.09	-0.14 - 0.31	0.04	-0.12 - 0.20	0.02	-0.15 - 0.19	-0.00	-0.12 - 0.12
Secondary or higher	-0.03	-0.34 - 0.28	0.12	-0.05 - 0.29	-0.07	-0.25 - 0.12	0.11	-0.06 - 0.27
Covered by health insurance(ref.: uninsured)	-2.16***	-2.59 - -1.72	-0.02	-0.45 - 0.41	-1.76***	-2.12 - -1.40	-0.35**	-0.58 - -0.12
Female headed-household (ref.: male-headed)	-0.16	-0.43 - 0.10	0.03	-0.18 - 0.24	-0.15	-0.33 - 0.02	-0.05	-0.16 - 0.05
Age of household head (ref.: <24)								
25-34	-0.14	-0.66 - 0.38	0.25**	0.09 - 0.41	-0.20	-0.51 - 0.12	0.24**	0.09 - 0.39
35-44	-0.14	-0.67 - 0.39	0.45***	0.27 - 0.62	0.10	-0.23 - 0.43	0.16*	0.02 - 0.31
45-54	-0.35	-0.89 - 0.20	0.46***	0.27 - 0.66	0.11	-0.23 - 0.45	0.18*	0.03 - 0.34
55-64	-0.20	-0.75 - 0.35	0.46***	0.21 - 0.72	-0.05	-0.38 - 0.29	0.35***	0.15 - 0.55
65+	-0.07	-0.69 - 0.55	0.43**	0.16 - 0.70	-0.14	-0.58 - 0.29	0.44**	0.17 - 0.70
Education of household head (ref.: none)								
Primary	-0.29	-0.63 - 0.06	0.09	-0.07 - 0.25	0.16	-0.06 - 0.38	0.07	-0.05 - 0.20
Secondary or higher	-0.19	-0.58 - 0.19	0.27**	0.09 - 0.45	-0.05	-0.28 - 0.18	0.26***	0.11 - 0.40
Household wealth status (ref.: 1st quintile)								
2nd quintile	0.15	-0.10 - 0.41	0.13	-0.05 - 0.30	-0.02	-0.23 - 0.18	0.02	-0.09 - 0.14
3rd quintile	0.34*	0.00 - 0.68	0.17*	0.00 - 0.33	-0.19	-0.41 - 0.04	0.06	-0.07 - 0.19
4th quintile	0.34	-0.00 - 0.69	0.24**	0.07 - 0.41	-0.12	-0.35 - 0.11	0.18*	0.02 - 0.35
5th quintile	0.30	-0.14 - 0.73	0.73***	0.46 - 1.00	-0.03	-0.35 - 0.28	0.53***	0.23 - 0.82
Urban (ref.: rural)	0.10	-0.22 - 0.42	0.33***	0.18 - 0.48	0.25*	0.05 - 0.45	0.23**	0.09 - 0.38
Region (ref.: Kinshasa)								
Bandundu	0.42	-0.17 - 1.01	-0.65**	-1.12 - -0.18	-0.17	-0.59 - 0.24	-0.58***	-0.90 - -0.25
Bas-congo	0.28	-0.33 - 0.89	-0.31	-0.75 - 0.12	0.02	-0.44 - 0.49	-0.39*	-0.72 - -0.06
Equateur	0.55*	0.04 - 1.07	-0.88***	-1.34 - -0.43	-0.19	-0.60 - 0.22	-0.70***	-1.03 - -0.37
Kasai-occidental	0.62	-0.09 - 1.33	-1.28***	-1.78 - -0.78	0.05	-0.41 - 0.52	-1.09***	-1.42 - -0.76
Kasai-oriental	0.13	-0.39 - 0.65	-1.06***	-1.53 - -0.60	-0.03	-0.44 - 0.38	-0.71***	-1.03 - -0.39
Katanga	0.27	-0.21 - 0.74	-0.54*	-0.99 - -0.09	-0.03	-0.45 - 0.39	-0.27	-0.70 - 0.16
Maniema	0.15	-0.47 - 0.77	-0.70**	-1.16 - -0.24	0.28	-0.18 - 0.74	-0.30	-0.65 - 0.05
Nord-kivu	-0.33	-0.87 - 0.21	-1.03***	-1.48 - -0.59	-0.39	-0.91 - 0.13	-0.80***	-1.16 - -0.43
Orientale	0.24	-0.27 - 0.74	-0.84***	-1.29 - -0.38	-0.19	-0.60 - 0.23	-0.56**	-0.90 - -0.21
Sud-kivu	-0.54	-1.18 - 0.11	-0.87***	-1.33 - -0.42	-0.58	-1.19 - 0.02	-0.75***	-1.11 - -0.39
Total number of household members	3,797				6,167			

