Equity of health-care financing: a progressivity analysis for Egypt

Yara Ahmed, Racha Ramadan and Mohamed Fathi Sakr
*Department of Economics, Faculty of Economics and Political Science,
Cairo University, Giza, Egypt*

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Abstract

Purpose – This paper aims to evaluate the progressivity of health-care financing in Egypt by assessing all five financing sources individually and then combining them to analyze the equity of the whole financing system.

Design/methodology/approach – Lorenz dominance analysis and Kakwani progressivity index were applied on data from 2010/2011 Household Income, Expenditure, and Consumption Survey and the National Health Accounts 2011 using Stata to evaluate the progressivity of each source of health-care finance and the financing system overall.

Findings – The data show that Egypt's health-care system, which is largely financed by out-of-pocket (OOP) payments, is slightly regressive, with an overall Kakwani index of -0.079. The overall regressive effect was the result of three regressive sources (OOP payments, an earmarked cigarette tax and direct taxes), one proportional finance source (social health insurance) and two slightly progressive sources (indirect taxes and private health insurance). This shows that the burden of financing health care falls more on the poor. These results signal the need for reform of health-care financing in Egypt to reduce dependence on OOP payments to achieve more equitable financing.

Originality/value – The paper seeks to augment the literature on health-care financing in Egypt by calculating specific progressivity estimates for all five sources of financing the Egyptian health-care system and analyzing the overall equity of this financing system. It will, therefore, provide a benchmark for monitoring the equity of finance in the Egyptian health-care system in future studies and allow one to assess the impact of implemented financing reforms in the future on the level of progressivity of health system financing.

Keywords Equity, Egypt health-care finance incidence, Health-care system financing, Progressivity analysis

Paper type Research paper

1. Introduction

With the start of the 1990s, a renewed international movement commenced toward health-care financing reforms. This movement spawned in the developed world and then spread to developing nations, such as Egypt, aiming to best utilize available public and private health-care resources. In addition to this efficiency dimension of health-care financing reform, there is the equity aspect. Equity is a central goal in health sectors worldwide; nevertheless, inequities between rich and poor continue to exist. The poor spend a larger share of their

income on health care than the rich, despite having lower utilization levels of health services and their greater needs (O'Donnell *et al.*, 2008).

As in the 1962 National Charter, the Government of Egypt (GoE) aims to achieve universal coverage of basic health services for all citizens. National policies first sought to provide free access to curative-care for all Egyptians in public hospitals/clinics. However, rapid population growth and declining government budgetary resources made achieving the goal of providing universal, publicly funded, quality health-care services difficult (World Bank, 2004).

The GoE in cooperation with the World Bank and bilateral donors instituted the Health Sector Reform Program in 1997 to investigate the reform of health-care financing among other aspects of the health sector. Over 20 years later, the Egyptian health-care system is still characterized by problems of quality, efficiency and equity (WHO, 2014). This signals the need for immediate pursuit of health-care financing reform because many constraints to the proper functioning of Egypt's health-care system are finance-related. The current financing system is clearly failing and must be closely examined to indicate the appropriate direction for reform.

Expenditure on health in Egypt as a share of gross domestic product (GDP) was 4.64 per cent in 2016 (World Bank), one of the lowest spending in the region. Egypt's health-care system is pluralistic and fragmented, with numerous sources of financing, financing agents and providers. It is estimated that in 2016, 62 per cent of the total health expenditure (THE) was financed by private out-of-pocket payments (OOPPs) – the highest among all middle-income countries in the region.

The typology of a country's health financing system is contingent on its relative mix/dependency of different sources of health sector funding: OOPP, private health insurance (PHI), social health insurance (SHI), earmarked health-taxes and general government revenues. The role of each source varies across countries, having implications for equity. While all five sources play a role in financing Egypt's health-care system, the dominance of OOPP is alarmingly high. According to the latest round of National Health Accounts (NHA) in Egypt (NHA, 2011); OOPP comprised around 70 per cent of health-care spending in 2008/2009, followed by government financing at 25 per cent of THE. With households and government being the two main financers of health care, SHI, an earmarked health-tax on cigarettes and PHI finance the remainder of THE in Egypt.

This pattern of financing is highly problematic because OOPP has been found to push people further into poverty. Additionally, heavy reliance on it indicates a lack of financial protection in the incidence of catastrophic injury/illness (Wagstaff *et al.*, 2002). Because a central idea in the literature is that no individual should be pushed/further pushed into poverty because of health-care expenditures, this pattern indicates a dire need for reform of Egypt's health-care financing system.

The aim of health-care financing reform is to attain an "optimal" system of finance that achieves the key principles of *equity*, *access*, *efficiency*, *quality* and *financial sustainability*. While all five dimensions are important when considering system redesign in Egypt, the equity function has gained special relevance post-January 25 revolution. Issues of equity are at the forefront of policy concerns and need to be addressed in the Egyptian health sector as part of its comprehensive reform effort. Analyzing the degree of equity in finance of health care in Egypt is hence a necessity.

This paper seeks to examine/assess the degree of equity, or lack thereof, in Egypt's health-care financing system; it thus analyzes how Egyptian households' payments for health care in each financing source are related to their respective ability to pay (ATP). This relationship may be progressive, proportional or regressive. Although the notion of what

constitutes an equitable health-care financing system is normative, the generally accepted premise in the literature is that an equitable financing system is a progressive one.

While it is frequently suggested that health-care financing in Egypt is "unfair" because it poses an excessive burden on the poor, there is no indicator of the magnitude of such inequity, making it impossible to monitor any progress or deterioration over time or tackle the problem efficiently. This paper will provide a benchmark for monitoring equity of finance in the Egyptian health-care system in future studies and allow one to assess the impact of implemented financing reforms in the future on the level of progressivity of health-care financing by establishing specific progressivity estimates for Egypt.

The paper is organized as follows: Section 2 reviews previous literature on equity in the finance of health care in different countries, Section 3 describes the Egyptian health-care system, Sections 4 and 5 represent the methodology and data used, respectively, Section 6 presents the main empirical results and Section 7 concludes.

2. Literature review
Research on health equity has been part of published literature for more than three decades. Most of the literature on equity in health focuses on utilization, access and financing of health care. The rising popularity of equity as a research topic in health economics reflects increased demand/interest in health equity on the part of policymakers, donors and NGOs.

Supply-side factors are also significant. Household data sets are more plentiful, added to the continuous flow of analytic techniques to quantify and understand health inequities and examine the influence of policies on health equity (O'Donnell *et al.*, 2008).

