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Out of Pocket Health Expenditure and Healthcare Subsidy in Jamaica, and Some Selected Countries in North America

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Abstract

Globally, financing healthcare is characterized by high Out-of-Pocket expenditure (OOPE) for healthcare. This has rendered so many households without health insurance into catastrophic health spending. This study has examined the effects of healthcare subsidies (HS) on OOPE in some selected countries in North America. We have employed advanced econometrics model, such as static fixed effects panel and dynamic system generalized method of moments (GMM) estimator. Our data was sourced from World Bank data base from 2000 to 2022. Our results show that there is a positive correlation between healthcare subsidies and OOPE, implying that HS is not strong enough to provoke reduction in OOPE. We also found an inverse relationship between cardiovascular disease mortality rate and OOPE. This implies that reduction in the mortality rate reduces the amount of OOPE in the region. The results suggest that government should device a better way like co-payment to achieve universal coverage for all its citizens. This would definitely and directly reduce the volume of payment households make on healthcare.

Keywords

Healthcare Subsidies, Out-of-Pocket Expenditure, Catastrophic Health Spending, Generalized Methods of Moment

1. Introduction

Globally, user fee otherwise known as out of Out-of-pocket expenditure (OOPE) per capita (current US$) remains the major source of healthcare finance. However, this has implications on households' living standards. OOPE reduces house-

hold income and his propensity to consume. In other words, high OOPE affects healthcare utilization and overall health outcomes. In the absence of co-payment, and other public healthcare programmes, OOPE can make household become catastrophic. That is a situation whereby households spend more than 10 to 25% on consumption or 40% on non-food expenditure. This situation has to potential of pushing individuals into poverty. In other words, a nation without co-payment arrangement exposes its citizens to health expenditure crises [1].

Universally, OOPE incurred by individuals are estimated to account for 23 percent of total universal health expenditure and 45 percent of health expenditure in underdeveloped and developing world. In North America, particularly the United States, out-of-pocket healthcare spending varies, but it can represent a significant portion of total healthcare costs, with some estimates suggesting it's around 10% or more of total healthcare spending. In the US, per capita out-of-pocket spending was $1424.6 in 2022.

Out of pocket health expenditure is a major barrier to accessing health care and a leading cause of catastrophic health expenditure. This has led many households to manifestation of law of inverse care. A situation whereby patients who need care most receive the least amount of care.

Previous studies provide relevant insights into the relationship between health care subsidies and user fees in health in some selected countries Sub-Saharan Africa and other countries with a dirt of studies around this subject within north America and missed results. Our review showed that most studies adopted descriptive analysis without paying attention to methodological issues like, stationarity of the variables, presence of multicollinearity, freedom from autocorrelation among other issues. For instance, Ghosh 2011 employed descriptive analysis and found that OOPE and public health spending are not always correlated. The study also found that the incidence of catastrophic expenditure also increased within the year under review. Lower- and middle-income quartiles bear the brunt of OOPE. This implies that poor households are more vulnerable to catastrophic OOPE.

Similarly, Maya *et al.* [2] found that OOPE significantly reduces households' welfare in Uganda. This is because households spend more on health-related issues more than food. In the same vein, [3] and [4] showed that a lot of households were push below the poverty line due to high out-of-pocket healthcare spending in Nigeria. According to them, the average per capita deficit of the households also increased as a result of healthcare expenditure. Other issues as relate to OOPE show that epidemic increases household OOPE in Cambodia [5], Furthermore, they revealed that the type of facility, in terms of being private or public as a predictor of OOPE.

Additionally, [6] that chronic sickness is the most important predictor of OOPE in Bangladesh. The study also found that education and health care spending are positively correlated. In other words, the most educated households spend more on health care than the less educated households and people with no education.

Similarly, increase in female gender was found to increase healthcare spending [7] [8]. In Nigeria, life expectancy and adult literacy though unexpected was found reported to have an inverse relationship with healthcare spending in Nigeria. The findings further showed that government health spending had little or no effect on improving the health status of the Nigerian population [9]. Other studies with similar findings include [10]-[13]. [14] failed to account for the heterogeneity in sub-Saharan Africa countries or the influence of economic shocks, which may produce an inconsistent or unreliable results. Additionally, to the best of our knowledge, there is no study that has examined health subsidies and user fees in health within the study region. This study fills these gaps by employing advanced econometric techniques, such as static and dynamic panel models to analyze the effect of health subsidies on use fees in health.