* p<0.05, ** p<0.01, *** p<0.001

Table 12. Results of two-part models for out-of-pocket expenditures for the most recent health care services, Liberia DHS 2013

VARIABLES	Inpatient				Outpatient	
	Probit		GLM		GLM	
	coef	95% CI	coef	95% CI	Coef	95% CI
Sex (ref.: male)						
Female	0.03	-0.08 - 0.15	-0.17*	-0.31 - -0.03	0.07	-0.09 - 0.22
Age (ref.: 0-4)						
5-14	0.04	-0.15 - 0.23	0.17	-0.10 - 0.44	0.06	-0.14 - 0.27
15-49	-0.04	-0.24 - 0.15	0.65***	0.44 - 0.86	0.35***	0.15 - 0.55
50-64	0.04	-0.20 - 0.29	0.72***	0.45 - 1.00	0.55***	0.23 - 0.87
65+	0.25	-0.02 - 0.53	0.91***	0.60 - 1.22	0.37	-0.04 - 0.77
Education (ref.: none)						
Primary	0.28***	0.12 - 0.44	-0.14	-0.34 - 0.06	0.02	-0.18 - 0.22
Secondary or higher	0.31**	0.12 - 0.50	0.05	-0.18 - 0.28	0.06	-0.16 - 0.28
Covered by health insurance (ref.: uninsured)	-1.14***	-1.53 - -0.76	0.63*	0.11 - 1.15	0.07	-0.38 - 0.53
Female headed-household (ref.: male-headed)	0.09	-0.08 - 0.27	-0.06	-0.25 - 0.13	-0.04	-0.21 - 0.12
Age of household head (ref.: <24)						
25-34	0.02	-0.26 - 0.29	0.14	-0.13 - 0.40	0.44***	0.19 - 0.69
35-44	-0.02	-0.30 - 0.27	0.40**	0.12 - 0.68	0.38**	0.15 - 0.61
45-54	-0.02	-0.31 - 0.27	0.35*	0.08 - 0.62	0.58***	0.28 - 0.88
55-64	-0.06	-0.39 - 0.26	0.06	-0.25 - 0.36	0.55**	0.21 - 0.90
65+	-0.21	-0.56 - 0.14	0.45*	0.06 - 0.84	0.47*	0.06 - 0.87
Education of household head (ref.: none)						
Primary	0.02	-0.20 - 0.24	-0.06	-0.28 - 0.17	0.20	-0.01 - 0.42
Secondary or higher	-0.10	-0.29 - 0.09	0.01	-0.21 - 0.23	0.14	-0.06 - 0.34
Household wealth status (ref: 1st quintile)						
2nd quintile	0.12	-0.05 - 0.29	-0.04	-0.27 - 0.18	0.12	-0.08 - 0.32
3rd quintile	0.14	-0.08 - 0.35	0.03	-0.20 - 0.26	0.06	-0.18 - 0.31
4th quintile	0.10	-0.16 - 0.35	0.08	-0.23 - 0.40	0.37**	0.12 - 0.62
5th quintile	0.29	-0.01 - 0.60	0.37	-0.04 - 0.78	0.63***	0.32 - 0.93
Urban (ref.: rural)	-0.08	-0.27 - 0.11	-0.18	-0.38 - 0.02	-0.12	-0.32 - 0.09
Region (ref.: North Western)						
South Central	0.90***	0.60 - 1.19	0.28	-0.05 - 0.61	0.15	-0.10 - 0.41
South Eastern A	0.19	-0.13 - 0.50	0.07	-0.25 - 0.39	0.07	-0.20 - 0.34
South Eastern B	0.11	-0.23 - 0.45	-0.13	-0.48 - 0.22	0.39*	0.01 - 0.77
North Central	0.69***	0.40 - 0.99	0.28	-0.03 - 0.60	0.14	-0.12 - 0.40
Total number of household members	2,106				2,982	