Much of the literature on equity in health-care finance initially came from public finance literature analyzing how tax systems redistribute income/wealth, applying this concept to health systems and examining the redistributive effect of health payments. The degree to which health contributions redistribute incomes is dominated by the progressivity of these contributions (Murray *et al.*, 2000). Most authors apply well-established methods of examining tax payment progressivity to health-care payments. The most-used tool of analysis in the literature is the Kakwani index (KI), which evaluates the degree of payment departure from proportionality.

The progressivity of a health-care financing system refers to the degree to which payments for health care rise/fall as a proportion of an individual's income as it rises. In a progressive system, health-care payments rise as a proportion of income as it rises. In a regressive system, payments fall as a proportion of income as it rises, while a proportional system is where health-care payments account for the same proportion of income for all, regardless of the income level.

Much of the ground-breaking work in the literature is owed to Adam Wagstaff and Eddy van Doorslaer. Key examples of relevance to this paper are van Doorslaer and Masseria (2004), Wagstaff and van Doorslaer (2000) and Wagstaff *et al.* (1989). Their work has been extended and applied in numerous studies. The majority of empirical work was initially on developed-country (DC) health systems. Wagstaff *et.al.* (1992), Wagstaff, van Doorslaer and Rutten (1993), Rasell *et al.* (1994) and Wagstaff and van Doorslaer (1999) all analyze progressivity using KI with application to various The Organization for Economic Cooperation and Development countries and have numerous common findings. First, while indirect taxes are generally regressive, direct taxes are progressive in all DCs studied. In countries with universal coverage, SHI was progressive, while in countries that excluded higher income groups, it was regressive. In the USA and Switzerland, PHI was regressive.

Another common finding is that OOPP in most DCs is regressive, particularly in systems where low-income groups are not covered by prepaid health care. The general consensus is

that tax-financed systems tend to be proportional or mildly progressive. In nations where financing is largely private, whether through OOPP or PHI, the system is most regressive. SHI-based systems are mixed, depending on whether high-income groups are allowed to opt out of the system.

Empirical work on equity in developing/less developed countries (LDCs) became more common since the beginning of the 2000s. A review of the literature makes a number of findings regarding equity of the various health-care financing sources. First, while it is generally accepted that OOPP is a regressive source of health-care financing in DCs, results are not as consistent in LDCs (Suarez-Berenguela, 2000; Bredenkamp et al., 2012).

Second, the equitability of financing health care through general government revenues depends on whether these revenues are derived from direct or indirect taxes. Most studies in DCs and LDCs indicate that direct taxes are a progressive source, whereas indirect taxes disproportionately burden the poor (Yu et al., 2008; Mtei et al., 2012).

Finally, while equity of SHI contributions varies from case to case, several studies have found that even when formal-sector SHI contributions are progressive, those from the informal sector are regressive (Akazilli et al., 2011; Mills et al., 2012). This is of special relevance in Egypt's case because a large percentage of the Egyptian labor force is working in the informal sector. Elshamy (2015) estimates the size of the informal sector in Egypt as being 37.4 per cent of GDP in 2012. The International Labor Organization likewise estimated that the size of employment in the informal sector in nonagricultural activities was as large as 51.2 per cent in 2011 (ILO, 2012).

For Egypt, the literature on health economics is extremely limited. That on equity in the finance of health care is especially scarce, with a few empirical studies on health-care financing. Literature review indicates that previous studies focused primarily on OOPP, indicating the need to further investigate the equity of health-care financing in the Egyptian context at the level of all identified sources of financing and calculating an estimate for progressivity of the whole system. This paper hence seeks to augment the literature on health-care financing in Egypt by calculating specific progressivity estimates for all five sources of financing the Egyptian health-care system and analyzing the overall equity of this financing system.

Literature review on health economics in Egypt revealed a number of interesting findings with regard to health-care financing that pose special relevance to the topic of this paper.

The benefit-incidence analysis in Rannan-Eliya et al. (2000) suggests a progressive pattern of health-care payments by finding that the incidence of both private and public health expenditures increased with rising income levels. However, El-Gazzar et al. (2010), using KI methodology applied in this paper, find that OOPP is regressive. While it is important to portray the results of these studies as part of the body of literature on health-care financing equity in Egypt, it is not illustrative to compare the results of the two studies because of several factors. First, the studies used different data sources; Rannan-Eliya et al. (2000) used the 1994 to 1995 Egypt NHA database and the National Household Health Utilization and Expenditure Survey 95; and El-Gazzar et al. (2010) used a 2006/07 User-fee Exemption Program, Baseline and Follow-up Survey from the Egyptian Ministry of Health. Second, the studies use different methodologies to assess the equity of health-care payments. Finally, there is almost a decade between the two studies, and while there were no notable changes during that time period in health-care financing at the national level, the time factor should be highlighted.

In a descriptive study comparing Cuba's and Egypt's health-care systems, Gericke (2005) suggests that health-care financing in Egypt is inequitable with both OOPP and public

spending being regressive. The paper suggests that to reform health-care financing equitably, Egypt should follow the Cuban experience to devote sufficient public funds to health care and replace OOPP with general taxation financing.

The high levels of OOPP in financing health care in Egypt also have significant poverty impact, which lies in the poor being pushed further into poverty because of catastrophic health payments (Abou-Ali, 2007).

Finally, there is a lack of confidence among Egyptians in the quality of government-subsidized health services and public sector providers, as well as problems of access to health services, especially among the rural population (El-Gazzar *et al.*, 2010).

3. Egypt's health-care system

Before discussing the Egyptian health-care system, this section highlights some socio-economic and demographic characteristics of present-day Egypt, given implications on health and putting the system in the appropriate contextual framework. With regard to where Egypt stands along its population pyramid, as of 2014, more than a third of the population was aged 0-15 years (35.3 per cent), with 60.4 per cent being 15-64 years (UNFPA, NPC and Baseera, 2016). This "youth bulge" implies that an increasing number of people will enter the reproductive age and have children, putting a greater burden on the health-care system, among other social services, in the future.

In terms of economy, the World Bank classifies Egypt as a lower middle-income country (https://data.worldbank.org/country/egypt-arab-rep) with 27.8 per cent of the population living below the poverty line in 2016 (CAPMAS, 2016). Numerous studies have shown difficulty in reaching the poorest groups of society through targeted assistance (Slater and Farrington, 2009), with rural women being particularly vulnerable despite being among those most in need. In reforming the health-care system, these are critical points to be considered.

