View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by RERO DOC Digital Library

Published by Oxford University Press in association with The London School of Hygiene and Tropical Medicine
Health Policy and Planning 2012;**27**:613–623
© The Author 2012; all rights reserved. Advance Access publication 25 January 2012
doi:10.1093/heapol/czs001

Inequality in household catastrophic health care expenditure in a low-income society of Iran

Zahra Kavosi,[1,2] Arash Rashidian,[1,3]* Abolghasem Pourreza,[1] Reza Majdzadeh,[3,4] Farshad Pourmalek,[5] Ahmad Reza Hosseinpoor,[6] Kazem Mohammad[4] and Mohammad Arab[1]

[1]Department of Health Management and Economics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran, [2]School of Management and Medical Informatics, Shiraz University of Medical Sciences, Shiraz, Iran, [3]Knowledge Utilization Research Center, Tehran University of Medical Sciences, Tehran, Iran, [4]Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran, [5]Institute for Health Metrics and Evaluation, University of Washington, Seattle, USA, [6]Department of Health Statistics and Informatics, World Health Organization, Geneva, Switzerland

*Corresponding author. National Institute of Health Research, Tehran University of Medical Sciences, Italia Ave, Tehran, Iran. Tel: +98-21-88991112. Fax: +98-21-88991113. E-mail: arashidian@tums.ac.ir

Accepted 20 October 2011

Background We assessed change in household catastrophic health care expenditures (CHE) and inequality in facing such expenditures in south-west Tehran.

Methods A cluster-sampled survey was conducted in 2003 using the World Health Survey questionnaire. We repeated the survey on the same sample in 2008 (635 and 603 households, respectively). We estimated the proportion of households facing CHE using the 'household's capacity to pay'. We identified the determinants of the household CHE using regression analysis and used the concentration index to measure socio-economic inequality and decompose it into its determinants factors.

Results Findings showed that the proportion of household facing CHE had no significant change in this period (12.6% in 2003 vs 11.8% in 2008). The key determinants of CHE for both years were health care utilization and health care insurance status. Socio-economic status was the main contributor to inequality in CHE, while unequal utilization of dentistry and outpatient services had reduced the inequality in CHE between socio-economic groups.

Conclusions We observed no significant change in the CHE proportion despite policy interventions aimed at reducing such expenditures. Any solution to the problem of CHE should include interventions aimed at the determinants of CHE. It is essential to increase the depth of social insurance coverage by expanding the basic benefit package and reducing co-payments.

Keywords Catastrophic health care expenditure, inequity, health care expenditures, decomposition, Iran

KEY MESSAGES

- We found no significant change in the proportion of households in District 17 of Tehran facing catastrophic health care expenditure (CHE), despite major policy initiatives during the study period.
- Inequality in facing CHE also had no significant change in this period.
- Any solution to the problem of CHE should include interventions aimed at the social determinants of CHE.

Introduction

Those receiving health care services face at least two important economic consequences: the direct costs of the service (demonstrating itself as out-of-pocket expenditure), and the loss of income and productivity (Murray *et al*. 2003a). Direct health care costs have serious repercussions for health: they discourage people from using services and encourage them to postpone health checks (WHO 2010). Such costs may increase to a level that forces individuals and families to cut back on other goods and service consumption (e.g. food and clothing) and to sell assets, puts them at risk of being trapped in long-term debt and, in short, disrupts their standard of living now or in the future (Pradhan and Prescott 2002; Van Doorslaer *et al*. 2007). Such costs and expenditures are labelled 'catastrophic'. Technically, catastrophic health care expenditures (CHE) are described as health care expenditures which exceed certain fractions of total household income (Berki 1986; Wyszewianski 1986; Wagstaff and Van Doorslaer 2003; Van Doorslaer *et al*. 2007). As defined in the *World Health Report 2000,* catastrophic expenditure represents the failure of the health system to protect the public from the financial consequences of health care (WHO 2000). The Report contributed to the attention given by policymakers and academics in many countries towards assessing household health care expenditures and describing households with excessively high expenditure (Narayan *et al*. 2000; World Bank 2000; Baeza *et al*. 2001).

As well as measuring the amount of household expenditure, it is also important to measure inequalities in facing such expenditures. The most disastrous consequences of CHE occur for the poor, as they may be forced to ignore their vital needs to attain health services in such a way that limited resources remain for them for bare necessities such as food and shelter (O'Donnell *et al*. 2008). Where some households spend a catastrophically high share of their capacity to pay on health care, extreme horizontal inequality occurs (Xu *et al.* 2003a).

There is no consensus on the threshold above which health care expenditures are considered catastrophic (Xu *et al*. 2007). The World Health Organization has suggested the cut-off value of 40% of household capacity to pay (Xu *et al*. 2003b).

The proportion of households facing catastrophic expenditure varies in different countries, depending on their health care system, social structure and economic profiles (Xu *et al*. 2003c). Xu *et al.* (2007) reviewed reports from 89 countries and reported a range from less than 0.01% in the Czech Republic, Slovakia and the United Kingdom to 10.5% in Brazil and Vietnam (Xu *et al*. 2007). Two studies that used sub-national data reported higher proportions of households facing catastrophic expenditures; 6–15% in Burkina Faso and 12% in Brazil (Su 2006; Barros and Bertoldi 2008).