* p<0.05, ** p<0.01, *** p<0.001

Table 13. Results of two-part models for out-of-pocket expenditures for the most recent health care services, Namibia DHS 2013

	Inpatient				Outpatient			
	Probit		GLM		Probit		GLM	
VARIABLES	coef	95% CI	coef	95% CI	coef	95% CI	coef	95% CI
Sex (ref.: male)								
Female	0.00	-0.07 - 0.07	-0.12	-0.24 - 0.01	0.02	-0.03 - 0.07	0.06	-0.03 - 0.16
Age (ref.: 0-4)								
5-14	-0.08	-0.21 - 0.05	0.01	-0.24 - 0.25	-0.03	-0.13 - 0.06	0.14	-0.03 - 0.31
15-49	-0.16	-0.34 - 0.02	0.04	-0.26 - 0.34	-0.15*	-0.27 - -0.03	0.10	-0.14 - 0.34
50-64	-0.17*	-0.34 - -0.01	0.40*	0.09 - 0.71	-0.13*	-0.25 - -0.02	0.19	-0.07 - 0.46
65+	-0.29***	-0.44 - -0.13	0.52***	0.22 - 0.82	-0.31***	-0.42 - -0.20	0.76***	0.32 - 1.21
Education (ref.: none)								
Primary	0.09	-0.03 - 0.20	0.04	-0.18 - 0.25	0.04	-0.04 - 0.11	0.05	-0.12 - 0.22
Secondary or higher	0.11	-0.04 - 0.26	0.30*	0.06 - 0.54	0.08	-0.02 - 0.18	0.11	-0.09 - 0.32
Covered by health insurance (ref.: uninsured)	-0.20	-0.44 - 0.04	0.64***	0.33 - 0.94	0.06	-0.07 - 0.19	0.87***	0.52 - 1.23
Female headed-household (ref.: male-headed)	-0.03	-0.22 - 0.16	-0.36*	-0.69 - -0.03	-0.02	-0.14 - 0.10	-0.15	-0.41 - 0.11
Age of household head (ref.: <24)								
25-34	0.04	-0.48 - 0.57	-0.32	-1.65 - 1.00	-0.11	-0.44 - 0.22	-0.07	-0.79 - 0.65
35-44	-0.01	-0.51 - 0.50	-0.15	-1.52 - 1.22	-0.21	-0.54 - 0.13	-0.29	-0.98 - 0.40
45-54	-0.02	-0.56 - 0.51	-0.31	-1.66 - 1.05	-0.12	-0.46 - 0.22	0.42	-0.39 - 1.23
55-64	-0.32	-0.87 - 0.22	0.27	-1.12 - 1.67	-0.58***	-0.92 - -0.25	0.50	-0.27 - 1.28
65+	-0.82**	-1.38 - -0.27	0.56	-0.83 - 1.95	-1.17***	-1.51 - -0.84	0.92*	0.08 - 1.75
Education of household head (ref.: none)								
Primary	0.13	-0.14 - 0.40	0.31	-0.19 - 0.80	-0.02	-0.18 - 0.15	0.08	-0.25 - 0.40
Secondary or higher	0.07	-0.26 - 0.40	0.50	-0.00 - 1.01	0.05	-0.16 - 0.25	0.69***	0.30 - 1.07