2. Methodology

2.1. Sample Size

$$\text{Total Observation} = N_C * T^* \text{ Sample per Country/Year}$$

where N_C represents number of countries and T represents the number of years.

$$\text{Total observation} = 20 * 23 = 460$$

Jamaica and other 19 countries with the North America were selected. Their selection was based on the data availability and assurance that this countries have balanced data set for all the variables employed in this study. The countries and their respective capital cities are reported in **Table A1** under **Appendix**.

2.2. Conceptual Framework

The conceptual framework of this study is built on [1], which is considered a household with the following resource allocation. An individual with a fixed income I which is allocated between healthcare consumption, H and non-healthcare consumption, NH. Note that the goal of a rational consumer is to maximize overall utility subject to the resource constraint, I.

The constrain is expressed in equation as follows:

$$phH + pnhNH \le I \tag{1}$$

where ph is the cost of healthcare, pnh represents the price of non-healthcare. If the consumer receives the subsidies d, (where $d \le s$), the budget constraint is then modified as shown in equation (2). Equation (3) explains the interaction between OOPE and healthcare subsidy (hsd), where f represents a function, and x connotes other variables that affect OOPE

$$(ph - hsd)H + pnhNH \le I \tag{2}$$

$$\text{OOPE} = f(\text{hsd}, x) \tag{3}$$

Empirical Framework

To investigate the nexus between user fees in health OOPE and healthcare subsidy in some selected countries in North America, the healthcare financing and

protection framework is suitable. Through this framework, we explore how various health financing sources such as external funding, government financing and personal expenditure interact and determine access to healthcare and financial protection [15]. This framework shows how a rise in in external support can reduce OOPE and enhance affordability and healthcare utilization. By estimating this model, the framework gives more information on how well-structured healthcare financing can reduce economic burden on households, most especially in a low and middle income countries and enhance better access to health care services. Therefore, from equation (3) we have the dynamic and static panel model specification is as follows

$$\begin{aligned} \mathrm{n}\,OOPE = {} & \beta_0 + \beta_1 \ln EHE + \beta_2 \ln GHE + \beta_3 \ln GDP + \beta_4 \ln LEXP \\ & + \beta_5 \ln POPFML + \beta_6 \ln POPADT + \beta_7 \ln MCVDOTHERS + \varepsilon_t \end{aligned} \quad (4)$$

where OOPE which denotes out-of-pocket health expenditure is the dependent variable, *EXE,* External health expenditure per capita (current US$), (*GHE*) connotes Current health expenditure per capita (current US$). These two variables are used as proxy for healthcare subsidies. Others are control variables, which are; Life expectancy at birth (*LEXP*) Population of female above the age of 65, (*POPFML*), Population of adult above the age of 65 (*POPADT*) and mortality from cardiovascular diseases and others (*MCVDOTHERS*) all which we obtained from world development indicators (WDI)

3. Results and Discussion

3.1. Descriptive Statistics

Table 1 presents the descriptive statistics of all the variables employed in this study. As shown in Table 1, we have 460 observations. The mean of user fees in health about $157 per capita, with the minimum value of 5.116 per capital and maximum value $637.824 per capita. Similarly, external health expenditure has an average value of $8.288 per capita, while the minimum and maximum values stand at $0.004 and $465.077 per capita, respectively. In the same vein, the average, minim and maximum values of government health expenditure, are $431.4, $8. And $1472.0 per capita, respectively. Gross domestic product has a mean value of $2.69e per capita, with a minimum and maximum values of 3.33e and 4.60e current US dollar, in that other. The average years of life expectancy in the study area is about 72 years, minimum, 45.6, maximum 80.4 years, while the standard deviation is 45.1 years. Furthermore, Table 1 also presents the mortality rate of cardiovascular diseases and other diseases, with an average mortality of 17.5%, while the minimum and maximum values stand at 8.9% and 34.8%, correspondingly.

Table 1. Descriptive statistics of the variables 8.9% and 34.8%, correspondingly.