Financing health care in Iran

In Iran, primary health care is financed and delivered mainly by the public sector. Secondary and tertiary care are delivered both publicly and privately. After a period of gradual decline in per capita expenditure on health care in the 1990s (Iran NHA team, no date), the country has observed a significant rise in health care expenditure in the 21st century. Per capita health care expenditure more than doubled from 2004 to 2008 from US$120 to over US$240, while in the same period household consumption expenditure per capita increased from about US$870 to over US$1100 (Trading Economics 2011). This suggests that an increasing share of household expenditure is diverted towards health care, especially as household out-of-pocket payments contribute over 50% of health care expenditure (WHO 2006).

The health care financing arrangements in the country are multitude and complex. There are four main health insurance schemes: Medical Services Insurance, Social Security Insurance, Armed Force Medical Services (for members and families of armed forces and veterans) and the Imam Khomeini Relief Fund (for the poor) (WHO 2006). The medical services and social security insurance schemes mainly cover employees (and their families) of the government and of private and semi-private registered companies and workshops, respectively. In 1995 the parliament approved a law requiring the government to provide universal coverage for all people. Since then smaller insurance funds under the major schemes have been developed to cover the insurance gaps, e.g. for those suffering from certain chronic diseases, voluntary insurance for the self-employed and a limited coverage for rural inhabitants. Most importantly, in 2005 an expanded rural insurance fund (under the medical services scheme), merged with a family medicine programme, was approved and implemented (Takian *et al*. 2011). It covered all those living in rural areas and small towns of less than 20 000 population. A growing market also exists for complementary private insurance.

Two more specific insurance plans developed in this period include 'on-the-bed inpatient insurance' (also called 'urban inpatient insurance') and Article 92 of the 4th Economic, Social and Cultural Development Plan that called for free-of-charge treatment of those injured in car accidents. 'On-the-bed' inpatient insurance is insurance coverage for urban people who are without other insurance and are admitted to public hospitals. The insurance is offered on-the-bed and became instantly effective. It resulted in unexpected costs for the medical services insurance that was obliged to offer the service. The other initiative covers all the related health care costs of traffic accident victims admitted to public hospitals, and is paid directly to the hospitals. This is important as traffic injuries are a major cause of mortality and morbidity in Iran, resulting in a burden of disease higher than any other disease category (Jafari *et al.* 2009). The scheme is funded using an ear-marked tax on cigarettes and soft drinks as well as third-party car insurance and was welcomed by the hospitals.

The insurance schemes have variable coinsurance payments from 0 to 30% of the expenditure, depending on the type and location of health care. Despite the development of the insurance schemes, a large proportion of health care expenditure is paid out-of-pocket, estimated at 58% in 2001 (WHO 2006), suggesting the coverage is not adequate. This has at least two causes. First, official estimates suggest that still about 10% of the population is not covered by any insurance (unofficial estimates suggest the figure may be closer to 20%) (World Bank 2007). Second, users spend more on health care than the formal coinsurance levels propose, as certain services are not covered by insurance and both ambulatory and inpatient care providers frequently impose extra costs for those services on

patients. As a result, Article 90 of the 4th Economic, Social and Cultural Development Plan of Iran (time span 2004–09) set policy goals of reducing out-of-pocket payments to less than 30% and the proportion of households facing CHE from the estimated level of over 2% to less than 1% (Planning and Management Organization of the Islamic Republic of Iran 2003).

In this study, we estimate the proportion of households facing CHE in 2003 and 2008 in one District of Tehran. We assess whether the proportions are significantly different, and the demographic and socio-economic determinants of CHE in each year. We also analyse socio-economic inequality in CHE. Such analyses help decision makers in formulating policies and allocating health system resources towards vulnerable groups (Hosseinpoor *et al*. 2006).

Methods

Study design

This is a longitudinal study involving two household surveys conducted in 2003 and 2008. We substituted missing households in 2008 with neighbouring households based on a predefined protocol.

Study population

We selected a representative sample from the 17th District of Tehran. This district [population: 260 000; households: 71 000 (Statistical Centre of Iran 2007)] has a relatively low socio-economic status compared with the rest of the city (Shahandeh *et al.* 2003). District 17 is an inner city district in the south of Tehran with relatively low socio-economic status. The district had been selected for the 2003 survey, as the Tehran University of Medical Sciences had established a community-based participatory research centre (the only one in Tehran) in the district to identify health needs and conduct interventions to improve health in that area. The survey was among several studies that were conducted to assess the needs and priority research areas that could contribute to improving population health. The 2008 survey was conducted in the same district to use the opportunity of assessing changes over time. This provided a unique opportunity to conduct such a comparison.

Questionnaire

The World Health Survey (WHS) is a valid, reliable and comparative instrument developed by the World Health Organization for countries in order to monitor health system performance (Üstün *et al.* 2003). The WHS contains two main sections: the household questionnaire and the individual questionnaire.

In this manuscript we report the results of the household questionnaire. It includes the following modules: 'household roster', 'health intervention coverage', 'health insurance', 'health expenditure', 'indicators of permanent income' and 'health occupation' (Üstün *et al.* 2003).