Finally, Egypt's epidemiological profile is changing with ongoing socio-economic development. Parasitic/infectious diseases are declining, whereas noncommunicable diseases are increasing, having direct implications for the system, which must adapt to these new disease trends (Egypt NHA, 2011).

These characteristics suggest that Egypt's health-care system will be facing pressure from a growing population. Given the existing problem of poverty in addition to the rise in noncommunicable diseases, which are long-term and expensive to cover without insurance, we find that it has become even more urgent to examine the equity of health-care financing in Egypt, which is mostly paid OOP.

In its present state, the Egyptian health-care system does not provide Egyptians with an adequate safety net to address the challenges accompanying the aforementioned socio-economic and demographic challenges. The system is pluralistic and fragmented, with many governmental, public and private providers and financing agents. This absence of an organized, well-managed health-care financing system has resulted in households directly bearing most health-care costs (NHA, 2011). As the literature review shows, this financing system has significant poverty/equity implications.

With regards to insurance coverage to protect citizens against catastrophic health expenditure, the Health Insurance Organization (HIO) provides compulsory health insurance to workers in the formal sector. It was established to cover the entire population, yet to date, coverage has been extended to three groups: government employees, public- and private-sector employees and widows and pensioners. A separate program, the Students' Health Insurance Program (SHIP), covers school children. Since its establishment, the SHI coverage through HIO has increased to cover more than half the population (Figure 1).

The HIO is primarily financed/funded through a system of premiums and copayments[1] for rendered services, in addition to transfers from the Ministry of Finance (MoF). The SHIP is financed by individual premiums paid by enrolled students, a government contribution per child, and a cigarette-tax per child. Only registered students are permitted to enroll.

Despite having nearly 60 per cent of Egyptians covered by SHI, the system continues to be financed primarily OOP, as shown in Figure 3. As per the theory of health-care financing, health expenditures are defined as all expenditures for prevention, promotion, rehabilitation and care, population activities, nutrition and emergency programs to improve health. Per the latest round of published NHA in Egypt (NHA, 2011), THE has risen in Egypt from Egyptian Pound (EGP) 7.5bn in 1994/95 to EGP 61.4bn in 2008/09, with per capita health expenditure also growing during this period from EGP 127 to EGP 800 (Figure 2). THE/capita continued its upward trend over the years to reach EGP 1273 in 2014.

Compared to other middle-income countries in the Middle East and North Africa region, Egypt invests a smaller proportion of GDP on health care. The WHO Global Health Expenditure Database (GHED) shows that as a percentage of GDP, THE in 2016 was 4.64 per cent in Egypt, compared to 5.47 per cent in Jordan, 6.95 per cent in Tunisia, 8.1 per cent in Iran and 8.02 per cent in Lebanon. The disparity between Egypt and DCs is even larger. The THE-to-GDP ratio in 2016 was 9.76 per cent in the UK, 9.25 per cent in Australia, 10.53 per cent in Canada and 11.14 per cent in Germany.

Despite the presence of SHI coverage, the dominance of OOPP is alarming. This percentage differs between Egypt's NHA and the WB/WHO databases. As per the latest round of Egypt's NHA in 2008/09, around 70 per cent of health spending came directly from OOPP, with 25 per cent coming from the GoE, 2 per cent from private employers and 1 per cent from donors (Egypt NHA, 2011). On the other hand, the OOPP-to-THE ratio as per both the WHO and WB databases has remained relatively stable over the past decade at around 60 per cent from 2006 to 2016 (62 per cent in 2016), and likewise for government spending share (29.3 per cent in 2016). This leads us to question the NHA result for the year 2008/2009,
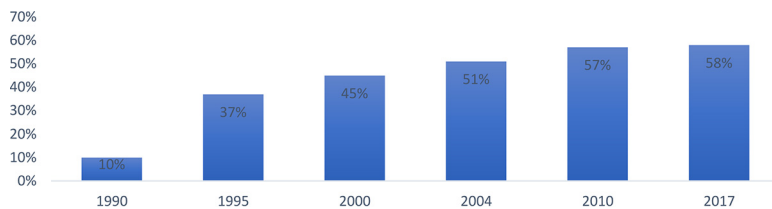
Figure 1.
Share of population covered by SHI

Source: By authors using data from HIO Annual Reports www.hio.gov.eg

Figure 2.
THE per capita (EGP)

Source: By authors using data from Egypt NHA (2011) and WHO and WB data bases

which differs from both WHO and WB databases, yet does not deter from the fact that even in the 60 per cent range, Egypt's OOPP-to-THE ratio is alarmingly high (Figure 3).

Finally, in a regional context, Egypt's percentage of OOPP within THE (62 per cent in 2016) is among the highest of all middle-income countries in the region compared to 28 per cent in Jordan, 31 per cent in Algeria, 26 per cent in Djibouti, 32 per cent in Lebanon and 49 per cent in Morocco. The 2016 ratio in DCs is even lower, being 9.8 per cent in France, 12.4 per cent in Germany, 14.6 per cent in Canada and 18.9 per cent in Australia (WHO GHED).

3.1 Present health system reform policy directions

The fragmented Egyptian health system described has made the attainment of equity in health outcomes a pressing, albeit challenging, need. An equity-driven health-care finance system is especially central to address the excessive burden of health-care finance and the illness–poverty cycle. The political context is also important to consider. Following the January 25 revolution, calls for equity in all aspects of social services, including health care, were at the forefront of demands of the Egyptian people. The rise in costs of living has made continued financing health care OOP challenging and unsustainable.

Egypt's new January 2014 Constitution places health as a priority, stressing the right to access quality health-care services, committing to increase public spending on health to 3 per cent of GDP toward achieving universal coverage. People's demands for justice and affordability in health care motivated the government to develop a coverage system based on the SHI model and provide sufficient funding for health while reducing OOPP. These efforts culminated in a new SHI law 2/2018, endorsed in May 2018, laying legislative groundwork for gradually expanding health coverage to the entire population.

