Equity in Financing and distribution of health benefits in Zambia

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**Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>AE</td>
<td>Adult Equivalent</td>
</tr>
<tr>
<td>ATP</td>
<td>Ability to Pay</td>
</tr>
<tr>
<td>BIA</td>
<td>Benefit Incidence Analysis</td>
</tr>
<tr>
<td>CBoH</td>
<td>Central Board of Health</td>
</tr>
<tr>
<td>CC</td>
<td>Concentration curves</td>
</tr>
<tr>
<td>CHE</td>
<td>Catastrophic Health Expenditure</td>
</tr>
<tr>
<td>CI</td>
<td>Concentration Index</td>
</tr>
<tr>
<td>CIT</td>
<td>Corporate Income Tax</td>
</tr>
<tr>
<td>FIA</td>
<td>Financing Incidence Analysis</td>
</tr>
<tr>
<td>KI</td>
<td>Kakwani Index</td>
</tr>
<tr>
<td>LC</td>
<td>Lorenz Curve</td>
</tr>
<tr>
<td>LCMS</td>
<td>Living Conditions Monitoring Survey</td>
</tr>
<tr>
<td>MPO</td>
<td>Mean Positive Overshoot</td>
</tr>
<tr>
<td>MSL</td>
<td>Medical Stores Limited</td>
</tr>
<tr>
<td>NHA</td>
<td>National Health Accounts</td>
</tr>
<tr>
<td>OOP</td>
<td>Out-of-Pocket</td>
</tr>
<tr>
<td>PAYE</td>
<td>Pay as You Earn</td>
</tr>
<tr>
<td>PBC</td>
<td>Performance-Based Contracting</td>
</tr>
<tr>
<td>PIT</td>
<td>Personal Income Tax</td>
</tr>
<tr>
<td>RBF</td>
<td>Results-Based Financing</td>
</tr>
<tr>
<td>SWAp</td>
<td>Sector-Wide Approach</td>
</tr>
<tr>
<td>VAT</td>
<td>Value Added Tax</td>
</tr>
<tr>
<td>ZHHEUS</td>
<td>Zambia Household Health Expenditure and Utilization Survey</td>
</tr>
<tr>
<td>ZRA</td>
<td>Zambia Revenue Authority</td>
</tr>
</tbody>
</table>
1. Introduction

The Zambian health care system continues to undergo various reforms. The system has experienced health financing and organisational reforms since 2006. Among the notable and common themes underpinning all the health reforms across the different timelines have been the following:

a. **Equity.** The policy commitment continues to be associated with the desire to ensure that resources and health care services are distributed and provided as close to the household or family as possible.

b. **Access and affordability.** Access to quality and affordable health care services continues to be one of the central themes of the reform process. In this regard, health services are supposed to be generally available, adequate, and of reasonable quality and cost.

Given the above, government expenditures in Zambia have been focused on provision of primary health care services. It is assumed that this strategy can help to guarantee equitable availability of health care services to the population irrespective of socio-economic status. Some of the other policies and instruments which have been used to enhance equity in Zambia over the years are:

(a) **Resource allocation formula.** Allocation of resources in the health sector has evolved from a historical budgeting approach in the 1990s to a needs-based approach. In 2004, a needs-based resource allocation formula was developed (and later revised in 2009 and 2017) to facilitate an evidence-based distribution of resources from the Ministry of Health to the districts. This formula accounts for material deprivation using variables such as prevalence of poverty; ownership of assets; disease burden; and access to banks, markets, and fuel stations. The deprivation index is then used as a weight on district population to derive relative shares of the resource envelope.

(b) Linked to the resource allocation formula is the **basic or essential health care package** which has been defined at all levels of the health system in Zambia. The main aim of this package is to rationalize planning subject to resource constraints and epidemiological considerations. Thus, priority setting and resource allocation have to be in line with requisites of the basic health care package.

(c) To increase access and utilization of health services, **user fees were abolished** at primary healthcare level (health posts, health centers and district hospitals) in 2006 in rural areas, 2007 in peri-urban areas, and 2012 at the entire at primary healthcare level nationwide.

(d) **Human resource distribution and placement.** Distribution of human resources is predominantly urban biased. The policy goal has been to achieve parity by re-distributing the available health workers and posting new graduates to rural areas to achieve a balance among the different geographical areas.

(e) **Infrastructure development.** Over the years, there have been huge investments in infrastructure (health posts, health centers and hospitals), medical equipment, staff housing in rural areas, and vehicles (including ambulances and motorbikes).
Determining the extent to which the above goals are progressing has raised the need for evidence. It is anticipated that if the policy measures are being attained, then equity in financing and utilisation of quality healthcare services ought to be attained. This is important because the overarching objective of the Zambia health care system, as with many other health systems worldwide, is to ensure that its population is provided with a minimum level and quality of health care. High expenditure on healthcare has the potential to expose poor households and individuals into further deprivation or poverty. The impoverishing or catastrophic effects of health care expenditures through out-of-pocket (OOP) payments are major causes of concern for policy makers worldwide. In Zambia, the health policy is focused on achieving fairness in financing and consumption of health care, and reducing inequities in health outcomes.

Given that a number of health financing reforms have been implemented in Zambia over the years, this study provides an updated analysis on the extent to which government expenditures on health provide an effective intervention in redistributing health care resources in an equitable manner. The study looks at the health system holistically and does not look at each of the individual reforms.

1.2 Objectives of the Study

The objective of the study is to analyse equity in financing, and beneficiary incidence. The study uses the 2014 Household Health Expenditure and Utilization Survey; and the 2010 and 2015 Living Conditions Monitoring Survey. The specific objectives are:

a. Financing incidence analysis – To estimate the distribution of health care financing burden between socio-economic groups, distinguishing between public and private financing mechanisms, and the factors influencing this distribution;

b. Catastrophic health expenditure analysis – to assess the extent of catastrophic payments for health care at household level; and

c. Benefit incidence analysis – To explore whether poor households benefit from public spending by facility level (primary, secondary and tertiary), by ownership (public and private), and by service (inpatient and outpatient).

2. Key Issues in Health Financing in Zambia

Zambia has over the past two decades embodied equity as a key element in the financing and distribution of health benefits. The policy debate on health equity in Zambia is linked to the political-economic history of the country and is one of the key elements of the 1991 health reforms (Kalumba 1997), and subsequent reforms. Motivation to incorporate equity in health financing and provision was triggered by the deterioration of the economy in the 1980s, which contributed to inequities in health outcomes and access to health care (Ministry of Health 1991). Consequently, the Zambian government has been unwavering in its pursuit of inclusive growth centered on eliminating the risk and prevalence of poverty and deprivation through the social sectors such as health and education. Thus, over the years, the Zambian government through the Ministry of Health has implemented a number of financing and organisational reforms aimed at achieving equity and other key health system goals (Gilson et al. 2003; Lake and Musumali 1999). Thus, the 1991 health reform vision of ‘equity of access to cost-effective quality health care as close to the family as possible’ has remained unchanged since 1991
A summary of the main elements of the health reforms in Zambia is provided in Appendix 1.