We used two recall periods for expenditure questions in each survey: the last 4 weeks for total household and health care expenditures, and the last 4 weeks and the last 12 months for outpatient and inpatient expenditures, respectively.

Data collection

From each household, a member who was 18 years or older and aware of the household expenditures and health service usage was eligible to respond to the questionnaire. Each household was approached for data at most 10 times in 2003 and 5 times in 2008 to reduce non-response. If the participants were not available after 10 (5 in 2008) contacts, the household was substituted with a neighbouring household.

To ensure data validity we interviewed again (via phone) all 2008 households who reported CHE.

Sampling and sample size

The 2003 survey used cluster sampling and the primary sampling unit was geographically identified building blocks in the district. Sixty-four clusters were identified via systematic sampling from the geographical sampling frame developed by the Statistical Centre of Iran for the district (Heshmat *et al*. 2003; Shahandeh *et al.* 2003; Rashidian *et al.* 2011). These clusters were distributed geographically in the district and each cluster (i.e. building block) included up to 18 households from which some households were randomly selected to answer the expenditure module of the questionnaire.

The 2003 sample covered 1123 households, from which expenditure data were collected for 635 households, out of which 579 households (91.2%) provided data suitable for analysis (Figure 1).

In 2008, we approached the households that were sampled in the previous survey. Exact addresses for 603 households (out of 635) were available to us. Nineteen households were non-existent (unoccupied, changed to non-residential, demolished) or unavailable and eight households were unwilling to respond, and were replaced with neighbouring households. Eleven households provided incomplete data, giving us an effective sample of 592 households (Figure 1).

Ethical issues

The study was approved by the Ethics Committee of the Tehran University of Medical Sciences. The participants signed or marked (if illiterate) the informed consent forms.

Statistical analysis

We conducted two main statistical analyses to measure household CHE, and to assess inequality in facing CHE. Economic status of households was determined based on their total monthly expenditures.

Catastrophic health care expenditure

Following Xu *et al.* (2003c) we considered health care expenditure 'catastrophic' if it was equal to or higher than 40% of the household capacity to pay, and defined a binary variable to capture this. Capacity to pay was defined as effective income (measured by total expenditure) minus basic subsistence needs adjusted for household size. Xu *et al*. (2003c) have reported the methodology in detail.

Determinants of catastrophic health care expenditure

We used logistic regression analysis to assess the role of the determining variables (insurance status, sex of household head,

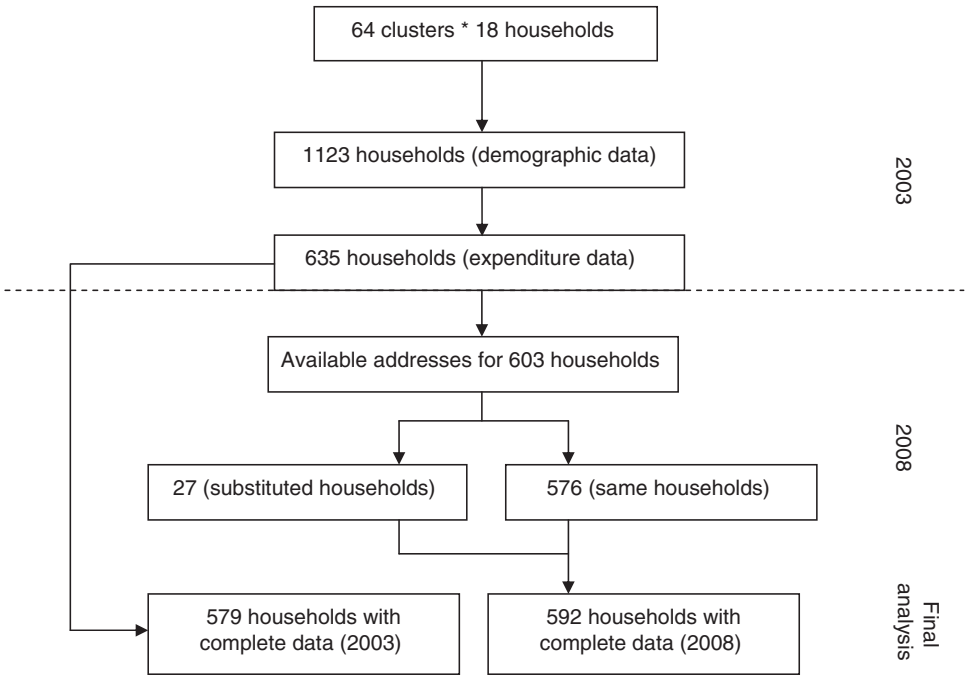

Figure 1 Sampling design

size, having a member over 65 years, having a member below 5 years, having a disabled member, economic status, reporting dentistry service usage, reporting inpatient service usage and reporting outpatient service usage) on the CHE. We repeated the regression analyses after removing the health service usage variables from the models to ensure the effects of demographic variables on the CHE were not masked by usage variables.

Inequality in catastrophic health care expenditure

A concentration index was used to measure socio-economic inequality in CHE in each period. Household total expenditure was used for the socio-economic status.