4. Methodology

There are two stages for quantitative progressivity analysis. First, to establish the progressivity of each source of finance. Second, to determine the overall progressivity of the system by weighting the progressivity of individual sources. As aforementioned, health care in Egypt is financed by five different sources:
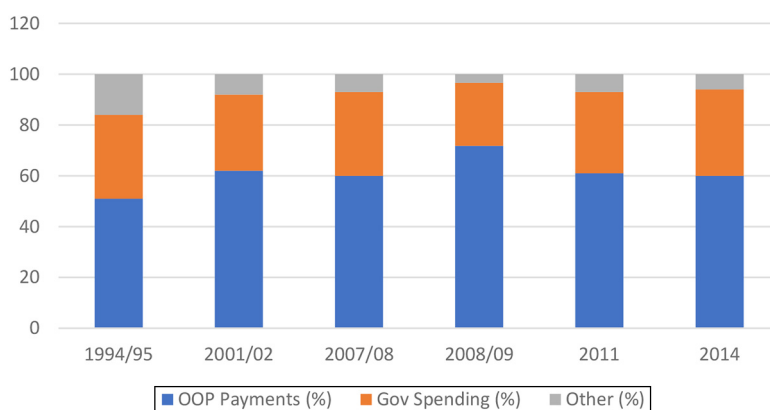
Source: By authors using data from Egypt NHA (2011) and WHO and WB data bases

Figure 3.
Shares of payment
sources in THE

(1) OOPP,

(2) general government revenues,

(3) an earmarked health tax on cigarettes,

(4) SHI, and

(5) PHI.

As in the literature, to assess the progressivity of health-care payments, households are divided into deciles and ranked based on their ATP. First, Lorenz dominance analysis is used, computing the concentration curve for each of the sources of health-care finance and comparing it to the Lorenz curve for ATP. If payments toward health care by an income group correspond to its share of ATP, then the payment concentration curve lies exactly on top of the Lorenz curve. Under a progressive system, the share of health payments made by the poor will be less than their share of ATP. The Lorenz curve will lie in this case above and is said to dominate the payment concentration curve. The opposite will be the case for a regressive system, whereby the Lorenz curve will be dominated (lie below) by the concentration curve (Kolm, 1969; Atkinson, 1970).

To quantify the degree of progressivity, the most widely used quantitative technique in health-finance literature is used, the KI (Kakwani, 1977), which was initially applied in tax finance research. Calculating KI provides a measure for the magnitude of the progressivity of each individual source of finance.

If G_{pre} is the Gini coefficient of pre-payment income and C_{pay} is the concentration index for the health-care payment variable, KI (πk) is defined as follows:

$$\pi k = C_{pay} - G_{pre},$$

which is twice the area between the Lorenz curve of pre-payment income and the payment concentration curve, plotting the cumulative proportion of the population (ranked according to pre-payment income) against the cumulative proportion of health-care payments. The Gini coefficient is twice the area between the Lorenz curve and the line of equality, while the concentration index is analogously defined but with respect to the concentration curve.

It has the useful properties of identifying progressivity and measuring its degree, and its results can be then compared to studies in other countries. KI is positive in a progressive system and negative in a regressive system, ranging from −2 to 1.

Another advantage of KI methodology is that the overall progressivity of financing is a function of the progressivity of individual financing sources; it is measured by a weighted average of the Kakwani indices for the sources of finance. The weights (referred to as macro-weights) are equal to the proportion of total health-care payments each source accounts for at the national level.

5. Data

Data used in the analysis comes from two sources. The first is the 2010/2011 Egypt Household Income, Expenditure and Consumption Survey (HIECS)[2]. The sample consists of 3,860 households, with 46 per cent of the sample being urban households and 54 per cent rural ones. Data from 2010/2011 is used because the last round of publicly available NHA conducted in Egypt at the time of writing this paper is the NHA (2011). This HIECS data set is therefore the most updated data that corresponds to the timeframe of macro-data published in the used NHA (2011).

The variables of interest are extracted from the expenditure module of the HIECS, where the expenditure of households for different items is reported. For the ATP variable, total

household expenditure is used as a proxy of the household's ATP. This is a commonly used proxy for household's revenue in LDCs, where income data is frequently misreported/ missing. Because the size and age structure of households differ, household estimates of aggregate expenditure are adjusted to reflect household size and composition through the application of an equivalence scale. The methodology of Yu *et al.* (2011) is followed and defines the number of adult equivalents (AE) in the household as follows:

AE = $(A + \alpha K)^\beta$, where A is the number of adults in the household, K is the number of children, α is the cost of children and β is the degree of economies of scale in consumption. Deaton and Zaidi (2002)'s proposal is followed in the value of α and β in LDCs (0.4 for α and unity for β).

Three out of five household health-care payment sources in Egypt are recorded in HIECS (2011): OOP medical payments,[3] PHI premiums and SHI contributions. Table I shows summary statistics for OOPP, the main health-care financing source in Egypt. On average, OOPP in the total expenditure of households is almost the same in urban and rural areas (6.2 per cent and 6.3 per cent, respectively). Interestingly, this is very close to the percentage of GDP spent on health at the national level, which was 5.9 per cent as per NHA (2011). However, OOPP constitutes an overwhelming share of THE. On average OOPP represents 87.3 per cent of THE for urban households and a higher 92.1 per cent for rural households. This confirms that Egyptian households finance almost all of their health care spending OOP.

Pharmaceutical products represent more than 50 per cent of THE in both urban and rural areas. This is consistent with the finding of the NHA that the bulk of spending on pharmaceuticals in Egypt is directly borne by households, given that even for the insured, most insurance plans do not cover pharmaceuticals.

The substantial weight of OOPP in THE in our sample is especially interesting given that 73.5 per cent and 66.9 per cent of urban and rural households in the sample, respectively, have some form of health insurance coverage. This mirrors the finding of the NHA that an increase in insurance coverage in Egypt has not led to a decrease in OOPP.

The fourth health-care payment source, earmarked health tax on cigarettes, is approximated by applying a tax rate that is estimated as 1.5 per cent of household expenditure on cigarettes recorded in the survey. The cigarette tax is approximated as follows: the government levies 10 piasters earmarked health tax on the sale of every cigarette pack, applicable regardless of the brand. With reference to Hanafy *et al.* (2010), there are three cigarette categories in the Egyptian market: low, medium and premium priced. As in 2010/2011, the average price per pack of the low-priced category is EGP6, of the medium-price category is EGP11 and of the premium-price category is EGP15.5. Low-priced, mid-priced and premium-priced market shares are 83.6 per cent, 11.9 per cent and 4.5 per cent, respectively. Therefore, the earmarked tax rate on low-priced brands is approximated to be (0.10/6)*100 = 1.67 per cent, on medium-priced brands is (0.10/11)*100 = 0.91 per cent and on premium brands is (0.10/15.5)*100 = 0.65 per cent. Hence, the weighted

Summary statistic	Urban	Rural	Total
Average OOPP as % of total household expenditure	6.2	6.3	6.3
Average OOPP as % of THE	87.3	92.1	90.3
Average expenditure on pharmaceuticals as % of THE	57.1	56.3	56.7
Health insurance coverage status			
Have insurance	73.5	66.9	69.6
No insurance	26.5	33.1	30.4

Source: Calculated by the authors based on HIECS (2011)

Table I.
Summary statistics

average earmarked health tax on cigarettes can be computed as = [1.67*(0.836) + 0.91* (0.119) + 0.65*(0.045)] = 1.5 per cent

As for the fifth health-care financing source, general government revenues, a set of assumptions are made to allocate, to the household level, the nonearmarked taxes used by the government to finance health services from general government revenues. These revenues come from two main sources, direct and indirect taxes, which are therefore considered as health-care payment variables.