Variable	*Obs*	*mean*	*std. dev.*	*Min*	*Max*
OOPE	460	157.94	141.627	5.116	637.824
EHE	460	8.288	23.623	0.004	465.077

Continued

GHE	*460*	*431.735*	*344.362*	*8.1*	*1472.046*
GDP	460	2.69e	5.08e	3.33e	4.60e
LEXP	460	72.053	45.109	45.577	80.407
POPADT	460	597789	1561799	3389	1.04e
MCVDOTHERS	460	17.514	5.223	8.9	34.8

3.2. Pre-Analysis Test Results

Our correlation matrix presented in Table 2 shows that health subsidies proxy by EHE and GHE are positively correlated with User fees in health which is proxy by OOPE. To determine the presence of multicollinearity the independent variables, the study employed variance inflation Factor (VIF) as reported in Table 3. The result shows no significant problem of multicollinearity. This confirms the level of robustness of our model.

Table 2. Correlation analysis.

	OOPE	EHE	GHE	GDP	EXP	POADT	MCVDOT
OOPE	1						
EHE	0.138	1					
GHE	0.8609	0.0651	1				
GDP	−0.1671	−0.0873	0.0807	1			
LEXP	0.3747	−0.1174	0.5967	0.0801	1		
POPADT	−0.2699	−0.0729	−0.2506	0.8659	−0.1264	1	
MCVDOTHERS	−0.1046	0.0628	−0.1983	−0.1083	−0.5347	−0.0112	1

Table 3. Variance inflation factor (VIF).

Variable	VIF	1/VIF
lnPOPADT	2.33	0.000412
lnPOPFML	2.51	0.000434
lnGDP	2.15	0.038241
lnLEXP	3.07	0.325299
lnMCVDOTHERS	1.37	0.731709
lnEHE	1.27	0.784878

3.3. Stationary Test Results

The result of stationarity test is reported in Table 4. This is conducted when you have a relatively large "*t*", that time frame. Following [16] which is specified as follows:

$$\Delta y_{it} = \rho y_{it-1} + \gamma_{0i} + \gamma_{1i} t + u_{it}, i = 1, 2 \cdots, N, t = 1, 2, \cdots, T \quad (5)$$

where time trend ($\gamma_{1i} t$) and individual effects (γ_i) are incorporated in the model.

Δy_{it} is the series for cross-section iii and time *t*. μi is the error term. Note that one important source of heterogeneity in this model is deterministic component since the coefficient of the predicted variable is constrained to be homogeneous across all units in the panel. Our findings show that the test statistics are below the critical values at the 1% level of significance at level except for GHE which falls below the critical value at first difference.

Table 4. Levin-Lin-Chu panel unit root test.

Variable	Statistic	At level (5%)	First Difference	Decisions
OOPE	−3.8703	0.0001	0.0000	Reject Ho
EHE	−11.8669	0.0000	0.0000	Reject Ho
GHE	(−0.5137) −8.8165	(0.3037)	0.0000	Reject Ho
GDP	−24.4164	0.0000	0.0000	Reject Ho
LEXP	−4.1441	0.0000	0.0000	Reject Ho
POPADT	−65.2478	0.0000	0.0000	Reject Ho
MCVDOTHERS	−7.5810	0.0000	0.0000	Reject Ho

Trend Analysis between OOPE and Subsidy in Jamaica

Figure 1 presents the trend analysis between OOPE and external health expenditure in Jamaica between 2000 and 2022. Figure 1 shows that external health expenditure is far lower than the proportion of OOPE in the years under review. Figure 1 also shows that there are inconsistencies in the trend of OOPE. Notably, in the years 2001 and 2008, the variable depicts unusual spikes. On the contrary, external health expenditure reveals a steady rise except for 2013 when the graph nosedived and then steadily rose until 2022.