Determinants of inequality in catastrophic health care expenditure

It is important to understand what is behind observed socio-economic inequalities in CHE, as it is not always straightforward. We use an example to explain the importance of identifying the determinants of inequality. Suppose a poor household never uses dentistry care, e.g. because they cannot afford it, and hence they do not face catastrophic expenditure because of it. On the other hand, if a wealthier household uses the service more, their chances of facing catastrophic expenditures is increased. While the poor households may face CHE due to essential care, wealthy households may face CHE because of 'luxury' care. In such cases, the 'inequality' gap in CHE between different socio-economic groups is reduced, but for the wrong reasons. Decomposition analysis is a tool to understand the observed inequalities.

We followed the methods proposed by Wagstaff *et al.* (2003) to 'decompose' the concentration index of CHE into its determinant variables. To do this we calculated the concentration index of the CHE and each of the determinant variables, as well as the absolute and percentage contribution of each variable to the concentration index of CHE. The details of the method are explained in Wagstaff *et al*. (2003) and other studies (Wagstaff *et al*. 2003; Hosseinpoor *et al.* 2006; Van De Poel *et al*. 2007). A technical note is available from the authors upon request. As decomposition is a linear model, we used the natural logarithm of the odds of the health care expenditure in the model instead of the observed CHE (Hosseinpoor *et al.* 2006).

Results

After omitting the households with incomplete information (e.g. households who reported zero food expenditure), 579 households in 2003 and 592 households in 2008 remained for further analysis.

78.9% and 73.6% of households in 2003 and 2008, respectively, were covered by health insurance. Univariate analysis showed that in both years, poorer quintiles had more uninsured households (P value < 0.05 in 2008). Table 1 reports the demographic profiles of the study sample households. Comparing 2003 with 2008, household size reduced from 4.2 to 3.9, in line with demographic changes in the country. Mean household monthly health care expenditure increased substantially in this period.

Zero health care expenditure was reported by 29% and 21% of the households in 2003 and 2008, respectively. Our data reveal that in 2003, 73 households [12.6%; 95% confidence interval (CI): 10–15%] faced CHE, compared with 70 households (11.8%; 95% CI: 10–14%) in 2008.

Table 1 Demographic characteristics of the study population, District 17, Tehran

Variables	2003	2008
Mean of household monthly total expenditure (in Iranian Rials)	3 063 955	3 835 511
	(~US$340)	(~US$426)
Mean of household monthly health expenditure (in Iranian Rials)	250 801	672 848
	(~US$28)	(~US$75)
% households with disabled member	–	17.4%
% households with female head	–	12.4%
% households having member over 65 years	13%	20%
% households having member under 5 years	22%	18%
% households having health insurance	78%	74%
Household size	4.2	3.9

Determinants of catastrophic health care expenditure

Univariate analyses showed that having a member over 65 years and having disabled members in 2008 resulted in a statistically significant difference between households facing CHE and other households (Table 2). In 2003 and 2008, CHE was more likely to occur in the lower socio-economic quintiles, although it reached statistical significance in 2008 only (Table 2). Also households facing CHE were more likely to report using inpatient, dentistry and outpatient service usage.

Table 3 provides the estimated odds ratios obtained from logistic regression analyses. As data on some variables including household head, disabled members and outpatient visits were not collected in 2003, we generated two models for 2008 data: one comparable to 2003, and the other including all variables.

Lack of insurance increased the probability of incurring CHE [Odds Ratio (OR) in 2003: 1.9 (95% CI: 1.1–3.5); OR in 2008: 2.4 (95% CI: 1.3–4.6)] (Table 3). Use of dentistry services increased the odds of facing CHE almost 4 times (95% CI: 2.3–7.2) in 2003 and 4.6 times (95% CI: 2.4–8.9) in 2008. Hospitalization increased the probability of incurring CHE by 3.5 times (95% CI: 1.6–7.7) and 11.4 times (95% CI: 3.8–34.6) in 2003 and 2008, respectively. Furthermore, for each additional outpatient visit the odds of facing CHE increased 1.5 times (95% CI: 1.3–1.8) in 2008 (Table 3).

Households in the poorest quintile were more likely to face CHE; the odds of catastrophic expenditure for the first quintile in 2003 sample were 3 times, and in 2008 sample 5 times, that of households in the 5th quintile (Table 3). Repeating regression models after removing health services usage variables resulted in few changes in the findings. As a result the insurance variable was no longer significant in the 2008 models. Also in the complete model of 2008, having a disabled member in the household increased the odds of facing CHE (1.31; 95% CI: 0.64–2.63).

Inequality in catastrophic health care expenditure

The concentration indices of facing CHE were −0.17 (95% CI: −0.30 to −0.04) and −0.19 (95% CI: −0.32 to −0.06) for 2003 and 2008, respectively. A negative value of the concentration index shows that poor households had higher probabilities of facing CHE in both study samples. Testing concentration curve dominance indicated no statistically significant dominance of one curve against the other, which means no significant change in inequality in CHE between 2003 and 2008 (Figure 2).