Some of the key health financing reforms which have been implemented over the years include the abolition of user fees in rural areas, peri-urban areas, and all primary health care facilities in 2006, 2007, and 2012, respectively (Carasso et al. 2012; Masiye, Kaonga, and Kirigia 2016). To enhance value-for-money and results-focus, Zambia also implemented a nation-wide performance-based contracting (PBC) system through a sector-wide approach programming (SWAp) framework between 1996 and 2006 (Chansa et al. forthcoming). PBC was abandoned in 2006 but later reappeared in form of results-based financing (RBF) in 11 districts between 2011 and 2014, and in 58 districts between 2016 and 2018. Further, a needs-based resource allocation formula for allocating operational grants flowing through the public health system at district level has been in implementation since 2004 (Chitah and Masiye 2007).

But though Zambia has implemented several health reforms, and has a fiscal redistributive system comprising social expenditures and taxes, the impact of these reforms and policies on poverty reduction and shared prosperity have not been adequately evaluated, especially in the health sector. Assessing fairness in financing of healthcare, resource allocation, and impact of public policies on the poor is critical to monitoring and evaluating the attainment of health systems goals of: (i) improved health status, (ii) financial risk protection, (iii) responsiveness to needs, and (iv) client satisfaction. This study applies three methods: (i) financing incidence analysis, (ii) benefit incidence analysis, and (iii) catastrophic health expenditure analysis to determine whether equity in health care financing and utilisation have been enhanced or not.

3. Conceptual Framework

3.1 Financing Incidence Analysis (FIA)

Equity in the sources of financing for health assumes an important dimension as it represents how financing is distributed. To determine how financing is distributed, analysis showing who or where the burden or tax incidence lies among the various socio-economic groups in society is conducted. This is done by looking at the progressivity of the sources of revenue for health care financing. A measure of progressivity advocated for is based on an approach which measures the extent of the departure of proportionality in the relationship between payments (resources generated) and the ability to pay (O’Donnell et al. 2008). The main sources of health financing in Zambia are: public financing through taxation, and donors; and to a small extent households and private health insurance.

3.2 Catastrophic Health Expenditure (CHE)

There are two alternative approaches that are used to consider the distribution of health care spending by households. The underlying principle for each of these is that health care payments should be at a certain level which should not exceed a given threshold such that the household suffers undue financial ruin or suffering as a consequence of experiencing expenditures above the given threshold (Wagstaff and Doorslaer 2003). Households that may experience expenditures on health care such that such expenses are above the threshold are said to experience catastrophic expenses. Alternatively, the minimum expenses on health care by households are set such that household income does not go below a set limit and experience poverty as a consequence of health payments.
3.2.1 Incidence and Intensity of Catastrophic Expenditures

In order to extend the interpretation of catastrophic expenditures reference is made to the intensity and incidence. The incidence or headcount is the percentage of individuals whose health care costs expressed as a proportion of income, exceeds a given discretionary threshold. The intensity or mean gap is the average amount by which payments as a proportion of income exceeds the threshold (Bredenkamp, Mendola, and Gragnolati 2010; O’Donnell et al. 2008).

3.3 Benefit Incidence Analysis (BIA)

Conceptually, BIA considers the distribution of public expenditures for services among different groups in the population particularly among different income groups. The main objective of BIA is to assess whether public spending is progressive, that is, whether public services serve the intended beneficiaries and whether it can redistribute resources to the poor. This is important because the effectiveness of public expenditure is usually determined by its ability to have a positive impact on the poor. By undertaking a BIA, we develop a relationship between public expenditure and the health outcomes that are produced (Demery 2000). Ultimately, BIA addresses the question of how public expenditures and benefits are distributed among the different socio-economic groups, and if any of the groups are advantaged or disadvantaged by the other (McIntyre and Ataguba 2011; Castro-Leal et al. 2000).

4. Methods

4.1 Data Sources

This study applies the standard methodologies for FIA, BIA, and CHE analysis. Raw data was obtained from the Living Conditions Monitoring Survey (LCMS) for 2010, and 2015; the 2014 Zambia Household Health Expenditure and Utilisation Survey (ZHHEUS); the Zambia Revenue Authority (ZRA), and National Health Accounts. The LCMS is a repeated nationally representative cross-sectional household survey which use a two-stage stratified cluster sampling method to generate household and individual-level information. The LCMS is designed to provide data on living conditions and welfare (including poverty estimates) overtime; and each survey includes modules on health, education, agriculture, household consumption and expenditure, economic and labour market activity and so forth. The 2004 and 2010 LCMS were administered to approximately 20,000 households while the 2015 LCMS was administered to 12,260 households. Considering that the health modules in the LCMS’ are too general and do not contain adequate data on health choices and spending, Zambia conducted a nationally representative health-sector specific household survey in 2014 which generated comprehensive data on health expenditure and utilisation. This study (the ZHHEUS) used a two-stage stratified sampling approach (similar to the LCMS), and gathered household- and individual-level information from 11,927 households. Tax revenue data was obtained from the ZRA (specifically to serve the FIA), and health expenditure data from previous National Health Accounts (NHA) surveys and the ZHHEUS.
4.2 Assessing health care financing incidence

This study applies both structural and effective approaches to assessing health care financing incidence.

4.2.1 Tax Computations

The analysis of health care financing incidence was limited to general taxation, and OOP payments. The key taxes covered in the analysis include personal income tax (PIT), corporate income tax (CIT), value added tax (VAT), fuel levy, and excise tax. Individual household tax contribution for various taxes was extracted from tax revenue data that was obtained from ZRA. This is summarised in Table 1 below which shows an overview of each type of tax, and the estimation method. The PIT component was estimated based on reported income while excise tax, VAT and fuel levy were estimated based on reported consumption expenditure on items where tax was applicable. For CIT, the study assumed that 50 percent of the tax burden falls on shareholder (those that reported dividends) and 50 percent on consumers. This is because it is difficult to know with certainty whether the burden of CIT is borne by shareholders or if it is passed on to consumers. In the estimations we take a graduated assessment of the different percentiles for assessing the incidence of CIT. However, as has been argued in the literature there is really no consensus or gold standard that has been established (Jenkins, Kuo, and Shukla 2000).

4.2.2 Ability to pay

FIA studies require an assessment of household’s capacity or ability to pay. This is because health financing equity is analysed with respect to ability to pay. But while reported income is used as a measure of socio-economic status in higher income settings, reported income generally suffers from under-reporting in low income countries, and is unreliable. In low income countries, consumption expenditure and composite indices of socio-economic status have been proposed as more reliable measures of socio-economic status. However, the use of a composite index is limited to the analysis of the concentration of either payments or income distribution and one cannot use it to calculate distribution indices. Therefore, adult equivalent consumption expenditure was used as the measure of ability to pay in this study. Specifically, per capita consumption and household expenditure were used to measure ability to pay.

4.2.3 Health care payments

At the household level, all payments relating to consumption of health care by the household were aggregated to obtain the total sum of health care expenditures which are considered as OOP. At the macro level, we obtained health care payments from general tax sources as the Zambian health care system is primarily funded through general taxes.