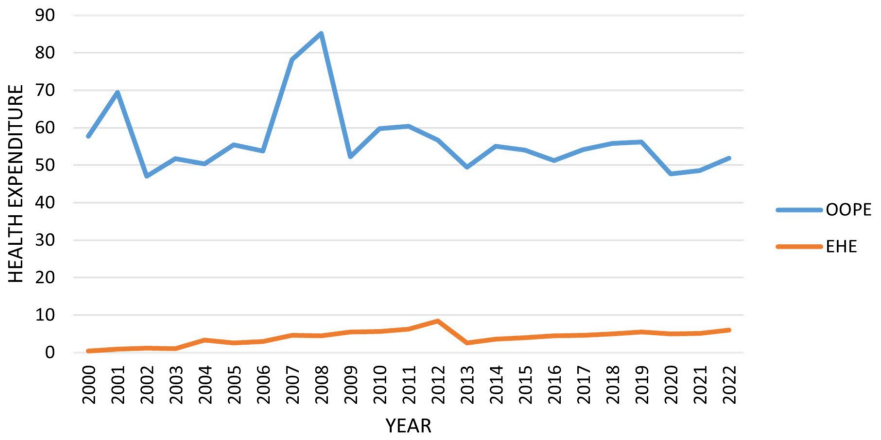

Figure 1. OOPE and health external health expenditure in Jamaica.

Similarly, Figure 2 presents the analysis and interaction between OOPE and

government health expenditure in Jamaica. Unlike external health expenditure, government health expenditure is higher than OOPE in Jamaica. Additionally, the trend shows an upward trend within the year under review. This implies that the Jamaican government is improving on her health system on a yearly basis. As it has been previously, observed, OOPE maintains a steady rise but for 2009 when there was a slight drop before it picked up again.

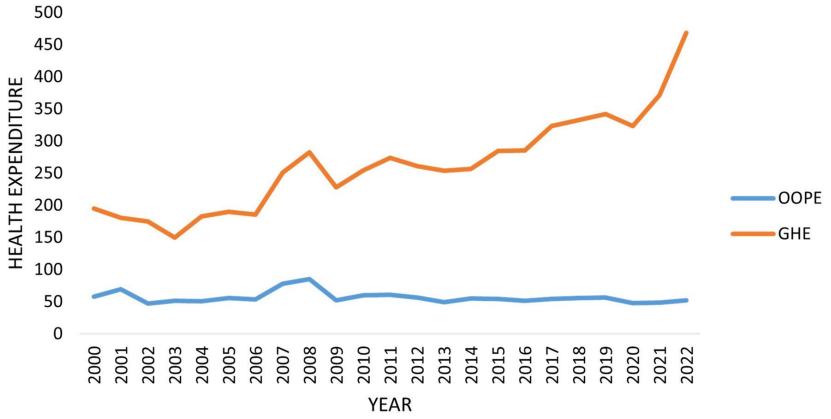

Figure 2. OOPE and government health expenditure in Jamaica.

3.4. Empirical Result

Table 5 presents the empirical results of this study. The fixed effect as well as random effect results were estimated through Stata 17. The test of choice of preference was conducted Hausman test. The result of the fixed effect was preferred due to the value of the chi square value which shows the level of significance at 1% significant level. The results of F-statistics and the corresponding level of significant are 392.11 and 0.000, respectively. The value of R^2 suggests that the model is fit.

From Table 5, there is a positive relationship between both External health expenditure, government heath expenditure and user fees in health. Specifically, a percent change in EHE and GHE leads to a change in household's OOP in health by 0.0004 and 0.4638, respectively. In other words, OOPE is not health subsidies elastic. Furthermore, as would be expected, a 1% change (increase) in life expectancy reduces the OOPE in health by 1.3440. Similarly, there is an inverse relationship between change in the population of adults and out of pocket health expenditure.

Table 5 further shows that there is an inverse relationship between cardiovascular and other diseases mortality rate and out of pocket health expenditure.

It also shows that a 1% increase in CVDS and other diseases mortality rate reduces OOPE by 0.2285.

Table 5. Static panel data.