Household wealth status (ref.: 1st quintile)								
2nd quintile	0.37*	0.06 - 0.68	0.04	-0.46 - 0.54	-0.04	-0.24 - 0.15	0.71***	0.32 - 1.09
3rd quintile	0.16	-0.18 - 0.50	-0.14	-0.72 - 0.43	0.08	-0.13 - 0.29	0.36	-0.04 - 0.75
4th quintile	0.14	-0.19 - 0.48	1.21***	0.59 - 1.83	0.24	-0.01 - 0.48	0.73**	0.26 - 1.21
5th quintile	0.12	-0.33 - 0.56	3.16***	2.35 - 3.97	0.47**	0.17 - 0.77	1.62***	0.98 - 2.26
Urban (ref.: rural)	0.21	-0.08 - 0.50	-0.45*	-0.90 - -0.01	-0.04	-0.22 - 0.15	0.02	-0.33 - 0.37
Region (ref.: Caprivi)								
Erongo	-0.20	-0.66 - 0.26	0.95*	0.08 - 1.82	-0.46**	-0.81 - -0.11	0.14	-0.51 - 0.79
Hardap	-1.04***	-1.51 - -0.56	-0.54	-1.22 - 0.13	-0.81***	-1.16 - -0.45	0.47	-0.35 - 1.30
Karas	-1.17***	-1.65 - -0.69	0.44	-0.44 - 1.33	-0.58***	-0.87 - -0.29	0.09	-0.55 - 0.73
Kavango	-0.28	-0.73 - 0.18	0.88**	0.29 - 1.47	-0.18	-0.47 - 0.11	0.08	-0.53 - 0.69
Khomas	-0.47	-1.00 - 0.06	1.38***	0.62 - 2.13	0.23	-0.14 - 0.60	1.69***	0.75 - 2.63
Kunene	-0.35	-0.89 - 0.20	0.76	-0.07 - 1.59	0.10	-0.27 - 0.47	1.22*	0.27 - 2.16
Ohangwena	-0.51*	-0.96 - -0.06	-0.01	-0.56 - 0.54	-0.33*	-0.59 - -0.07	-0.31	-0.97 - 0.34
Omaheke	-0.81**	-1.34 - -0.28	0.63	-0.26 - 1.52	-0.53***	-0.81 - -0.24	1.03**	0.35 - 1.71
Omusati	-0.56*	-1.02 - -0.09	0.77	-0.22 - 1.77	-0.30*	-0.58 - -0.01	-0.68*	-1.27 - -0.08
Oshana	-0.35	-1.11 - 0.41	0.61	-0.06 - 1.27	-0.20	-0.48 - 0.07	0.45	-0.25 - 1.15
Oshikoto	-0.41	-0.90 - 0.09	0.10	-0.62 - 0.82	-0.37*	-0.68 - -0.06	0.75	-0.28 - 1.77
Otjozondjupa	-0.78**	-1.26 - -0.29	0.42	-0.35 - 1.18	-0.40**	-0.70 - -0.10	0.73*	0.02 - 1.44
Total number of household members	6,494				15,991			

* p<0.05, ** p<0.01, *** p<0.001

Table 14. Results of two-part models for out-of-pocket expenditures for the most recent health care services, Rwanda DHS 2010