Technical details on the FIA approach are presented in Appendix 3.
Table 1: Tax sources, definitions and computation techniques

<table>
<thead>
<tr>
<th>Tax</th>
<th>Rates</th>
<th>Computation Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT</td>
<td>35 percent on dividends</td>
<td>Apportioning CIT receipts based on assumptions on tax shifting. Shifting assumptions include certain percentage borne by shareholders (the LCMS includes information on those who receive dividends) and the rest of the households through consumption. We assumed that 50 percent of the tax burden is borne by shareholders and the remainder 50 percent by households through consumption.</td>
</tr>
<tr>
<td>VAT</td>
<td>16 percent on standard rated goods</td>
<td>This was computed on all commodities where VAT was applicable. We excluded all commodities that are either zero rated or exempt.</td>
</tr>
<tr>
<td>PIT</td>
<td>• Equal to or below K800,000 – no tax</td>
<td>We first removed a non-taxable pension allowance of K550,000 before computing the amounts of taxes. Then applied rates to the appropriate tax bands.</td>
</tr>
<tr>
<td></td>
<td>• 25 percent on income above K800,000 but equal to or below K1,335,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 30 percent on income above K1,335,000 but equal to or below K3,300,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 35 percent on income above K3,300,000</td>
<td></td>
</tr>
<tr>
<td>Excise tax</td>
<td>• 60 percent on clear bear</td>
<td>All these taxes were charged on respective product values. No tax was charged on unprocessed tobacco because this is assumed to be sold informally.</td>
</tr>
<tr>
<td></td>
<td>• 10 percent on opaque beer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 125 percent on spirits and wines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 145 percent on cigarettes</td>
<td></td>
</tr>
<tr>
<td>Health Levy</td>
<td>1 percent on interest earned from savings</td>
<td>The 1 percent was charged on interest earned from all formal bank savings accounts.</td>
</tr>
<tr>
<td>Fuel Levy</td>
<td>15 percent on petrol and diesel</td>
<td>Fuel levy was estimated for those who use fuel directly by applying a 15 percent rate while for those using commercial buses and other modes of transport it was estimated based on the total spent on public transport.</td>
</tr>
</tbody>
</table>

4.3 Estimating catastrophic health expenditure

Technical details on the CHE approach are presented in Appendix 3.

4.4 Estimating beneficiary incidence

This study used the standard methodology for BIA which involves three steps (McIntyre and Ataguba 2011; O’Donnell et al. 2008). These are:

i. Estimation of unit expenditures for health services.

ii. Imputation of the unit expenditure to households or individuals. This is in effect considered an in-kind transfer and BIA is used in measuring the distribution of the in-kind transfer across the population for health care

iii. Grouping of households (or individuals) by sub-groups of the population (based on some measure of socio-economic outcome). A common criterion for grouping is income or wealth.

Technical details on the BIA approach are presented in Appendix 3.
5. Results

5.1 Financing Incidence Analysis

5.1.1 Structural Progressivity of Health Financing: Taxes and OOP

This section looks at the distribution of the health financing burden through taxes and OOP between 2010 and 2014. First, results on the percentage contribution to total tax revenue by major tax sources is provided in Table 2. The results show that income taxes generate more than half of the total government revenue between 2010 and 2014. On average, income from individuals through Pay as You Earn (PAYE) or personal income contributed 25 percent of the total annual tax revenue between 2010 and 2014 while revenue from domestic taxes on goods and services was 14 percent of the total tax revenue over the same period. Income from Excise taxes was the largest share of domestic taxes on goods and services.

Table 2: Percentage contributions to total tax revenue by major tax sources (2010–2014)

<table>
<thead>
<tr>
<th>Tax Source</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income Tax</td>
<td>56</td>
<td>52</td>
<td>57</td>
<td>50</td>
<td>48</td>
<td>53</td>
</tr>
<tr>
<td>CIT</td>
<td>18</td>
<td>19</td>
<td>21</td>
<td>12</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>PAYE</td>
<td>29</td>
<td>24</td>
<td>24</td>
<td>25</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
<td>Withholding Tax</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>5</td>
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<tr>
<td>Extraction Royalty</td>
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<td>5</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>6</td>
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<tr>
<td>Domestic Goods &amp; Services</td>
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<td>9</td>
<td>9</td>
<td>15</td>
<td>22</td>
<td>14</td>
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<td>Excise Duties</td>
<td>10</td>
<td>9</td>
<td>11</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Domestic VAT</td>
<td>4</td>
<td>0</td>
<td>-1</td>
<td>5</td>
<td>11</td>
<td>4</td>
</tr>
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<td>Trade Taxes</td>
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<td>9</td>
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<td>8</td>
<td>7</td>
<td>9</td>
</tr>
</tbody>
</table>

Source: Authors’ compilation from ZRA data.

Figures 1 and 2 presents results from an assessment of the distribution of health care payments as a share of ability to pay (ATP) across the five quintiles for 2010 and 2014. The results show that for both 2010 and 2014, the share of ATP that each quintile spent on health care through corporate income tax (CIT), Value Added Tax (VAT), and Excise taxes are increasing with each quintile. This suggests that CIT, VAT, and Excise taxes are progressive i.e. wealthier households pay a higher share of their income on these taxes. On the other hand, results for both 2010 and 2014 show that PIT is not progressive for the second poorest and middle quintiles. This implies that households in the second poorest quantile pay a higher share of their personal income than the middle quantile. For OOP spending, results for 2010 shows a weak progression or proportional distribution of ATP as compared to 2014 which shows a progressive distribution.
5.1.2 Effective Progressivity of Health Care Payments: Taxes and OOP

Assessing progressivity in health financing by using ratios as highlighted in 5.1.1 has some limitations (Ataguba et al. 2018). In particular, structural progressivity does not provide a comprehensive picture of how health care payments as a share of ATP are distributed across the entire spectra over time. To avert this problem, the analysis was repeated by using concentration curves with a view of measuring effective progressivity by using the Kakwani index (Figure 3). In addition, dominance tests were also calculated (Table 3) in order to establish whether progressivity or regressivity is the same for the entire distribution of ATP. This approach is consistent with guidelines on conducting FIA studies (Ataguba et al. 2018), and the multiple comparison approach was used to conduct the dominance tests (O’Donnell et al. 2008).
Results from the effective progressivity analysis for the year 2010 (Figure 3A and Table 3) show that taxes as a whole are progressive (Kakwani index = 0.18, p<0.01). However, a review of individual taxes shows that Excise tax is regressive (Kakwani index = -0.015, p<0.01). Specifically, the concentration curve for Excise tax lies inside the Lorenz curve after the 60th cumulative population share. Below this threshold, the concentration curve oscillates up and down the Lorenz curve and this explains why the dominance test for Excise tax is not dominant. Non-dominance for Excise tax could be explained by cigarette tax that has a negative Kakwani index (-0.16, p<0.01) (which suggests regressivity). However, the 45 degree line and the Lorenz curve for cigarettes are non-dominant. On the other hand, taxes on alcohol are progressive (Kakwani index = 0.21, p<0.01). The reason why cigarette tax in Zambia is regressive is because the percentage of adult men smoking cigarettes is prevalent among the poor (Figure 4). Review of the progressivity of CIT, VAT, and PIT for the year 2010 shows varying levels of progressivity with PIT being the least progressive (Kakwani index = 0.01, p<0.01) while CIT (Kakwani index = 0.20, p<0.01) and VAT (Kakwani index = 0.24, p<0.01) are more progressive. For 2014, results show that VAT and Excise taxes are progressive while PIT is regressive (Figure 3B).

For OOP spending, results for 2010 (Figure 3C and Table 3) shows that OOP is progressive (Kakwani index = 0.06, p<0.01). However, the level of progressivity is very weak and this is confirmed from the dominance test for OOP which shows that the 45 degree line dominants while the Lorenz curve is non-dominant. In 2014, the concentration curve for OOP dominates the Lorenz curve (Figure 3D) and this indicates that OOP health spending is regressive in 2014.