	Fixed effect		Random **effect**	
	Coefficient	Std. err.	Coefficient	Std. err.
lnEHE	0.0004 (0.000)	0.0066	−0.0025 (0.697)	0.0125

Continued

lnGHE	**0.4638 (0.000)**	**0.0523**	**0.5501 (0.000)**	**0.0383**
lnGDP	0.4056 (0.000)	0.0573	0.3613 (0.000)	0.0463
lnLEXP	−1.3440 (0.000)	0.3156	1.4773 (0.000)	0.4707
lnPOPADT	−2.5242 (0.001)	0.0709	−0.3518 (0.000)	0.3814
lnMCVDOTHERS	−0.1357 (0.061)	0.0722	−0.1367 (0.054)	0.0660
F-stat = 496.95				
p-value = 0.000				
R^2 = 87			**R^2 = 87**	
Huasman chi2(0) = (b − B)' [(V_b − V_B)^(−1)](b − B)				
p-value = 0.00				

The results of the dynamic panel is reported in Table 6. The results of the Sargan test and the values are 22.6174 and 1.0000, respectively. The result shows that the instrument is not valid since the p-value is insignificant. Similarly, we report the report the p-value of AR1 and AR2 as 0.000 and 0.1364. The rule of thumb says that the p-value of AR2 to be insignificant for the model to be declared free of autocorrelation.

The direction of coefficients of our subsidies shows that one of the proxies is positive while the other has a negative relationship. The positive relationship of GHE implies that a 1% change (increase) in EHE increases OOPE by 0.5236%. Conversely, the negative association between OOPE and EHE shows that a % change (increase) in EXE reduces OOPE by 0.0025%. Though not in conformity with *a priori* expectation, they are both significant at 1% level of significance. Similarly, GDP is also positively correlated with OOPE.

Table 6 further shows that a 1-year change (increase) in life expectancy of individuals in the region under consideration increases the amount of OOPE by $0.6659. Similarly, a one 1% change in the household adult population reduces their OOPE by $0.1830. Additionally, a 1% change (increase) in mortality rate due to cardiovascular and other diseases reduces the amount of OOPE by $0.2743.

Table 6. GMM dynamic panel result.

OOPE	Coefficient	Std. err.	z	95% conf.
L1.	−0.1891 (0.240)	0.161118	−1.17	−0.04364
L2.	−0.1469 (0.029)	0.067329	−2.18	−0.03196

Continued

lnGDP	**0.2687 (0.000)**	**2.153862**	**3.65**	**79.77397**
lnEHE	−0.0025 (0.509)	0.605616	−0.66	14.09868
lnGHE	0.5236 (0.000)	1.62715	5.22	110.0452
lnLEXP	0.6659 (0.000)	23.32505	0.57	−506.877
lnPOPADT	−0.1830 (0.175)	19.43665	−2.21	−1072.81
lnMCVDOTHERS	−0.2743 (0.000)	4.058011	−1.36	22.48925
AR1=	−4.2151 (0.0000)			
AR2=	−1.4892 (0.1364)			
Sargan value = 22.6174				
P-value = 1.0000				

4. Discussion

As earlier reported, this study prefers the result of the fixed effect based on the chi square value of the Hausman test, which shows that the model is significant at 1% level of significance. From the static panel results, OOPE and health subsidies (EHE and GHE) are positively correlated. And they are very significant at 1% level of significance. The result implies that an increase in EHE and GHE result to a rise in user fees in health. In other words, an increase in healthcare subsidies reduces the financial access, which invariably increase the risks of unmet healthcare needs. In other words, the result suggests that the volume of health subsidies is insufficient to provoke a reduction in OOPE in the region. This result though negates the *a priori* expectation, which presumed that the more the government spends on health, the less the level of OOPE, it is consistent with [16] and [17], that reported a positive but significant relationship between OOPE and government health expenditure in sub-Saharan Africa. In the same vein, [7] and [18] reported a positive relationship between OOPE and government spending in India.

On the contrary, [6] reported an inverse and significant relationship between external funding and OOPE of the region. Their finding suggests that an increase in health subsidies lead a fall in user fees in health.

Our result from static panel data further shows that gross domestic product has a statistically significant relationship with OOPE. This means that the growth in gross domestic product leads to a rise in OOPE in the region. The estimated elasticity of 0.4106 obtained in our analysis suggest that a 1% change in GDP increases the OOPE payment by 0.71%. This perhaps means the rise in income was not used to purchase health insurance or any form of co-payment that reduce the amount

of OOP in the event of illness.