Decomposition of socio-economic inequality in catastrophic health care expenditure

Table 4 shows the concentration index and relative contributions of each determinant of inequality in CHE. The fifth column demonstrates the concentration index of each variable which implies the extent to which the respective variable is distributed across wealth. Concentration indices of the determinant variables such as having household members over 65 years or less than 5 years and having disabled members are negative, which means these variables are higher amongst the poor. On the other hand, health services use variables (except inpatient service use) have a positive concentration index, implying higher use of these services among the better-off (Table 4).

The last column of Table 4 shows the grouped contribution from the categorical variables. A positive contribution to socio-economic inequality means that the relevant variable raises inequality, and vice versa. The findings indicate that the majority (83%) of observed inequalities can be attributed to households' economic status. Household size, insurance status, having members aged over 65 years, disabled members, and members under 5 years old increased inequality, favouring the rich. Health service usage was another contributor to inequality. Dentistry service usage (−7%) and outpatient visits (−2%) contribute negatively to socio-economic inequality, suggesting that unequal usage of such services resulted in the reduction of inequality in CHE in different socio-economic groups.

Discussion

To the best of our knowledge, this is the first study using the decomposition method to analyse inequality in CHE. It is also among the few examples of studies that have assessed CHE over time (Sun *et al.* 2008; Mataria *et al.* 2010).

Our study has five important findings. We observed that no significant change occurred in the proportion of households facing CHE despite major policy initiatives in this period; that inequality in facing CHE had no significant change in this

Table 2 Number and proportion of households facing catastrophic health care expenditure (CHE) by study variables in the 2003 and 2008 surveys

Variables	2003 survey N (%)	2008 survey N (%)	Variable definition
Total no. households with CHE	73 (12.6%)	70 (11.8%)	
Economic status		*	Economic status based on household total expenditure
Quintile 1 (poorest)	25 (17%)	23 (18%)	
Quintile 2	16 (14%)	9 (14%)	
Quintile 3	15 (14%)	21 (13%)	
Quintile 4	9 (9%)	8 (9%)	
Quintile 5 (richest)	8 (7%)	9 (6%)	
Insurance status			Whether household has health insurance or not
Have	52 (11%)	47 (11%)	
Not have	21 (17%)	23 (15%)	
Household head			Sex of household head: father, mother or others
Father	–	62 (11%)	
Mother or other	–	8 (18%)	
Member ≥65		*	Whether the household has a member aged equal to or more than 65 years
Have	12 (16%)	21 (17%)	
Not have	61 (12%)	49 (10%)	
Member ≤5			Whether the household has a member aged equal to or less than 5 years
Have	14 (11%)	15 (14%)	
Not have	59 (12%)	55 (11%)	
Household size			Number of household members split in 3 categories
1–2 members	18 (19%)	3 (12%)	
3–6 members	48 (11%)	48 (10.5%)	
>7 members	7 (12%)	19 (17%)	
Disabled member		*	Whether the household has a disabled member
Have	–	21 (20%)	
Not have	–	49 (10%)	
Dentistry usage	**	**	Whether the household has expenditure on dentistry service in the previous month
Have	27 (27%)	29 (14%)	
Not have	46 (10%)	41 (8%)	
Inpatient service usage	*	**	Whether the household has expenditure on inpatient service in the previous year
Have	12 (30%)	13 (56.5%)	
Not have	61 (12%)	57 (10%)	
Outpatient service usage		**	Whether the household has expenditure on outpatient service in the previous month
Have		67 (14.5%)	
Not have		3 (2%)	

*$P < 0.05$; **$P < 0.001$.

period; that the main contributors to CHE are similar to previous studies; that there is a discrepancy between our findings and the CHE calculated at the national level using routine data; and that necessary dental care is an important contributor to CHE in Iran. We explain these findings in detail below.

First, we observed no significant change in the proportion of households facing CHE over the 5-year period. This was unexpected because as well as clear and unambiguous policy objectives in the 4th Economic, Social and Cultural Development Plan of Iran for reducing the level of CHE (World Bank 2007), major initiatives were adopted in this period to reduce CHE. We noted a few such initiatives in the introduction, including the 'on-the-bed inpatient insurance' and free-of-charge treatment of those injured in car accidents. It is therefore difficult to explain why we observed no significant reduction in CHE. One potential explanation is that in this period the health care costs increased significantly (our findings indicate that the median and mean costs doubled and tripled, respectively). Also it is possible that the current initiatives may not have tackled the main determinants of CHE, as we will explain further below; or that they may

Table 3 Association between determinants and catastrophic health care expenditure