Figure 3: Effective progressivity of individual taxes and OOP, Zambia 2010 vs 2014

![Concentration curve for taxes, 2010](image1.png)  ![Concentration curve for taxes, 2014](image2.png)

Source: Authors’ compilation from LCMS 2010 and ZHHEUS 2014 data.
C. Concentration curve for OOP, 2010

D. Concentration curve for OOP, 2014

Source: Authors’ compilation from LCMS 2010 and ZHHEUS 2014 data.

Table 3: Distribution of health financing burden in Zambia: Taxes and OOP - 2010

<table>
<thead>
<tr>
<th></th>
<th>Concentration Index (standard error)</th>
<th>Kakwani Index (standard error)</th>
<th>Dominance Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT</td>
<td>0.78*** (0.06)</td>
<td>0.20*** (0.32)</td>
<td>-</td>
</tr>
<tr>
<td>Domestic VAT</td>
<td>0.81*** (0.02)</td>
<td>0.24*** (0.02)</td>
<td>-</td>
</tr>
<tr>
<td>PIT</td>
<td>0.58*** (0.16)</td>
<td>0.01*** (0.07)</td>
<td>-</td>
</tr>
<tr>
<td>Excise taxes</td>
<td>0.55*** (0.044)</td>
<td>-0.015*** (0.13)</td>
<td>-</td>
</tr>
<tr>
<td>Alcohol</td>
<td>0.78*** (0.045)</td>
<td>0.21*** (0.12)</td>
<td>-</td>
</tr>
<tr>
<td>Cigarettes</td>
<td>0.4*** (0.06)</td>
<td>-0.16*** (0.19)</td>
<td>+</td>
</tr>
<tr>
<td>Fuel</td>
<td>0.82*** (0.02)</td>
<td>0.25*** (0.12)</td>
<td>-</td>
</tr>
<tr>
<td>Health levy</td>
<td>0.75*** (0.05)</td>
<td>0.17*** (0.1)</td>
<td>-</td>
</tr>
<tr>
<td>All taxes</td>
<td>0.76*** (0.06)</td>
<td>0.18*** (0.05)</td>
<td>-</td>
</tr>
<tr>
<td>OOP</td>
<td>0.64*** (0.02)</td>
<td>0.06*** (0.04)</td>
<td>+</td>
</tr>
</tbody>
</table>

***p<0.01, **p<0.05, *p<0.1

Dominance tests: – indicates that the 45 degree line or Lorenz curve dominates the concentration curve
+ indicates that the concentration curve dominates the 45 degree line or Lorenz curve
++ indicates non-dominance i.e. the concentration curve crosses the Lorenz curve at a certain point

Figure 4: Prevalence of smoking cigarettes among male adults in Zambia

5.2 Catastrophic Health Expenditure

5.2.1 Incidence and Intensity of Catastrophic Health Expenditures

This section examines changes in the incidence and intensity of OOP health spending across households from different income status between 2010 and 2015. Having established that OOP health spending is regressive from the previous section, the aim is to determine whether OOP health spending leads to catastrophic health expenditure i.e. whether OOP health spending exceeds 20 percent or 40 percent of a household’s ‘capacity to pay.’ In this case, capacity-to-pay is defined as total household expenditure minus expenditure on subsistence, essentially food. The 20 percent and 40 percent thresholds were selected based on empirical precedence from the literature. Using data from the 2010 and 2015 LCMS, the incidence (headcount) and intensity (mean overshoot) of catastrophic health expenses due to OOP payments were calculated and the results are presented in Figures 5 and 6 for the 20 percent and 40 percent thresholds. The results show that between 2010 and 2015, fewer households experienced catastrophic health spending at both the 20 percent and 40 percent thresholds (Figures 5A and 5B). However, for the households experiencing catastrophic health spending in 2010 and 2015, the level of intensity was more profound for the poor at both the 20 percent and 40 percent thresholds (Figures 6A and 6B). In Appendix 2, results for the 10 percent and 30 percent thresholds are provided.

To further understand the socio-economic status of the location, facility type, and main components of OOP spending at household level, results from the 2014 ZHHEUS were used. The results show that households in rural areas are more likely to experience catastrophic health spending than those in urban areas (Figure 7A). Further, visiting a private facility and hospitals (2nd, 3rd, and district level) is more likely to lead to catastrophic health spending as compared to the other health facilities (Figure 7B). And Figure 8 shows that 42 percent of health-related spending at household level is on drugs (42 percent) followed by transportation and food (26 percent).

Figure 5: Incidence of catastrophic health spending at household level, 2010-2015

![Figure 5: Incidence of catastrophic health spending at household level, 2010-2015](image)

Source: Authors’ compilation from LCMS 2010 and 2015 data.
Figure 6: Intensity of catastrophic health spending at household level, 2010-2015

A. Mean Overshoot at 20% threshold  
B. Mean Overshoot at 40% threshold

Source: Authors’ compilation from LCMS 2010 and 2015 data.

Figure 7: Catastrophic health spending by Residence and Facility Type (percent), 2014

A. Residence  
B. Facility Type


Figure 8: Shares of total household health expenditure (percent), 2014

5.3 Benefit Incidence Analysis (BIA)

As earlier stated, Zambia has implemented a number of health reforms over the years aimed at improving access to health care for all Zambians, particularly the poor. This section assesses the distributional impact of the health reforms in Zambia on public spending and equity across regions and income groups by using the 2010 and 2015 LCMS, and the 2014 ZHHEUS. By using multiple surveys, the study evaluates changes in the distributional impact of the health reforms over a period of time. The study does not look at each individual element of the health reforms but examines changes in benefit incidence across different income groups over time.

5.3.1 Distribution of health subsidies and outpatient visits at public health facilities by province

Figure 9A shows that four provinces (Luapula, Southern, Copperbelt, and Eastern) recorded a reduction in their share of total health subsidies in 2015 in comparison to 2010. The largest reduction in the share of health subsidies was in Copperbelt and Southern provinces at 7 percent and 5 percent, respectively. Eastern province received the highest share of total health subsidies from the government in 2010 and 2015 despite a two-percentage point reduction between 2010 and 2015. This is followed by Lusaka and Copperbelt provinces which ranked second and third overall, respectively.¹ Outpatient visits at public health facilities also shows a reduction in four provinces (Southern, Luapula, Copperbelt, and Eastern) in 2015 as compared to 2010 (Figure 9B). These four provinces had ranked highest in outpatient visits in 2010. The largest reduction in outpatient visits was observed in Eastern and Copperbelt provinces while the highest gain of 3 percent was recorded in Lusaka and Central provinces. Eastern province ranked first in the overall share of outpatient visits for 2010 and 2015 while Lusaka and Southern provinces ranked second and third, respectively.

Figure 9: Distribution of health subsidies and outpatient visits at public health facilities by province

<table>
<thead>
<tr>
<th>Province</th>
<th>2010</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Western</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Central</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Luapula</td>
<td>20</td>
<td>22</td>
</tr>
<tr>
<td>Southern</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>Lusaka</td>
<td>30</td>
<td>33</td>
</tr>
<tr>
<td>Copperbelt</td>
<td>35</td>
<td>37</td>
</tr>
<tr>
<td>Eastern</td>
<td>30</td>
<td>33</td>
</tr>
<tr>
<td>Muchinga</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: Authors’ compilation from LCMS 2010 and 2015 data.