VARIABLES	Inpatient				Outpatient			
	Probit		GLM		Probit		GLM	
	coef	95% CI	coef	95% CI	coef	95% CI	coef	95% CI
Sex (ref.: male)								
Female	0.05	-0.21 - 0.31	-0.43***	-0.65 - -0.21	-0.14**	-0.23 - -0.06	-0.37***	-0.50 - -0.25
Age (ref.: 0-4)								
5-14	-0.18	-0.81 - 0.45	0.05	-0.47 - 0.58	-0.02	-0.20 - 0.16	-0.03	-0.25 - 0.19
15-49	-0.22	-0.74 - 0.29	-0.21	-0.61 - 0.19	0.39***	0.21 - 0.56	0.31**	0.11 - 0.52
50-64	-0.15	-0.81 - 0.51	0.41	-0.24 - 1.06	0.68***	0.41 - 0.95	0.56***	0.31 - 0.81
65+	0.10	-0.78 - 0.98	-0.36	-1.30 - 0.59	0.88***	0.44 - 1.33	0.63**	0.24 - 1.02
Education (ref.: none)								
Primary	0.14	-0.20 - 0.48	0.67***	0.39 - 0.94	-0.07	-0.21 - 0.06	0.10	-0.07 - 0.28
Secondary or higher	-0.16	-0.72 - 0.40	0.83***	0.35 - 1.31	-0.22	-0.45 - 0.01	0.21	-0.14 - 0.55
Covered by health insurance (ref.: uninsured)	0.23	-0.10 - 0.56	-0.51***	-0.78 - -0.24	0.44***	0.32 - 0.56	-0.79***	-0.95 - -0.64
Injured in the last 4 weeks (ref.: not injured)	-0.04	-0.35 - 0.27	0.24	-0.03 - 0.51	1.05***	0.87 - 1.22	0.00	-0.15 - 0.16
Female headed-household (ref.: male-headed)	-0.25	-0.52 - 0.01	-0.13	-0.38 - 0.12	0.00	-0.12 - 0.12	0.01	-0.12 - 0.14
Age of household head (ref.: <24)								
25-34	0.41*	0.01 - 0.82	-0.21	-0.58 - 0.16	0.03	-0.20 - 0.26	0.03	-0.19 - 0.26
35-44	0.30	-0.13 - 0.74	0.09	-0.29 - 0.46	0.13	-0.11 - 0.37	0.02	-0.20 - 0.24
45-54	0.35	-0.07 - 0.77	0.16	-0.27 - 0.58	0.06	-0.19 - 0.30	0.31*	0.03 - 0.58
55-64	0.39	-0.18 - 0.96	0.14	-0.38 - 0.66	0.05	-0.21 - 0.31	0.04	-0.23 - 0.32
65+	0.02	-0.67 - 0.71	0.75	-0.09 - 1.60	0.13	-0.20 - 0.46	0.09	-0.20 - 0.39
Education of household head (ref.: none)								
Primary	-0.06	-0.35 - 0.23	-0.24	-0.50 - 0.03	-0.02	-0.16 - 0.12	0.12	-0.06 - 0.29
Secondary or higher	-0.10	-0.55 - 0.35	0.17	-0.34 - 0.68	0.04	-0.17 - 0.25	0.19	-0.13 - 0.50
Household wealth status (ref.:1st quintile)								
2nd quintile	0.13	-0.21 - 0.47	0.02	-0.28 - 0.31	0.07	-0.08 - 0.22	0.03	-0.17 - 0.24
3rd quintile	0.07	-0.27 - 0.41	0.06	-0.25 - 0.37	0.05	-0.12 - 0.22	0.06	-0.15 - 0.27
4th quintile	0.39	-0.07 - 0.85	0.16	-0.15 - 0.48	0.16	-0.03 - 0.34	0.02	-0.22 - 0.26
5th quintile	-0.14	-0.56 - 0.29	0.91***	0.47 - 1.36	0.28**	0.07 - 0.49	0.68***	0.41 - 0.95
Urban (ref)	-0.19	-0.55 - 0.16	0.13	-0.20 - 0.46	0.22	-0.13 - 0.57	0.36*	0.07 - 0.66
Region (ref.: Kigali)								
South	-1.21***	-1.79 - -0.63	-0.94***	-1.45 - -0.44	-0.11	-0.47 - 0.25	-0.69***	-1.04 - -0.34
West	-0.75*	-1.38 - -0.12	-1.10***	-1.62 - -0.58	0.44*	0.07 - 0.81	-0.58**	-0.95 - -0.21
North	-1.00**	-1.63 - -0.38	-1.15***	-1.67 - -0.62	0.24	-0.13 - 0.62	-0.76***	-1.14 - -0.38
East	-0.99**	-1.60 - -0.38	-0.78**	-1.34 - -0.23	0.18	-0.19 - 0.55	-0.10	-0.54 - 0.33
Total number of household members	1,908				6,264			