The coefficient of elasticity of adult population also suggests that a 1% change in adult population leads to a 0.18% in OOPE payment. This is because it requires more fund to cater for vulnerable adults out of pocket than the younger generation. This is contrary to [19] who revealed that family with more elderly people have more health problem and hence experience not only high OOPE but also catastrophic health expenditure in Senegal. The study further found that burden of diseases within the household increase their level of OOPE. This accordingly also increase the level of household poverty.

As would be expected, the coefficient of elasticity of mortality rate of CVD shows that a 1% fall in OOPE leads to a statistically significant fall by 0.27% fall in CVD and other diseases.

The result of GMM dynamic panel shows the same trend as the static panel results. The descriptive result shows that our analysis if free from the problem of serial correlation. This decision follows the level of significance of AR2 in **Table 6**, with the p-value of 0.1364, showing non-significance level. It is also worthy to note that other determinants of OOPE according to previous studies include level of poverty. [20] showed that Households in the lowest quintiles India was found to be inversely correlated with catastrophic health expenditure. This is consistent with [7]. According to this study, lower and middle income quartiles bear the brunt of OOPE. Other studies with similar findings include [21] [22]. Similarly [23] showed that a lot of Yenagoa households in Nigeria were push below the poverty line due to high out-of-pocket healthcare spending. The result further showed that the average per capita deficit of the households in this region also increased as a result of healthcare expenditure.

The result of static and dynamic panels showed that OOPE and GDP are positively correlated. This implies that an increase in GDP also leads to a statistically significant increase in the level of OOPE payment. This again does not conform to expected relationship. The result of GMM dynamic panel shows the estimated elasticity of GDP suggests that a 1% increase in GDP leads to 0.2687% increase in GDP. This contradicts the findings of [24] which suggests that economic growth has the potential to attract more health spending across 184 countries of the world.

4.1. Conclusion

The study considered the effects of the external health expenditure and government health expenditure (healthcare subsidies) on OOPE in Jamaica and some selected countries within North America. We conclude that only external health expenditure has an expected impact on OOPE while GHE did not have expected outcomes on OOPE. It implies that GHE is not sufficient enough to incite impacts on user fees in health in the study area. Similarly an increase in GDP does not have potential to provoke a fall in the amount of OOPE. This also suggests that absolute growth in GDP does not automatically translate to improvement in health expenditure or health outcomes.

Our findings also show that there is a statistically significant correlation between CVDs and other diseases and, OOPE, implying that a reduction in cardiovascular mortality reduces the amount of households OOPE. These findings conclude that since only external health expenditure reduces OOPE, government should work towards the achievement of universal health insurance coverage for her citizens.

4.2. Limitation of the Study

There are lot of missing figures in some other independent variables that affect OOPE. This has led to reducing the number of variables, so as not to have unbalanced data set.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix

Table A1. Nations and their capital cities.

	Nation	Capital
1	Antigua and Barbuda	St. John's
2	Bangladesh	Dhaka
3	Barbados	Bridgetown
4	Belize	Belmopan
5	Costa Rica	San José
6	Cuba	Havana
7	Dominica	Roseau
8	Dominican Republic	Santo Domingo
9	El Salvador	San Salvador
10	Grenada	St. George's
11	Guatemala	Guatemala City
12	Honduras	Tegucigalpa
13	Haiti	Port-au-Prince
14	Jamaica	Kingston
15	Nicaragua	Managua
16	Panama	Panama City
17	St. Kitts and Nevis	Basseterre
18	St. Lucia	Castries
19	St. Vincent and the Grenadines	Kingstown
20	Trinidad and Tobago	Port of Spain

Table A2. Definition of variables.

	Variables	Variation	Abbreviation
1	Out-of-pocket health expenditure	Out-of-pocket expenditure per capita (current US$)	OOPE
2	External health expenditure	External health expenditure per capita (current US$)	EHE
3	Government health expenditure	Current health expenditure per capita (current US$)	GHE
4	Gross Domestic product	GDP (current US$)	GDP
5	Life Expectancy	Life expectancy at birth, total (years)	LEXP
6	Adult population 65 and above	Population ages 65 and above, total	POPADT
7	Mortality Rate	MR CVDS & Others	*MCVDOTHERS*

SOURCE: Authors' computation [24].