Direct taxes in Egypt consist of a personal income tax due on the total annual income of individuals above 5000 EGP, from:

- employment;
- commercial/industrial activities;
- professional and noncommercial activities; and
- real estate (www.mof.gov.eg).

The HIECS reports the net income of individuals from all aforementioned sources during 2010/2011; however, gross income that is needed to calculate personal income tax payments is not available. To extract personal income tax information needed, a tax exercise was conducted to work back from the net to gross. It should be noted that the assumptions made to this end are very strong ones; however, this was necessary because of the constraints faced with the availability of income data in Egypt. It was also not possible to dismiss the tax-incidence analysis from the progressivity assessment given the importance of general government revenues as a source of health-care financing in Egypt.

Indirect taxes, as in 2011, came in the form of:

- general sales tax;
- corporate income tax;
- capital gains tax;
- Petrol authority and Suez Canal tax and property tax.

Revenues from the general sales tax constituted 37.7 per cent of total government tax revenues for 2010-2011; corporate income tax was 12.8 per cent; capital gains tax was only 0.04 per cent; the petrol and Suez Canal tax generated 25.8 per cent; property tax accounted for 7.3 per cent and other taxes made up 5.2 per cent (Krafchik, 2014). Because revenues coming from other types of indirect taxes cannot be allocated down to the household level, the tax-incidence analysis is conducted for the general sales tax. In other words, it is assumed that the indirect government tax revenues used to finance health care corresponds to general sales tax only. This strong assumption was needed to provide a proxy for the indirect taxes used for financing health care.

HIECS provides disaggregated data on household expenditure on a comprehensive set of consumption categories, which are used to calculate the incidence of the general sales tax. The sales tax levied in Egypt is dependent on the type of commodity. The following relevant tax laws/ decrees are referred to derive the sales taxes levied on different commodities: Law no. 2 of 1997; Law no. 89 of 2004; Law no. 9 of 2005 and Presidential Decree no. 65 of 1995. The value of household expenditure on each commodity is multiplied by the relevant sales tax rate as per the aforementioned laws and aggregated to get the total sales tax payment made by each household.

The second data source used is the NHA (2011), which is used to get the aggregate health expenditures data. The macro-weights of the five health-care financing sources in Egypt, as derived from the NHA, are as follows:

(1) OOPPs: 69.7 per cent.
   The weight of OOPP in total health-care financing is taken as reported in the NHA. This figure is higher than the weight given to OOPP in THE reported in other sources. Both the WHO and WB databases report the weight of OOPP to be in the range of 60-62 per cent of THE. However, because this is the latest round of NHA in Egypt (NHA 2011), publicly available and the closest to our 2011 HIECS data set, we use the documented figures to derive the needed macro-weights.

(2) General government revenues: 26.59 per cent.
   The share of THE attributed to funds from the general government budget is calculated from NHA. However, the breakdown of this percentage between the different sources of government tax revenue is not identifiable from the NHA.

   With respect to the financing agents through which general government revenues are spent on health care, the main player is the Ministry of Health and Population, accounting for 19% THE. The Ministry of Higher Education accounts for 4.8 per cent of THE at the financing-agent level. The remaining 2.79 per cent of THE financed from general government revenues comes through spending by HIO, whereby Egypt's central government provides 46 per cent of HIO funds. This is mainly from allocations to the HIO from the MoF and central government's employers' funds.

   While this is the weight of spending from general government revenues in THE at the macro-level, to apply it to KI, this weight should be divided among the different types of taxes that fund the general government's spending on health. Unfortunately, this information is not available; therefore, assumptions are made to divide this figure between the three main sources of tax revenues being used in the analysis: income, sales and cigarette taxes. Therefore, the following is assumed:

(3) Earmarked cigarette tax: 0.29 per cent.

   Given that this is the only type of taxation whose entire revenue goes to spending on health care, a reported figure for its weight is available. In reference to a multi-country WHO study on earmarked taxation for health, the earmarked health tax on cigarettes in Egypt was 1.086 per cent of general government expenditure on health in 2013, the closest year to our survey data with a publicly reported weight. This was spent on rehabilitative and preventive health services for primary and secondary school students (Cashin *et al.*, 2017).

   Because of the unavailability of information on tax revenue sources used to finance government spending on health, we assume they take the same weights as that of direct and indirect taxes in the overall government budget. The personal income tax and general sales tax are taken as a proxy for direct and indirect taxes, respectively, which is a very strong assumption made because of data constraints. For the fiscal year 2010/2011, direct taxes constituted approximately 23 per cent of total tax revenue, whereas indirect taxes accounted for around 77 per cent (MoF). The weights of the personal income tax and general sales tax in total health-care finance are assumed to be:
   - personal income tax: 6.05 per cent; and
   - general sales tax: 20.25 per cent;
   - Social health insurance: 3.21 per cent.
   The weight of THE that can be attributed to SHI contributions is calculated from the NHA, which shows how much of THE comes from the HIO and other insurance providers in Egypt.

(4) Private health insurance: 0.5 per cent.

The private health insurance sector in Egypt is very limited in coverage. This weight is taken as reported in the NHA.

6. Estimated results

6.1 Lorenz dominance analysis

The sample is first divided and then ranked into deciles, based on the adjusted total household expenditure (ATP proxy); the Lorenz curve for ATP is computed using Stata, as are the concentration curves for each of the health-care payment variables. The first is then graphically compared to each of the latter curves, and formal tests of dominance are conducted of the payment concentration curve against the Lorenz curve to either accept or reject a null hypothesis of nondominance (proportionality).

The analysis displayed in Figure 4 suggests that OOPPs are regressive and the share of OOPPs made by the poor is more than their share of ATP because the concentration curve for OOPP lies above – dominates – the Lorenz curve. This is confirmed by the formal dominance test.

The regressivity of OOPP in Egypt is expected, given that most studies in the literature find OOPP to be regressive. This regressive distribution is consistent with the findings of El-Gazzar et al. (2010) and NHA (2011) that poorer Egyptian households suffer disproportionately from direct health-care payments.