* p<0.05, ** p<0.01, *** p<0.001

4. Discussion and Conclusion

The main focus of this study was to examine out-of-pocket health expenditures and associated factors in four African countries—The Democratic Republic of the Congo, Liberia, Namibia, and Rwanda—using nationally representative data from the Demographic and health Surveys. Because the level of out-of-pocket spending is related to health care utilization, we also assessed use of inpatient and outpatient care services among all household members.

4.1. Health Care Utilization

In the study countries use of inpatient care ranged from 4% to 18% and use of outpatient care from 7% to 41%. The differences in the use of health care services reflect the countries' respective economic development status. The lowest level of health care use was in DRC, where GDP per capita is 385 in constant 2010 USD (World Bank 2016a). Namibia had relatively higher levels of health care use than the other three countries, which may reflect the broad reach of public sector facilities and providers, and also because Namibia is a relatively wealthier country with a GDP per capita of 6,014 constant 2010 USD (World Bank 2016a).

As would be expected, health care utilization rates are higher when confined to those who need health care, rather than calculated for all individuals. For example, in Rwanda, when we restricted the analysis to household members who reported experience of illness or injury in last four weeks, the estimate for outpatient care utilization was substantially higher (70%) compared with our estimate of 11% that included all individuals regardless of their need for health care.

In analyzing individual, household, and community characteristics associated with using health services, we found that in most of the study countries age and sex play a role in seeking care. Women were more likely to seek health care services than men. Children under age 5 and household members age 65 or over were more likely to seek care compared with other age groups. While the education level of the head of the household was positively associated with use of the health care in some study countries, there was no clear association between health care utilization and individuals' educational attainment, or an association between health care utilization and household wealth status. This non-finding may reflect the composition of the study samples. As mentioned, the analytical samples included all individuals rather than only individuals with a need for care. If educational attainment and household wealth status are associated with reduced likelihood of illness or injury but increased likelihood of seeking care, their association with use of health services would be cancelled out when the sample includes both individuals who needed and sought care and those who did not need care (or were not aware they needed to seek care). In addition, a large proportion of the sample (14-20%) was under age 5, which could also contribute to the nonsignificant association between individual educational attainment and health care utilization.

We were able to assess the effect of health insurance on use of health services only in Rwanda because it was the only study country where health insurance data were collected for all household members regardless of whether they reported any use of health care. Health insurance coverage in Rwanda is common and the majority of the insured are covered by the community-based mutual health insurance, which is designed to increase the use of health care, especially for the poor. Our findings indicate that Rwandans with health insurance coverage were more than twice as likely to receive both inpatient and outpatient care services compared with the uninsured. A study based on a national survey in 2005-2006 in Rwanda also found that individuals in households covered by mutual health insurance used health services twice as much as those in households without insurance coverage (Saksena et al. 2011). The positive impact of health insurance on general service utilization has also been found in India, Vietnam, and China (Aggarwal 2010; Saksena et al. 2011; Wagstaff 2007; Wang et al. 2009).

Across all four countries, individuals were more likely to use public than private facilities and providers for treatment. Public providers may be a more attractive source of care for health seekers because they generally charge less for services than in the private sector. In Liberia the private sector plays a relatively larger role in the provision of health care compared with the other three study countries. This may reflect the structure of the health system, which is based on a multi-sectoral approach and partnership with the private sector. NGOs and private agencies provide most health care services in Liberia (WHO Health Action in Crises 2005). The reasons for receiving health care differ by country. In DRC and Liberia, where the burden of malaria is among the highest in the world (WHO Global Malaria Programme 2015), the most common reason given for seeking care is malaria and/or fever. Reasons related to sexual and reproductive health are more commonly reported for inpatient than outpatient care.