Variables	Adjusted OR 2003	95% confidence interval	Adjusted OR 2008 (model comparable to 2003)	95% confidence interval	Adjusted OR 2008 (complete model)	95% confidence interval
Economic status					*	
Quintile 1 (poorest)	3.10	(1.26–7.79)	3.78	(1.46–9.78)	5.03	(1.82–13.87)
Quintile 2	2.55	(0.99–6.51)	3.76	(1.25–11.27)	4.19	(1.13–13.76)
Quintile 3	2.19	(0.85–5.62)	2.76	(1.10–6.88)	2.78	(1.06–7.25)
Quintile 4	1.44	(0.51–4.05)	1.89	(0.64–5.57)	1.96	(0.639–6.99)
Lack of insurance	1.93*	(1.05–3.51)	1.84*	(1.00–3.38)	2.42*	(1.26–4.65)
Female household head	n.a.	n.a.	n.a.	n.a	1.79	(0.69–4.69)
Having member ≥65 in household	1.66	(0.79–3.48)	1.75	(0.88–3.45)	1.43	(0.69–2.95)
Having member ≤5 in household	0.82	(0.41–1.64)	1.63	(0.79–3.36)	1.13	(0.53–2.49)
Household size						
3–6 members	0.62	(0.31–1.22)	0.54	(0.14–2.03)	0.62	(0.15–2.53)
>7 members	0.93	(0.32–2.62)	0.99	(0.23–4.25)	1.13	(0.24–5.38)
Having disabled member in household	n.a.	n.a.	n.a.	n.a.	1.31	(0.64–2.63)
Dentistry service usage	4.09**	(2.31–7.24)	6.35**	(3.40–11.84)	4.58**	(2.36–8.91)
Inpatient service usage	3.52**	(1.61–7.69)	11.55**	(4.12–32.31)	11.39**	(3.76–34.57)
Outpatient service usage	n.a.	n.a.	n.a.	n.a.	1.51**	(1.29–1.77)

*$P < 0.05$; **$P < 0.001$.
n.a. = not applicable.

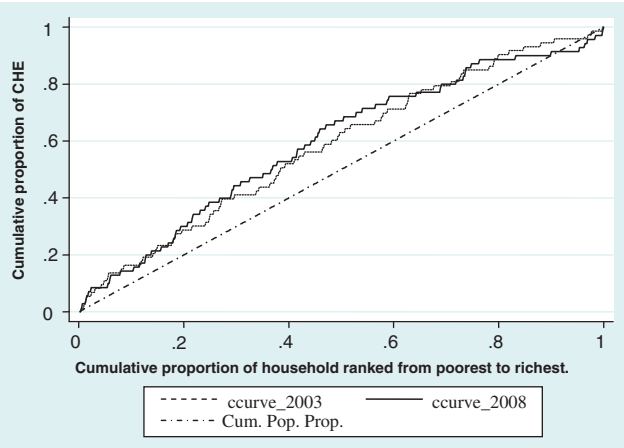

Figure 2 Concentration curves of facing catastrophic health care expenditure (CHE) in 2003 and 2008, District 17, Tehran

have been dwarfed by other initiatives (e.g. hospital fundholding) that inevitably shifted some cost to households (Jafarisirizi *et al.* 2011).

Second, the inequality in facing CHE had no significant change over this period, with households with lower socio-economic status being more likely to face CHE. Socio-economic status was the single most important contributor to inequality in CHE. Factors such as health service utilization and health insurance, which affected the level of CHE, had little or no contribution to the socio-economic inequality in CHE among the socio-economic spectrum of the population, because they themselves were more or less equally distributed among the socio-economic spectrum of the population. Hence policies that aim to reduce inequality in health care expenditure must tackle the social determinants of health and include poverty reduction strategies. Improving the depth of social health care insurance may also reduce the effect of socio-economic status on inequality in health-care usage (Liua *et al*. 2002).

Except for dentistry service use and outpatient services use (which were more likely to occur in wealthier households), other determinant variables increased the socio-economic inequality, disfavouring the poor. This finding demonstrates that in order to assess the success or failure of policies aimed at reducing inequality, measurement of CHE should be complemented with inequality analyses.

Our data also suggest that health services usage, especially of dentistry services, reduces inequality in CHE as poor people use fewer health services. In other words, it suggests that as poor people use relatively less dentistry and outpatient care, they are less affected by the catastrophic impacts of spending on such services. And as the use of such services is concentrated in wealthier families, by increasing the chance of CHE in such families the inequality in the number of families facing CHE in different socio-economic groups is reduced. The poor use the services less and hence they are less likely to face catastrophic expenditure because of it. A similar picture has been reported in other studies (van Doorslaer *et al.* 2006a; Steinhardt *et al*. 2009).

Table 4 Decomposition analysis of concentration index of catastrophic health care expenditure in 2008

	Coefficient	Mean	Elasticity	Concentration index (CI)	Contribution to CI	Contribution to CI %
Economic status						83%
Quintile 1	1.402	0.216	−0.115	−0.785	0.090	
Quintile 2	1.282	0.108	−0.053	−0.46	0.024	
Quintile 3	1.026	0.280	−0.109	−0.071	0.008	
Quintile 4	0.689	0.152	−0.039	0.362	−0.014	
Lack of insurance	0.836	0.263	−0.084	−0.095	0.008	6%
Female household head	0.573	0.076	−0.016	−0.389	0.006	5%
Having member ≥65	0.567	0.204	−0.044	−0.099	0.004	3%
Having member ≤5	0.374	0.179	−0.025	−0.068	0.002	1%
Household size						8%
3–6 members	−0.604	0.772	0.177	0.069	0.012	
>7 members	−0.078	0.186	0.005	−0.357	−0.002	
Having disabled member	0.335	0.174	−0.022	−0.357	0.002	2%
Dentistry service use	1.589	0.154	−0.092	0.102	−0.009	−7%
Inpatient service use	2.497	0.039	−0.036	−0.032	0.001	1%
Outpatient service use	1.789	0.782	−0.531	0.005	−0.003	−2%
CI Ln odds $_{CHE}$	0.129					
Mean	−2.64					