As per literature consensus, regressivity of OOPP means that it is an inequitable source of health-care finance, especially in LDCs such as Egypt, where large segments of the population, particularly the poor and unemployed, are not covered by health insurance. Those vulnerable groups either use publicly provided, subsidized health services, characterized by long waiting times and substandard quality, or pay for privately provided health care OOP, which can have catastrophic impoverishing effects. In some cases, the poor forgo certain services altogether; OOPP being a "postpaid" payment mechanism follows the
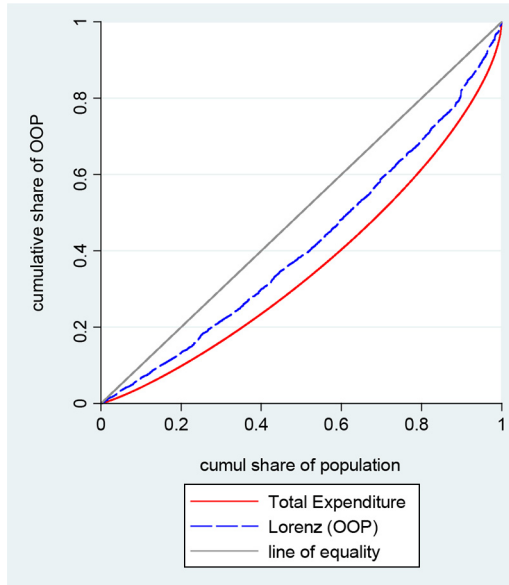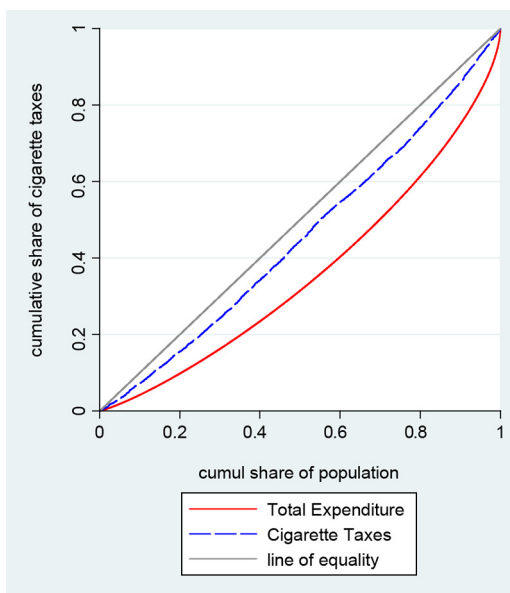

Figure 4.
Concentration curve for OOPPs

"who pays, who gets" rule, whereby the wealthy who can afford health care pay for it and the poor may have to forgo it (Chen *et al.*, 2012).

In Egypt, paying for health care OOP is not too challenging for higher income groups, who willingly pay for high-quality private care, rather than use virtually free-of-charge public facilities. In the absence of insurance coverage, many low-income, unemployed and informally employed Egyptians cannot afford medical treatment in the private sector. This signifies the importance of evaluating the equity of OOPP in light of health-care utilization patterns also, rather than to examine the financing distribution only. Therefore, poorer households are bearing a larger burden of OOPP in Egypt relative to their ATP. Furthermore, their inability to access the same quality of health-care services such as richer households, because of the OOPP barrier, is another dimension of health-care financing inequity.

The concentration curve for the earmarked cigarette health tax in Figure 5 lies above the Lorenz curve, portraying regressive distribution. This is logical because of how the GoE levies the cigarette tax, whereby a fixed 10 piaster health tax is collected on each cigarette pack, regardless of the brand/price.

Lump-sum taxation is regressive in effect. Charging the same lump-sum 10 piaster tax on all cigarette categories available in the market means that a greater burden of the tax falls on those with lower incomes who more likely to consume the least expensive variety.

If the logic suggesting that smokers' choice of cigarette brand is influenced by their income level is followed, it can be assumed that lower income smokers will consume the low-priced category, whereas the better-off will consume mid-priced brands and higher income smokers will opt for premium brands. Given the way the earmarked tax is structured, lower income households with smokers will be effectively paying a higher tax in percentage terms than higher income households whose smokers consume premium brands. This makes the earmarked health tax on cigarettes a regressive source of financing.
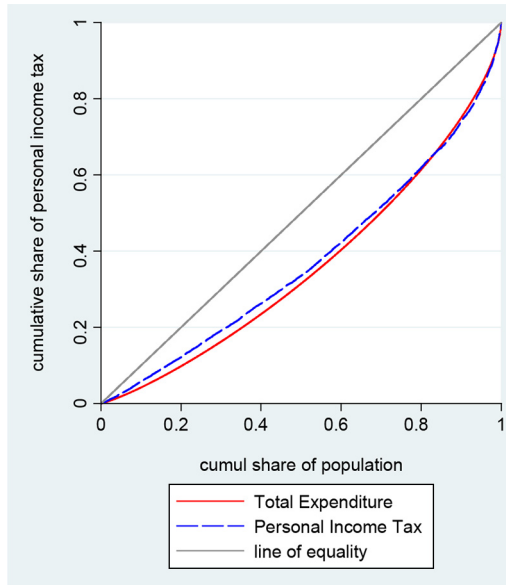

Figure 5.
Concentration curve
for earmarked
cigarette tax

The concentration curve for personal income tax lies above the Lorenz curve, as shown in Figure 6, and then at the top end of the income distribution, it lies almost directly on top of it, suggesting that personal income taxes in Egypt are mostly regressive, and then becomes proportional at higher ATP.

By law, personal income tax in Egypt follows a progressive schedule, whereby the population is divided into four income tax brackets as per Law No. 91 of 2005. The total income earned during the year, above 5000 EGP, is subject to income tax, increasing progressively with the income, where the lowest bracket faces 10 per cent tax and the highest bracket is taxed 25 per cent.

The finding that personal income taxes are regressive and at best proportional, despite the progressive tax law, is not surprising. Several studies find that tax systems of most MENA countries exhibit low progressivity. The highest income tax in Egypt (25 per cent) is less than the average top rate for middle-income LDCs and the way the higher bracket thresholds are designed subjects households with highly varying incomes to the same tax (Jewell *et al.*, 2015). For instance, in the third bracket, those with incomes of EGP 50,000 and those with income**s** of EGP 10m face the same 20 per cent income tax. This grouping results in well-off households being effectively under-taxed, placing more tax burden on low- and particularly middle-income households. Corruption in tax collection also contributes to this regressivity. Tax evasion is widespread in Egypt, especially among the rich/affluent, while low-income segments are less able to hide their real incomes, which is mostly employment income and openly conveyed (Gersovitz *et al.*, 1993). This results in higher income segments bearing less of the tax burden than they should.