4.2. Out-of-Pocket Health Expenditures

We found a wide range in absolute levels of out-of-pocket spending across the four study countries. The average cost of health care services was highest in Liberia, and Liberia also has the highest proportion of health care users with zero out-of-pocket payments. In all four countries cost of care was generally lower through public providers than private providers. The biggest differential in cost of care between public and private providers was observed in Namibia.

We did not estimate the share of out-of-pocket health expenditures from total income or catastrophic health spending because the DHS does not collect information on household income or household expenditures or consumption. The results of our multivariate analysis indicate that the magnitude of out-of-pocket expenditures is associated with sex and age. When out-of-pocket spending does occur, women tend to spend less than men. Cost of care also generally increases with age. These findings are consistent with other studies (Brinda et al. 2012; You and Kobayashi 2011). While other studies have documented the effects of sex and education of the household head on higher household health expenditures (Leone, James, and Padmadas 2013; Mohanty and Srivastava 2013), we did not find a consistent association in the study countries.

The relationship between health insurance coverage and out-of-pocket health spending varied across the study countries. In DRC and Rwanda, health insurance coverage was associated with lower out-of-pocket expenditures for both inpatient and outpatient care services, while in Liberia and Namibia it was associated with higher out-of-pocket payments. In Rwanda 95% of the insured are covered by the mutual health insurance scheme, which covers outpatient and inpatient services, essential drugs, medical imagery, and laboratory tests (Ministry of Health of Rwanda 2010). Sakesena and colleagues (2011) found that mutual health insurance in Rwanda provided financial risk protection and substantially reduced the incidence of catastrophic health expenditure. Studies in other countries have also shown that health insurance protected enrollees by reducing out-of-pocket spending (Acharya et al. 2013; Aggarwal 2010; Bauhoff, Hotchkiss, and Smith 2011; Nguyen and Wang 2013; Nguyen, Rajkotia, and Wang 2011). Our finding of an association between health insurance coverage and higher out-of-pocket spending in Namibia and Liberia is also documented in other studies (Shahrawat and Rao 2012; Wagstaff and Lindelow 2008; You and Kobayashi 2011). One explanation for this counterintuitive relationship between health insurance coverage and out-of-pocket health spending is adverse selection; that is, individuals at higher risk of illness or with chronic diseases are more likely to enroll in insurance and also more likely to incur higher health care costs. Alternatively, the benefit packages offered by insurance schemes may lead to higher out-of-pocket payments, for example, if they offer only limited coverage (for example, cover only hospitalization) (Shahrawat and Rao 2012).

Although access to health services for poorer households did not differ from that of more affluent households, our results indicate that poorer households spent less in absolute terms on out-of-pocket payments. This finding agrees with other studies from a number of countries (Chuma and Maina 2012; Hotchkiss et al. 2005; Rahman et al. 2013; Rous and Hotchkiss 2003), which also indicated that the relative

share of health expenditures to total or non-food household expenditures was higher in poorer households. Unfortunately, our data did not allow us to test this association.

The results of this study should be considered in light of several limitations. Ideally, we would have liked to examine access to health care among individuals who needed care—for example, household members who reported a condition or illness that required health care or treatment with medicines, or those with a chronic illness. However, identification of such household members was only possible with the Rwanda DHS, in which information for all household members was collected on whether they had an illness or injury in the four weeks before the survey. In the absence of such information in the other three study countries, we examined use of health services among all household members. The use of health services would be expected to be higher among those who needed care than the estimated use based on all household members regardless their need for care. Including all household members in the analysis, rather than only those who needed care could also affect the results on the associations between service utilization and individual, household, and community characteristics. If an individual characteristic (for example, socioeconomic status) is negatively associated with the probability of having an illness or injury, but positively associated with propensity of seeking care, then the estimated association between this characteristic and use of health services will be diluted or cancelled out if the analysis includes individuals who do not need care. This may partially explain why we did not find a consistent association between use of health care services and individual educational attainment or household wealth status.