¹Lusaka province recorded a 3-percentage point increase between 2010 and 2015
5.3.2 Distribution of total subsidies in comparison to reported illnesses at provincial level

To assess if health subsidies are distributed in line with reported illnesses for health care at provincial level in Zambia, the share of health subsidies for each province was compared with the share of the population reporting illnesses for each province. Data for this exercise were drawn from the 2014 ZHHEUS. The results show that distribution of health subsidies at provincial level is not in line with reported illnesses in each province in Zambia (Figure 10). Specifically, Eastern, Lusaka, and Copperbelt provinces received a greater share of the subsidies even though the percentage shares of the population reporting illnesses were significantly lower. All the other seven (7) provinces, which are predominantly rural, received a lower share of health subsidies despite having a larger share of the population reporting illnesses.

Figure 10: Distribution of total subsidies in comparison to reported illnesses by province

![Graph showing distribution of total subsidies compared to reported illnesses by province]

Source: Authors’ compilation from ZHHEUS data.

5.3.3 Distribution of outpatient and inpatient health care benefits by income groups

Table 4 shows dominance test results for utilization of outpatient health services (or distribution of health benefits) across the various health providers and facilities. In 2010, mission health facilities are pro-poor with a concentration index of -0.114 (p-value < 0.05) while public hospitals and private health facilities are pro-rich with concentration indices of 0.058 (p-value < 0.01) and 0.324 (p-value < 0.05), respectively. In 2015, results from both the LCMS and ZHHEUS show that the distribution of benefits is pro-rich at public hospitals and private health facilities. For mission health facilities, the 2015 LCMS shows a pro-rich distribution of benefits with a concentration index of 0.093 (p-value < 0.1) while results from the ZHHEUS are statistically insignificant. However, at 10 percent level of significance, results from the LCMS are barely statistically significant. On the other hand, overall distribution of benefits at all public health facilities (hospitals and health centers) was evenly distributed in 2010 with a concentration index of 0.014 (p-value < 0.01) but became pro-rich in 2014 with a concentration index of 0.046 (p-value < 0.05).
Table 4: Benefit incidence test results – outpatient health services

<table>
<thead>
<tr>
<th>Provider/facility type</th>
<th>LCMS 2010</th>
<th></th>
<th></th>
<th>ZHHEUS 2010</th>
<th></th>
<th></th>
<th>ZHHEUS 2014</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CI</td>
<td>SE</td>
<td>DT</td>
<td>CI</td>
<td>SE</td>
<td>DT</td>
<td>CI</td>
<td>SE</td>
</tr>
<tr>
<td>Public</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All hospitals</td>
<td>0.058***</td>
<td>0.028</td>
<td>-</td>
<td>0.048*</td>
<td>0.030</td>
<td>-</td>
<td>0.214***</td>
<td>0.024</td>
</tr>
<tr>
<td>Health centers</td>
<td>-0.0486</td>
<td>0.011</td>
<td>+</td>
<td>-0.023</td>
<td>0.017</td>
<td>+</td>
<td>0.013</td>
<td>0.018</td>
</tr>
<tr>
<td>All health facilities</td>
<td>0.014***</td>
<td>0.009</td>
<td>n-Dom</td>
<td>0.002</td>
<td>0.007</td>
<td>n-Dom</td>
<td>0.046**</td>
<td>0.018</td>
</tr>
<tr>
<td>Mission health facilities</td>
<td>-0.114**</td>
<td>0.031</td>
<td>+</td>
<td>0.093*</td>
<td>0.054</td>
<td>-</td>
<td>-0.106</td>
<td>0.068</td>
</tr>
<tr>
<td>Private health facilities</td>
<td>0.324**</td>
<td>0.050</td>
<td>-</td>
<td>0.597***</td>
<td>0.063</td>
<td>-</td>
<td>0.686***</td>
<td>0.027</td>
</tr>
</tbody>
</table>

***p<0.01; **p<0.05; *p<0.1

Note: CI = Concentration Index; SE = Standard Error; DT = Dominance Test; – means that the 45 degree line dominates (pro-rich); + means that the concentration curve dominates (pro-poor); n-Dom means non-dominance

Using results from the 2014 ZHHEUS, health facilities are further broken down by provider and facility type, and by outpatient and inpatient care. The benefit incidence test results are shown in Table 5. The results show that the distribution of benefits at all public health facilities (all types of hospitals and health centers) are generally pro-rich for both inpatient and outpatient services except for district hospitals and health centers which are pro-poor for inpatient services with concentration indices of -0.09 (p-value < 0.1) and -0.179 (p-value < 0.01), respectively. Furthermore, while the results for beneficiary incidence for outpatient services at mission health facilities are statistically insignificant, results for inpatient services are pro-poor with concentration index of -0.158 (p-value < 0.1). Meanwhile, the distribution of benefits for both outpatient and inpatient services at private health facilities is pro-rich.

Table 5: Benefit incidence test results – outpatient and inpatient services - 2014

<table>
<thead>
<tr>
<th>Provider/facility type</th>
<th>Outpatient</th>
<th>Inpatient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CI</td>
<td>SE</td>
</tr>
<tr>
<td>Public</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tertiary (3rd level) hospitals</td>
<td>0.523***</td>
<td>0.065</td>
</tr>
<tr>
<td>General (2nd level) hospitals</td>
<td>0.385***</td>
<td>0.032</td>
</tr>
<tr>
<td>District (1st level) hospitals</td>
<td>0.091**</td>
<td>0.037</td>
</tr>
<tr>
<td>Health centers</td>
<td>0.013</td>
<td>0.018</td>
</tr>
<tr>
<td>All hospitals (3rd+2nd+1st)</td>
<td>0.214***</td>
<td>0.024</td>
</tr>
<tr>
<td>All health facilities (hospitals &amp; health centers)</td>
<td>0.046**</td>
<td>0.018</td>
</tr>
<tr>
<td>All health facilities (inpatient &amp; outpatient)</td>
<td>0.059***</td>
<td>0.018</td>
</tr>
<tr>
<td>Mission health facilities</td>
<td>-0.106</td>
<td>0.068</td>
</tr>
<tr>
<td>Private health facilities</td>
<td>0.686***</td>
<td>0.027</td>
</tr>
</tbody>
</table>

***p<0.01; **p<0.05; *p<0.1

Note: CI = Concentration Index; SE = Standard Error; DT = Dominance Test; – means that the 45 degree line dominates (pro-rich); + means that the concentration curve dominates (pro-poor); n-Dom means non-dominance
5.3.4 Distribution of total benefits in comparison to need by income groups

To further assess the distribution of health care benefits, we compared the need for health care with the benefits received by wealth quintile (Figure 11). Overall, there has been an improvement in the cumulative proportion of the population receiving benefits relative to their need. The lowest or poorest 60 percent of the population received a lower share of benefits relative to their share of need in 2010 (Figure 11A), but the situation improved in 2015 with only the poorest 40 percent of the population receiving a lower share of benefits relative to their share of need (Figure 11B). Furthermore, the poorest 20 percent of the population received a much higher percentage share of benefits in 2015 (22.7 percent) as compared to 2010 when they received 17 percent of the benefits.

On the other hand, the richest 20 percent of the population received a much lower percentage share of benefits in 2015 (17.5 percent) as compared to 2010 when they received 18 percent of the benefits. This suggests that inequities have reduced between 2010 and 2015. Even though there has a pro-poor redistribution of benefits in 2015 whereby the bottom 20 percent and 40 percent of the population received more than a 20 percent share of benefits in each quintile, the distribution of benefits is still inappropriate because the lowest two income groups have higher health needs. For instance, the poorest 20 percent of the population only received 17 percent of the benefits in 2010 despite having a 18.7 percent share of health need. In 2015, the percentage share of benefits for the poorest 20 percent of the population increased but the benefits (22.7 percent) were still less than the health need (23.6 percent). Meanwhile, for the richest 20 percent of the population, the share of benefits received were relatively higher than their health needs in both 2010 and 2015.