As in the literature, direct taxes have good potential to be a progressive means of financing health care through general government revenues, so the government should consider reforming the personal income tax schedule. First, by creating more reasonable bracket cutoffs and grouping those with comparable incomes together,

instead of the huge disparities that currently exist within brackets. Increasing the tax rate on highest incomes above the current 25 per cent, to ensure that higher income segments are adequately taxed, is worth considering. Second, appropriate legislation and incentives should be enforced to avoid tax evasion and corruption in tax collection. Such reforms will likely improve the progressivity.

Figure 7 shows that at the lower end of the spectrum, the concentration curve for the sales tax lies above the Lorenz curve and then crosses it and at the upper end of the spectrum, the Lorenz curve lies above the concentration curve. This suggests that the sales tax is regressive for low- and middle-income deciles and becomes progressive at the highest deciles.

Regressivity of indirect taxes such as sales tax is well-documented in the literature, with its burden mainly falling on citizens and increasing product prices. In the fiscal year 2012/2013, revenues from the general sales tax comprised a substantial 37.7 per cent of GoE's general budget. Given this weight, the degree of equity of the general sales tax heavily influences the equity of general government revenues' financing health care.

Laws governing the general sales tax may explain why it is not regressive throughout the income spectrum, veering toward progressivity. Many necessary goods are exempted from sales tax: dairy products, vegetables and all subsidized products (mainly consumed by the poor). However, most products heavily consumed by rich and poor alike are subject to the standard sales tax rate of 10 per cent, with some categories facing a 5 per cent or 15 per cent rate. Examples are bus/train services (5 per cent), soap/detergents (5 per cent), regular tea/sugar (10 per cent), regular cooking oil (10 per cent), express mail (10 per cent) and mobile phone services (15 per cent). Given their smaller incomes, sales tax on these commodities constitutes a larger percentage of the income of those in lower income deciles compared to those better-off, explaining regressivity of the sales tax for low- and middle-income deciles, where these products constitute a significant portion of household spending.
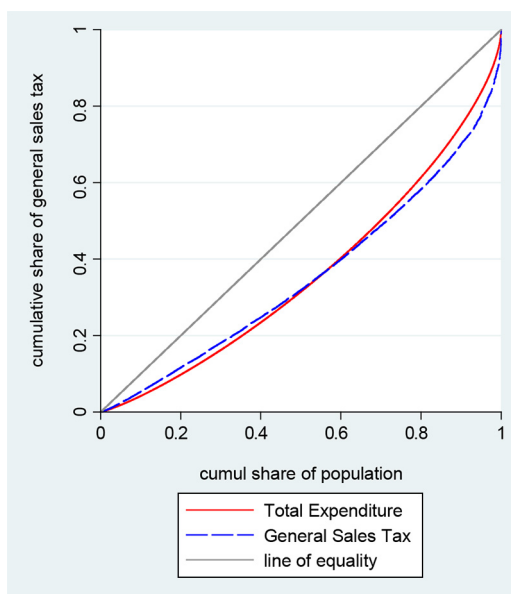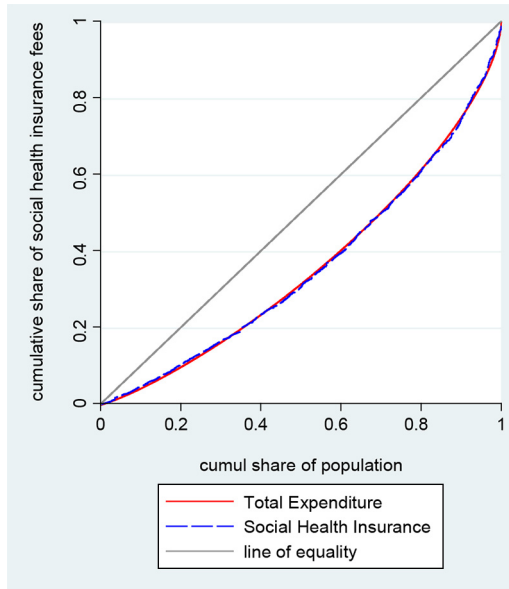

Figure 7.
Concentration curve
for general sales tax

Progressivity of sales tax observed at higher deciles could be explained by the higher tax rate of 25 per cent on many expensive luxury goods, e.g. large-screen televisions, large refrigerators, air conditioners, cars above 1600 cc and perfumes/cosmetics, generally consumed more by upper-income segments. Logic suggests that the wealthier the household, the more they would consume these products and hence the more the 25 per cent sales tax they would pay. The share of this tax in household spending would therefore increases with household income, explaining the progressivity found at the upper end of the spectrum.

The concentration curve for SHI fees shown in Figure 8 lies almost directly on top of the Lorenz curve, indicating that SHI contributions are proportional to ATP. Egypt's SHI law stipulates that coverage is mandatory for all government, public- and formal private-sector employees, in addition to pensioners/widows and students. For each beneficiary category, a certain percentage premium is levied, irrespective of the income level, so the SHI fee accounts for the same proportion of income for all beneficiaries. This may explain why contributions were found to be proportional to ATP and not progressive.

The concentration curve for PHI fees crosses the Lorenz curve at several points and does not uniformly lie either above or below it, making it difficult to assess dominance from the graphical representation in Figure 9. This could be because of the extremely limited PHI coverage in Egypt, whereby our data set has less than 4.5 per cent of households having PHI coverage. The gaps in data for PHI (because of noncoverage) most likely resulted in the step-like concentration curve.

Making inferences regarding equity of PHI fees from the Lorenz dominance analysis is therefore difficult, so calculating the KI will provide a more accurate idea about the progressivity of this health-care payment variable (Table II).