Another limitation of the study is our inability to assess the burden of out-of-pocket health expenditures relative to income, because income data were unavailable in DHS surveys. Universal health coverage requires health policies that protect against catastrophic payment. But catastrophic payment is not always synonymous with high health expenditures (Xu et al. 2003). In the absence of income data in DHS surveys, we were unable to calculate catastrophic health spending but could only estimate absolute out-of-pocket health expenditures.

Finally, the results of our analysis of the determinants of out-of-pocket spending may be biased due to endogeneity. For example, the positive relationship between health insurance coverage and out-of-pocket health expenditures could be due to adverse selection, in that individuals with high risk of health problems are also more likely to enroll in insurance.

4.3. Conclusion

In the study countries the use of health care is generally low, and service provision primarily relies on public health providers. Out-of-pocket health spending in absolute terms varies substantially across countries, with individuals in poorer households spending less than those in wealthier households. While the use of health care services is related to many factors, cost is an important barrier to access. Our results provide evidence that expanding health insurance coverage, especially in Liberia and DRC, where service use is low and out-of-pocket health expenditure is high, may contribute to lower out-of-pocket payments. Existing evidence suggests that risk pooling through health insurance has been effective in increasing health care utilization and reducing the likelihood of catastrophic expenditures (Xu et al. 2003). Community health insurance in Rwanda has been successful in increasing health care use and reducing out-of-pocket health expenditures. Enrollees in community health insurance in Rwanda are over twice as likely to seek care and spend significantly lower out-of-pocket compared with those without insurance. Namibia has higher coverage of private health insurance and employer-based insurance. While this may also contribute to the high level of health care utilization, out-of-pocket expenditures are also higher among the insured than those uninsured. No single insurance "prototype" or scheme fits all. Countries should explore various options, including social health insurance, community-based health insurance, private insurance, and employer-based insurance depending on the country context, such as the level of economic development, social stability, and disease burdens.

The results of this study also have implication for data collection. The DHS Program has collected data on out-of-pocket health expenditure in 12 countries since 2010 but the module is country-specific and differs substantially across these surveys. A standard out-of-pocket health expenditure module was developed in 2012 and intended for use in countries that requested data on health expenditures. However, the standard module has not been adopted in subsequent surveys. For example, Namibia 2013 DHS and DRC 2013 DHS used a different module than the standard one. While modifications to the questionnaire may be necessary in light of a country's request, maintaining consistency of the module is essential for comparisons over time and across countries.

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Appendix Table 1. Share of government and private sector as a percent of total health expenditure

	DRC		Liberia		Namibia		Rwanda	
	Government	Private	Government	Private	Government	Private	Government	Private
2010	26	74	23	77	58	42	37	63
2011	36	64	35	65	61	39	36	64
2012	45	55	33	67	59	41	37	63
2013	34	66	31	69	59	41	38	62
2014	37	63	31	69	60	40	38	62

Source: WHO NHA indicators accessed at: http://apps.who.int/nha/database/Select/Indicators/en

Appendix Table 2. Total health expenditures (THE) and out-of-pocket (OOP) payments per capita, in million constant 2010 US dollars, and share of out-of-pocket expenditure as a percent of total health expenditure

Countries	DRC			Liberia			Namibia			Rwanda		
	THE	OOP	%	THE	OOP	%	THE	OOP	%	THE	OOP	%
2010	13	5	37%	39	10	27%	406	30	7%	44	12	28%
2011	12	5	39%	42	12	29%	486	34	7%	47	14	29%
2012	15	6	38%	42	13	30%	468	34	7%	51	15	29%
2013	16	6	39%	42	13	31%	470	35	7%	52	14	28%
2014	19	7	39%	46	14	31%	499	36	7%	52	15	28%

Source: WHO NHA indicators accessed at: http://apps.who.int/nha/database/Select/Indicators/en