Figure 11: Distribution of total benefits in comparison to need for health care: 2010 vs 2015

Source: Authors’ compilation from LCMS 2010 and 2015 data.
6. Conclusion

6.1 Zambia’s health financing incidence is relatively progressive

While several taxes which were assessed (CIT, VAT, PIT) were found to be progressive in 2010, this was not the case for Excise tax which was found to be regressive. Some components of Excise tax such as cigarette tax is regressive while taxes on alcohol are progressive. The reason why cigarette tax in Zambia is regressive is because the percentage of adult men smoking cigarettes is prevalent among the poor. And though PIT was progressive in 2010, its level of progressivity was weaker than the other taxes i.e. CIT and VAT which were more progressive. In 2014, PIT was regressive. Considering that income from individuals through PIT contributed 25 percent of the total annual tax revenue between 2010 and 2014, poor households bear a larger burden of financing health services through PIT. For OOP health spending, results shows that it was regressive in 2014 compared to 2010 when OOP was marginally progressive (almost proportional).

6.2 Catastrophic health expenditures are prevalent among poor households and expose them to greater financial risk

The results show that between 2010 and 2015, fewer households experienced catastrophic health spending at both the 20 percent and 40 percent thresholds. However, the poor still experienced higher incidence of catastrophic health spending than the rich. Further, between 2010 and 2015, the intensity of catastrophic health spending increased for almost all the quintiles but was significantly higher for the poor. This means that for the households experiencing catastrophic health spending in 2010 and 2015, the level of intensity was more profound for the poor. Secondary data from the ZHHEUS (Ministry of Health 2014) shows that households in rural areas are more likely to experience catastrophic health spending than those in urban areas. In addition, a visit to a private facility and hospital is more likely to lead to catastrophic health spending.

Decomposition of health-related household OOP spending further indicates that a huge share is spent on medicines (42 percent) followed by transportation and food (26 percent) (Ministry of Health 2014). This suggests that there could be a problem of physical access to health facilities in Zambia (particularly in rural areas) while the quality of service provided at health facilities is poor. Lack of medicines at health facilities forces patients to buy drugs from private pharmacies and drug stores. These findings further suggest that Government policy on free access to health care through the removal of user fees is not fully effective.

6.3 Distribution of subsidies and utilization of outpatient services at public health facilities favours urban provinces

The results show that the distribution of subsidies and utilization of outpatient services at public health facilities in Zambia has consistently been in favour of urban provinces, with the exception of Eastern province. This suggests that allocation of resources across the 10 provinces in Zambia is not related to disease burden, poverty levels, size of the population, and quantity of health facilities in each province. Apparently, disease burden, poverty levels, and population size are key elements of the district-level resource allocation formula that has been in use since 2004 in the public health sector in Zambia. Empirical studies that have evaluated the application of the resource allocation formula in Zambia have concluded that the formula has not been fully applied and this could be one of the reasons for the variations in the
distribution of public health subsidies by province in Zambia. And though Eastern province had the highest percentage share of the subsidies and outpatient utilization of health services, health outcomes in this province are among the poorest in Zambia as highlighted in previous demographic and health surveys. This suggests poor quality of health services in Eastern provinces and other rural areas, particularly for maternal health services. For example, urban women were more likely than rural women to be provided information about pregnancy complications, to be weighed, blood pressure measured, and urine and blood samples taken during antenatal care.

Gaps in service coverage at facility-level raises questions on the effectiveness of the user fee removal policy that was designed to increase access, and utilisation of quality health care. Some studies find no evidence that removal of user fees has increased utilisation of health care in Zambia, particularly for the poor. Further, service quality—a key factor in boosting utilisation of health services—is low in Zambia and varied across provinces. This partially explains why the user fees removal policy has had minimal impact on increased utilisation of health services in Zambia. Another study shows that the richest 50 percent of the population benefit more from income transfers that have been triggered by the user fees removal policy than the poor (Lépine, Lagarde, and Le Nestour 2017). Thus, despite the existence of free health care, Zambians still incur indirect costs when accessing health care such as transport, food, accommodation for family members taking care of patients, and purchase of medicines not available at the health facility (Chama-Chiliba and and Koch 2016).

6.4 Outpatient benefits by provider type and level of health care favours are pro-rich

This study shows that the distribution of outpatient benefits at private health facilities and public hospitals have continually been in favour of the rich over the period 2010–2015. The most glaring finding is that the distribution of outpatient benefits at faith-based health facilities has moved from being pro-poor in 2010 to pro-rich in 2015. This suggests a deterioration in access to health services by the poor over the years despite the fact that mission health facilities are funded by government, are located in rural areas where most of the poor people reside, and the services are free. This trend is similar to the distribution of overall benefits at all public health facilities (hospitals and health centers) which favoured the rich in 2014 despite being evenly distributed in 2010. Distribution of benefits for both inpatient and outpatient services also shows that the rich benefit more than the poor at both public and private health facilities. However, inpatient services for public district hospitals, public health centers, and mission health facilities are pro-poor.

6.5 Distribution of total health benefits is not commensurate to need for health care

Distribution of total health care benefits received in comparison to need for health care shows an improvement in the cumulative proportion of the poor population receiving benefits relative to their need between 2010 and 2015. Nonetheless, the poorest 20 percent of the population still received lesser health benefits in comparison to their needs in both 2010 and 2015 as compared to the richer households who received a greater share of health benefits despite having a lower share of health need.

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\(^2\) The Zambian government funds all mission health facilities under the Churches Health Association of Zambia (CHAZ) through a monthly operational grant and salaries for the health workers. CHAZ health facilities enjoy the same privileges as government health facilities.
References


### Appendix 1: Key health reform areas and elements, Zambia: 1992-2018

<table>
<thead>
<tr>
<th>Period</th>
<th>Organization</th>
<th>Finance</th>
<th>Provider Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992-1993</td>
<td>- Devolution of health services - SWAp is introduced</td>
<td>- Tax-based finance - Pooling of government &amp; donor funds for districts - Medical user fees introduced with exemptions for the poor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995-1996</td>
<td>- Provider-purchaser split - Central Board of Health (CBoH) created -</td>
<td>- Basic Health Care Package developed - Population-based resource allocation formula developed</td>
<td>- Country-wide PBC</td>
</tr>
<tr>
<td></td>
<td>Functions of Medical Stores Limited (MSL) restricted to storage and distribution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998-1999</td>
<td>- Functions of CBoH and Ministry of Health streamlined - MSL contracted-out</td>
<td>- Medium Term Expenditure Framework - Pooled funding extended to all levels - Needs-based resource allocation formula developed - Intro-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>under a lease agreement</td>
<td>duction of medical levy</td>
<td></td>
</tr>
<tr>
<td>2003-2004</td>
<td>- MSL contracted-out under a management contract - Re-organisation of SWAp</td>
<td>- Some donors transition from pooled funding at the Ministry of Health to General Budget Support at the Ministry of Finance - Medical</td>
<td>- PBC discontinued</td>
</tr>
<tr>
<td></td>
<td>coordination mechanisms</td>
<td>user fees removed in all rural areas (2006); and peri-urban areas (2007)</td>
<td></td>
</tr>
<tr>
<td>2006-2007</td>
<td>- Dissolution of CBoH - The Ministry of Health assumes role of provider,</td>
<td>- Medical user fees removed at the entire primary health care level (2012) - Medical levy abolished</td>
<td></td>
</tr>
<tr>
<td></td>
<td>purchaser &amp; regulator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011-2013</td>
<td>- Transfer of the primary health care function from the Ministry of Health</td>
<td>- Medical user fees removed at the entire primary health care level (2012) - Medical levy abolished</td>
<td>- RBF introduced in 11 districts</td>
</tr>
<tr>
<td></td>
<td>to the Ministry of Community Development, Mother and Child Health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015-2018</td>
<td>- Re-merger of the primary health care function to the Ministry of Health</td>
<td>- Medical user fees removed at the entire primary health care level (2012) - Medical levy abolished</td>
<td>- RBF introduced in 58 districts in five of the 10 provinces</td>
</tr>
</tbody>
</table>