Figure 8.
Concentration curve
for SHI fees
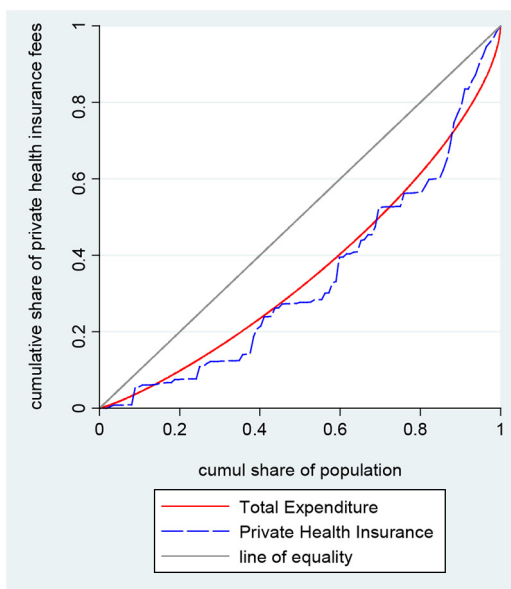
Figure 9.
Concentration curve
for PHI fees

Health-care payment variable	Test result (5% significance level)
OOPP	Concentration curve dominates
Earmarked cigarette tax	Concentration curve dominates
Personal income tax	Concentration curve dominates
General sales tax	Concentration curve dominates
SHI	Does not reject the null hypothesis of proportionality
PHI	Does not reject the null hypothesis of proportionality

Table II.
Tests of dominance
between the health-
care payment
concentration curve
and Lorenz curve

6.2 Kakwani index
KI is calculated for each health payment variable to quantify progressivity and provide numerical validation for the graphical analysis (Table III):

$$
\begin{aligned}
\text{KI of total health} - \text{care finance} &= (-0.11405 * 0.697) + (-0.19424 * 0.0029) \\
&+ (-0.02804 * 0.0605) + (0.01288 * 0.2025) + (0.00141 * 0.0321) \\
&+ (0.00141 * 0.0321) + (0.02115 * 0.005) = -0.079
\end{aligned}
\tag{1}
$$

Health-care payment variable	KI	Result
OOPP	−0.11405	Regressive
Earmarked cigarette tax	−0.19424	Regressive
Personal income tax	−0.02804	Mildly regressive
General sales tax	0.01288	Mildly progressive
SHI	0.00141	Proportional
PHI	0.02115	Mildly progressive

Table III.
Kakwani index
calculation

KI results for OOPP, earmarked cigarette tax, personal income tax and SHI confirm the findings of the Lorenz dominance analysis. However, the results are inconsistent for the financing incidence of the general sales tax. The graphical analysis for the general sales tax suggested regressivity at the low- and middle-income brackets and progressivity at the upper brackets, with the dominance test signaling regressivity, while KI shows it to be mildly progressive. The general consensus in the literature is that indirect taxes are regressive, and given Egypt's sales tax structure, the finding of regressivity from Lorenz dominance analysis seem more logical.

Given that it is not possible to determine the financing incidence of private health insurance from the graphical analysis, KI is referred to, which shows that it is mildly progressive. The progressivity of PHI premiums can be because of the rich voluntarily purchasing private insurance and selecting policies with premiums in line with their ATP to protect themselves against catastrophic health spending. This suggests that progressivity of PHI premiums should not be interpreted to mean that they are necessarily an equitable source of finance, but rather, is the result of the "who pays, who gets" principle, where purchasing higher quality private insurance coverage is not a challenge for higher income groups but cannot be afforded by the less wealthy.

7. Concluding remarks

Progressivity analysis of the five main sources of health-care payments in Egypt is crucial for the assessment of equity of health system financing. Both Lorenz dominance analysis and KI calculations of our data show that OOPP and earmarked cigarette tax are regressive. General government revenues and SHI are found to be proportional to ATP, while PHI is mildly progressive.

KI of total health-care financing is found to be regressive, suggesting that the health-care system is financed in an inequitable manner. This result is not surprising, as per the latest round of NHA conducted in Egypt (NHA, 2011), health care in Egypt is predominantly financed by OOPP, constituting around 70 per cent of THEs.

The regressivity of health-care finance in Egypt, as shown by our data, means that paying for health care in Egypt puts an excessive burden on the poor. Given that the net regressive effect is driven primarily by the regressive OOPP, to achieve equitable financing of health care, reform efforts should be directed toward reducing the weight of OOPP in the financing mix. This policy recommendation is in line with the present reform direction being undertaken by the GoE with the new SHI law, which seeks to achieve universal coverage through SHI for all Egyptians.

The major concern with the new law is how policymakers will tackle the issue of informality in Egypt's labor market. The extent to which the system will identify and incorporate informal workers into the coverage system will be key in determining the system's success in achieving equitable financing.

A common problem of SHI-type systems as proposed by the new law is that patients have no incentive to limit demand and medical providers have no incentive to limit supply (Henke and Schreyogg, 2004). Overconsumption of health services, as well as possible over-prescription, could, therefore, be negatives of the new system. Policymakers need to be aware of this potential moral hazard issue and institute proper regulation to monitor the practice of health-care providers. Having co-payments for services is important to curb overconsumption of health-care services.

Upgrading the quality of service provision in public health-care facilities should be at the top of policymakers' agendas to ensure that increased SHI coverage under the new law translates into lower OOPP. As results show, SHI coverage under the old system has not prevented Egyptians from paying for private health care OOP, mainly because of problems of quality/availability at public facilities. Therefore, if public facilities serving the insured under the new system do not match the quality of private sector providers, Egyptians will continue to pay for private health care OOP. Another policy option to consider is including private providers in the network of facilities serving the insured under the new SHI system.

While reducing the weight of OOPPs in the financing mix is crucial, given their regressivity, and is the stated goal of the new law, we recommend that policymakers consider an additional reform of the structure of OOPP to make them more progressive. Policymakers should consider the Colombian experience in reforming copayments, whereby user fees are designed to depend on individuals' salary income and exempt the poorest category from co-payments altogether.

Finally, incorporating countercyclical fiscal policies for health expenditures through a long-run policy of reserve accumulation in SHI funds will enable Egypt to avoid drops in financing during economic downturns.

It is recommended that further research investigate the potential health-care financing equity implications of such an SHI model. Such research should undertake simulation exercises to investigate how different financing structures, including that proposed by the new law, impact KI and whether they result in more/less progressive health-care financing.

Notes

1. Premiums: legally mandated contributions, paid to the HIO to maintain coverage. They are unrelated to risk, and because they are deducted from monthly salary in Egypt, they are effectively a payroll tax. Co-payments (user-fees): amounts paid OOP by the patient, above insurance premiums, at point-of-service – form of cost-sharing (Sankey, 1997).

2. The authors acknowledge receiving only 25% of raw data of HIECS from CAPMAS.

3. With respect to OOPP, the authors highlight the understanding that figures reported in HIECS, as with any survey data, are possibly influenced by small-sample/recall biases. This is because many health-care payments are made on an infrequent basis. The authors went through the data for OOPP in the sample, to review logic in reported figures in line with income and socio-economic features of corresponding households and cleaned data from any outliers.

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Corresponding author
Yara Ahmed can be contacted at: yara_mahmoud@yahoo.com