Third, the study showed that households with no health insurance or those using services which were not covered by health insurance plans (e.g. dental care) spent higher proportions of their capacity to pay on health care. Other studies worldwide have demonstrated similar results in observational studies (Berki 1986; Waters *et al.* 2004; Xu *et al.* 2007) and in quasi-experimental designs (Knaul *et al.* 2006; Somkotra and Lagrada 2008; Sun *et al*. 2008). On the other hand, a study in China showed that where health insurance increases health care usage, the risk of CHE may also increase (Wagstaff and Lindelow 2008). These findings suggest that resources should be spent on managing provider and patient health care usage patterns as well as provision of health care insurance. Similar to other studies we also found health service usage (Su *et al.* 2006; Adhikari *et al*. 2009; Somkotra and Lagrada 2009) and household socio-economic status (Wyszewianski 1986; Merlis 2006; Su *et al.* 2006; Sun *et al*. 2008) to be key determinants of CHE. Others have found the reverse association between socio-economic status and CHE (Su *et al.* 2006; Van Doorslaer *et al.* 2006b; Van Doorslaer *et al*. 2007). Barros and Bertoldi (2008) suggested that disagreements about the role of socio-economic status may arise from differences between studies in defining socio-economic status.

The way we calculated socio-economic status and CHE (Xu *et al*. 2007) has some limitations in defining such relationships for two important reasons. One reason is that the poor who forgo their needs and do not consume health care are left out of CHE calculations. The other reason is that the poor who spend catastrophically on health care increase their capacity to pay (e.g. through decreasing their other expenditures by going without food) and total expenditure (e.g. through borrowing money or selling assets). Both increased capacity to pay and increased total expenditure push such households towards a higher socio-economic status in our analyses. As a result the impact of socio-economic status on CHE may be more prominent than we (and others) have reported.

Fourth, our findings are distinct from a national study of CHE in 2001. This used routine household expenditure data to calculate CHE and reported that 2.3% of households in Iran (range at provincial level: 0.7–4.7%) faced catastrophic expenditures. It estimated the household CHE for Tehran province at 2.5% (Razavi *et al.* 2005). We believe our findings provide a valid estimate for the district we covered. We reduced bias in data collection using justifiable sampling methods and data collection tools. We also re-checked our data with all the households that reported CHE in 2008.

The differences between our data and the national report may arise from different factors. It is possible that people in District 17 of Tehran differ from the average in the country and the province in their health care needs and expenditure. Differences in the socio-economic status of households in District 17 and the rest of the country may also contribute to such differences. Another important factor may be the validity of the data collection tools and approaches. Routinely collected data for other purposes [in this case for establishing household general expenditure patterns and national inflation levels (Razavi *et al.* 2005)] may not suffice for health care expenditure analysis. A recent sub-national study, conducted among 189 households in one district in Kermanshah city, Iran, reported the proportion of households facing CHE, as measured by the WHS questionnaire, as 22% (Daneshkohan *et al.* 2011). Another study in Georgia observed a sharp increase in CHE from 1999 to 2007

(2.8% and 11.7%, respectively). The authors argued one reason for such a difference might have been the data collection tools: Household Budget Survey in 1999 and Health Utilization and Expenditure Survey in 2007 (Gotsadze *et al.* 2009).

Fifth, we found essential dental care usage to be an important determinant of CHE. Dentistry services are among the more expensive health care services in Iran and are not usually covered in social insurance benefit packages. Most people pay directly out-of-pocket at the time of use. While we were re-checking expenditure with CHE households, we asked what sort of dental care they used. We asked this on suspicion that they may have used 'luxury' services such as orthodency or other expensive care considered non-essential. We found the households that had faced CHE and used dental services reported essential care such as filling, endodontic treatment or tooth extraction for a decayed tooth. This finding questions the hypothesis that it is 'luxury' dentistry services that result in CHE, and reinforces the calls to include essential dental care in social insurance benefit packages.

Our study has other limitations. Our sample was limited to one district in Tehran which may limit the generalizability of its findings to other settings. Also our study may have suffered from a lack of statistical power. We observed relatively wide confidence intervals for certain outcome measures, which suggests future studies would benefit from larger samples. Data about expenditures and service use are usually prone to recall bias. In this study, we tried to reduce this limitation by shortening the recall period. Over- and under-estimation of income and expenditure are other limitations of such studies. Our approach of using total monthly expenditures for household classification is more reliable than the alternatives of using total monthly income (Murray *et al.* 2003b).

Future research should focus on the limitations of CHE analysis and develop methods of estimating the bias introduced through using expenditure data for categorizing household socio-economic status. It should also consider ways of incorporating the unmet needs of the poor in the analysis. A health system may have a very low CHE just because it is not capable of meeting the population health care needs. Future research should also make use of quasi-experimental designs for assessing the impacts of different interventions on CHE level.