*Source: Chansa (forthcoming).*
Appendix 2: Incidence and Intensity of Catastrophic Health Expenditure

Table A.1: OOP expenditure on health – 2010

<table>
<thead>
<tr>
<th>Threshold</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quintile</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Head Count (%)</td>
<td>15.0</td>
<td>8.7</td>
<td>8.0</td>
<td>6.5</td>
</tr>
<tr>
<td>Mean Overshoot (%)</td>
<td>2.1</td>
<td>2.1</td>
<td>1.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Mean Positive Overshoot (%)</td>
<td>27.3</td>
<td>25.4</td>
<td>21.9</td>
<td>23.2</td>
</tr>
</tbody>
</table>

OOP health spending as a share of non-food expenditure (monthly)

<table>
<thead>
<tr>
<th>Threshold</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quintile</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Head Count (%)</td>
<td>6.9</td>
<td>4.8</td>
<td>4.4</td>
<td>3.1</td>
</tr>
<tr>
<td>Mean Overshoot (%)</td>
<td>22.2</td>
<td>6.0</td>
<td>6.5</td>
<td>1.4</td>
</tr>
<tr>
<td>Mean Positive Overshoot (%)</td>
<td>327.6</td>
<td>125.5</td>
<td>143.3</td>
<td>43.5</td>
</tr>
</tbody>
</table>

OOP health spending as a share of total household expenditure (monthly)

Source: Authors’ compilation from LCMS 2010 and 2015 data.

Table A.2: OOP expenditure on health – 2015

<table>
<thead>
<tr>
<th>Threshold</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quintile</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Head Count (%)</td>
<td>3.9</td>
<td>2.3</td>
<td>2.3</td>
<td>1.7</td>
</tr>
<tr>
<td>Mean Overshoot (%)</td>
<td>10.7</td>
<td>1.6</td>
<td>1.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Mean Positive Overshoot (%)</td>
<td>301.7</td>
<td>71.5</td>
<td>64.1</td>
<td>29.6</td>
</tr>
</tbody>
</table>

Authors’ compilation from LCMS 2010 and 2015 data.
Appendix 3: Technical Notes

1.0 Financing Incidence Analysis

1. Adult equivalent in household (AE):
In adjusting for the household size and composition in order to obtain individual estimates where appropriate the LCMS survey uses the following deflator:
\[ AE = (A + \alpha K)^\theta \]

Where,
- \( A \) = number of adults in the household
- \( K \) = the number of children
- \( \alpha \) = cost of the children
- \( \Theta \) = degree of economies of scale

2. Concentration Index: the concentration index is by definition
\[ C = 1 - 2 \int_0^1 L_h(p) dp \]
and for a discrete living standards variable is
\[ C = \frac{2}{N\mu} \sum_{i=1}^N h_i r_i \left( 1 - \frac{1}{N} \right) \]
Where,
- \( H_i \) = the health sector variable
- \( \mu = \text{the mean} \)
- \( r_i = \frac{i}{N} = \text{the fractional rank of individual I in the living standards distribution, with I = 1 for the poorest and i=N for the richest} \)

3. Kakwani Index (KI). In order to overcome some limitations imposed by graphs, such as identifying the variations or relativities in progressivity by various criteria such as type of source, time or region, it is useful to compute and complement the use of graphs with some other measure. The KI is such a measure. The KI is defined as twice the area between a payments’ concentration curve and the Lorenz curve. It is estimated as:
\[ \pi_k = C - G, \text{ where } C = \text{health payments' concentration index and } G = \text{the Gini Coefficient of the ATP variable. The value of } \pi_k \text{ ranges from -2 to +1. A negative number indicates a regressive relationship; } L_H(p) \text{ lies inside } L(p). \text{ A positive number indicates progressivity; } L_H(p) \text{ lies outside } L(p). \text{ If the relationship is proportional, the concentration lies on top of the Lorenz curve and the index is 0.} \]
The KI is computed from convenient regression of the model:
\[ 2\sigma_R^2 \left[ \frac{h_i}{\eta} - \frac{y_i}{\mu} \right] \]

Progressivity of funding sources

According to O’Donnell et al. (2008, p.193), the overall or total progressivity of health financing depends on both the progressivity of the different sources of finance and on the proportion of revenue collected from each of the financing sources. This means that there is a need to understand the overall progressivity of the tax system as a whole especially in cases where the public health system relies extensively on public financing. Determining who pays for the final cost of health care provision is critical in understanding progressivity.
Concentration Curve and Concentration Index: Concentration curves (CC) can be used to
determine the extent of socio-economic inequality within a chosen health outcome variable and
how it varies over time (O’Donnell et al. 2008). However, concentration curves do not measure
the extent of inequality which can be compared across region, time or other comparative basis.
The concentration index (CI) is defined relative to the CC. This is twice the area between the
CC and the line of equality (45° line). The index is zero with no socio-economic inequality, negative when the curve is above the line of equality indicative or there is inequality, indicative
of pro-poor dimensions of the variable under consideration. The index has bounds of -1 and 
=+1.

KI: The Lorenz curve (LC) shows the proportion of health expenditures or income attributable
to cumulative shares of the population. It has a range (0,1). Dominance of the LC over another
distribution which holds for the CC as well occurs, when for any given distribution of the
population, p, the LC of a given income distribution is above that of the other distribution. This
implies that the dominating LC has a distribution with less inequality.

OOP expenditures: These are the household expenditures for all household related consumption.

ATP: This is given as the difference between expenditures on non-discretionary items less
expenditures on food and food related items.

2.0 Benefit Incidence Analysis - Constant Unit Cost Assumption

This study uses a repeated cross-sectional survey design and applies the traditional BIA
methodology (McIntyre and Ataguba 2011; O’Donnell et al. 2008) to assess the distribution of
public subsidies and service benefits (utilization of health services). Listed below are the key
steps and activities which were undertaken.

i. Using household expenditure as a measure of socio-economic status, quintiles were
constructed and used to rank the population by wealth;

ii. Data on the utilization of health services was disaggregated by provider, level of health
care, outpatient/inpatient, and socio-economic status;

iii. Unit costs for outpatient and inpatient services was calculated by using expenditure
data, population, and utilization rates;

iv. “Benefits” were calculated by expressing utilization of health services in monetary
terms by multiplying utilization rates by unit costs for each socio-economic group. The
“benefits” were then aggregated across different types of health services for each socio-
economic group; and

v. Comparing the distribution of health expenditures (subsidies) and benefits by province,
providers, type of health services; and for the different socio-economic groups in order
to determine differences in benefit incidence and with respect to need.

This study uses constant unit subsidies and adapts the generic formula below from O’Donnell
et al. (2008).

\[
X_j \equiv \sum_{i=1}^{n} H_{ij} \frac{S_i}{H_i} \equiv \sum_{i=1}^{n} \frac{H_{ij}}{H_i} S_i
\]  

(1)
Where:

\[ X_j = \text{the value of total health subsidy imputed to the socio-economic group, } j \]

\[ H_{ij} = \text{number of health visits of group } j \text{ to health facilities at level } i \text{ (with } i = \text{ health facility type}) \]

\[ H_i = \text{is the total number of visits by different levels of health care by different income groups} \]

\[ S_i = \text{government recurrent net spending (less all private payments)} \]

\[ \frac{S_i}{H_i} = \text{unit subsidy of funding health subsidy at level } i. \]

The share of total health subsidy \((S)\), accruing to the groups is given by the formula below

\[ x_j = \sum_{i=1}^{n} \frac{H_{ij}}{H_i} \left( \frac{S_i}{S} \right) \equiv \sum_{i=1}^{n} h_{ij} S_i \] (2)

From this equation, the share of total health subsidy to each group is determined by two factors: (i) share of the group within the context of the total health visits at each level of care \((h_{ij})\) and (ii) the share for each level of care in total health subsidy \((s_i)\).

From the first equation, the provincial or regional analysis is derived as follows:

\[ x_j = \sum_{k=1}^{n} \sum_{i=1}^{N} \frac{E_{ijk}}{E_j} \left( \frac{S_{ik}}{S} \right) \equiv \sum_{k=1}^{n} \sum_{i=1}^{N} e_{ijk} S_{ik} \]

In which \(k\) refers to the region specified in the unit subsidy, and \(n\) depicts the number of provinces (regions) under consideration which in this case is ten (10). An assumption made in the literature is that the unit subsidy \(S_{ij}\) is constant across all units of type \(i\).

3.0 Health Expenditures and Impoverishment Effects

The principal interest or objective of the analysis is underpinned in the values and principles centered around providing health care to all persons in a fair and equitable manner so as to ensure dignity for all individuals. This extends the argument made by Berki (1986) that financial catastrophic expenditures may affect a relatively small share of the population, and still account for a substantial share of health expenditures. Yet there is limited evidence of the extent and significance of health expenditures and their impoverishing effects (O’Donnell et al. 2008). Although O’Donnell focuses on Asia, the circumstances hold equally for Sub-Saharan Africa.
OOP expenditures

These are payments made by households at the point of service. OOPs will usually include expenditures related to clinicians’ consultation fees, payment for medicines, payment for clinical services incurred such as laboratory diagnosis, x-rays and hospitalisation. Insurance reimbursement are normally netted out of OOPs.

Household consumption expenditure (HCExp)

These are the household monetary and in-kind consumption and payment for all goods and services.

Food expenditures

This is the amount of money spent in all foodstuff including own production monetary equivalent by households. It excludes expenditures on cigarettes, alcohol and restaurant served foodstuffs.

Poverty line and household subsistence expenses

Household subsistence spending is defined as the minimum requirement to maintain basic life. This is defined at the internationally accepted conversion of US$1.25 (Ravallion, Chen, Sangraula 2008). This minimum level poverty line has been adjusted with a purchasing power parity rate of US$1 = ZMK10.00. The approach used in defining poverty is the extent of the food and non-food expenditure in the household. The food share expenditures as a proportion of total expenditures are taken as median expenditures within the range 45–55 percent. In deriving the estimates, the following variables are used:

- Household size – the total number of household members at the time of the survey = \( N \)
- Stratum – the lowest sampling unit = the standard enumeration area

\[
\text{Food expenditure} = \frac{\text{food expenditures for the household}}{\text{total expenditures by the household}} = \frac{\text{Food}_h}{\text{Exp}_h}
\]

- The household food expenditure equivalent = household food expenditure over household size:
  \[
  \text{Household food expenditure equivalent} = \frac{\text{Food}_h}{\text{Equivalent size}_h}
  \]
- A household is defined as poor when the total household expenditure is less than its subsistence spending:
  \[
  \text{poor}_h = 1, \quad \text{if } \text{exp}_h < \text{se}_h, \quad \text{where } \text{se}_h = \text{pl}*\text{eqsize}_h, \quad \text{se}_h = \text{subsistence expenditure for each household}
  \]
  \[
  \text{poor}_h = 0, \quad \text{if } \text{exp}_h > \text{se}_h
  \]
  \( \text{pl} = \text{weighted average of food expenditure} \)

- The household’s ATP = the household’s non-subsistence spending and is the non-subsistence effective income.

- OOP payments share of household ATP (oopatp)
• **OOP payment share of household ATP**: the burden of health payments is defined as the OOP payments share of the household’s ATP

\[ oopatp = \frac{oop_h}{atp_h} \]

• **Catastrophic health expenditures**: These occur when a household’s total OOP payments equal or exceed a given threshold, \( z \), (30 – 40 percent) of the household’s ATP or non-subsistence expenditure. The threshold, \( z \), can adapted and be over a range of values.

Adopting the methodology by O’Donnell et al. (2008), we define incidence and intensity of catastrophic health expenditures as a share of health care costs in total expenditures and/or non-food expenditures relative to a defined threshold (see above). Conceptually this is shown in Figure A.1 below. In the figure, the horizontal axis shows the cumulative share of households ordered in a ratio \( \frac{T}{x} \) from the largest to the smallest (equivalent to the cumulative density function for the reciprocal of the health payments budget share with the axes reversed). The interpretation of the graph is that at the threshold, \( z \), exists the fraction \( H \) of households with health care budget shares that exceed the threshold, \( z \), which is equal to the catastrophic payment head count. If an indicator \( E \), is defined such that

\[ E = 1 \text{ if } \frac{T_i}{x_i} > z \text{ and } 0, \text{ otherwise, then the estimate of the headcount is} \]

\[ H = \frac{1}{N} \sum_{i=1}^{N} E_i \text{ where } N \text{ is the sample size} \]

Where, \( T = OOP \)

\[ X = \text{total household expenditure} \]

\[ f(x) = \text{food expenditures} = \text{non – discretionary expenditure}, \]

it follows that the household experiences catastrophic expenditures where

\[ \frac{T}{X} \text{ or } \frac{X}{[X - f(x)]} \]

exceeds a given threshold, \( z \),

where \( z \) = represents expenditure levels where the absorption of household resources by spending on health care imposes a severe disruption of living standards or the ATP is severely limited.

The catastrophic payment overshoot captures the average by which payments (as a proportion of total expenditures) exceed the threshold \( z \).

\[ \text{The household overshoot } = O_i = E_i (\frac{T_i}{x_i}) - z, \text{ the overshoot is the average:} \]

\[ O_i = \frac{1}{N} \sum_{i=1}^{N} O_i, \text{ where } N \text{ is the sample size} \]

According to O’Donnell et al. (2008), \( O \) which is shown in Figure A.1, is given as the area under the payment share curve and above the threshold. Further, since \( H \) captures the incidence of catastrophe occurrence, \( O \) captures the intensity of occurrence and are related through the mean positive overshoot (MPO), which is defined as:

\[ \text{MPO } \frac{O}{H} \]
Figure A.1: Health Payments Budget Share against Cumulative Percent of Households Ranked by Decreasing Budget Share