Health financing systems that are perceived to be fair have the best chance for long-term sustainability (WHO 2010). Comparing the proportion of households facing CHE and the concentration index of CHE in both years suggests that there has been no change in inequality between 2003 and 2008. This suggests that the pro-poor interventions implemented over the past few years have not reduced CHE in poor households. Although our sample is too small for making grand conclusions, it suggests that the lack of a tangible change in the proportion of households facing CHE may have arisen from competing trends in Iran's health system. The spiralling cost of health care (in part due to general inflation in the country and in part because of increasing health care tariffs) and the increasing consumption of expensive high-tech health care services have clearly overtaken the policy intentions of establishing effective universal coverage and reducing CHE. Any solution to the problem of CHE should include interventions aimed at the social determinants of the CHE (Marmot 2005). It is essential to improve the social health insurance coverage in Iran. Such policies should focus on covering households without insurance protection as well as increasing the depth of the insurance coverage by expanding the basic benefit package and reducing co-payments. As the study conducted was in one district of Tehran, further research should use larger samples (preferably at national level) to confirm the results.

Acknowledgements

This research would not be done without the generous and patient co-operation of the residents of District 17 of Tehran. We thank anonymous reviewers for their useful comments and suggestions.

Funding

For both 2003 and 2008 surveys we received funding from the Deputy of Research of the Tehran University of Medical Sciences (contract number 86-04-27-6598).

Conflict of interest

None declared.

References

Adhikari SR, Maskay NM, Sharma BP. 2009. Paying for hospital-based care of Kala-azar in Nepal: assessing catastrophic, impoverishment and economic consequences. *Health Policy and Planning* **24**: 129–39.

Barros AJ, Bertoldi AD. 2008. Out-of-pocket health expenditure in a population covered by the family health program in Brazil. *International Journal of Epidemiology* **37**: 758–65.

Baeza C, Crocco P, Nunez M, Shaffer M. 2001. Towards Decent Work: Social Protection in Health for all Workers and their Families. *ILO/STEP Framework for the Extension in Social Protection in Health*. Geneva: International Labour Organization.

Berki SE. 1986. A look at catastrophic medical expenses and the poor. *Health Affairs* **5**: 138–45.

Daneshkohan A, Karami M, Najafi F, Karami Matin B. 2011. Household catastrophic health expenditure. *Iranian Journal of Public Health* **40**: 94–9.

Gotsadze G, Zoidze A, Rukhadze N. 2009. Household catastrophic health expenditure: evidence from Georgia and its policy implications. *BMC Health Services Research* **9**: 69.

Heshmat R, Fakhrzade H, Pourebrahim R, Nouri M, Alaedini F. 2003. Study of cardiovascolar disease risk factors in 17th district of Tehran population research center of Tehran University of Medical Sciences: statistical designing and sampling method. *Diabetes and Lipid Journal* **3**(Suppl. 1):21–5. [In Persian].

Hosseinpoor AR, Van Doorslaer E, Speybroeck N *et al.* 2006. Decomposing socioeconomic inequality in infant mortality in Iran. *International Journal of Epidemiology* **35**: 1211–9.

Iran NHA team. No date. Iran National Health Accounts. World Bank and the PHR plus. Online at: http://www.who.int/nha/docs/en/Iran_NHA_report_english.pdf, (Accessed August 2011).

Jafari N, Abolhassani F, Naghavi M *et al.* 2009. National burden of disease and study in Iran. *Iranian Journal of Public Health* **38**(Suppl. 1):71–3.

Jafarisirizi M, Rashidian A, Abolhasani F *et al.* 2011. Space or no space for managing public hospitals: a qualitative study of hospital autonomy in Iran. *International Journal of Health Planning and Management* **26**: e121–37.

Knaul FM, Arreola-Ornelas H, Méndez-Carniado O *et al.* 2006. Evidence is good for your health system: policy reform to remedy catastrophic and impoverishing health spending in Mexico. *The Lancet* **368**: 1828–41.

Liua G.G, Zhao Z, Caic R, Yamada T, Yamada T. 2002. Equity in health care access to: assessing the urban health insurance reform in China. *Social Science and Medicine* **55**: 1779–94.

Marmot M. 2005. Social determinants of health inequalities. *The Lancet* **365**: 1099–104.

Mataria A, Raad F, Abu-Zaineh M, Donaldson C. 2010. Catastrophic healthcare payments and impoverishment in the occupied Palestinian territory. *Applied Health Economics and Health Policy* **8**: 393–405.

Merlis M, Gould D, Mahato B. 2006. Rising out-of-pocket spending for medical care: a growing strain on family budgets. New York: Commonwealth Fund.

Murray CJL, Knaul F, Musgrove Ph, Xu K, Kawabata K. 2003a. Defining and measuring fairness in financial contribution to the health system. Geneva: World Health Organization. GPE Discussion Paper No. 24.

Murray CJL, Xu K, Klavus J *et al.* 2003b. Assessing the distribution of household financial contributions to the health system: concepts and empirical application. In: Murray CJL, Evans DB (eds). *Health Systems Performance Assessment (Debates, Methods and Empiricism)*. 1st edn. Geneva: World Health Organization, pp. 513–31.

Narayan D, Patel R, Schafft K, Rademacher A, Koch-Schulte S. 2000. *Voices of the Poor: Can Anyone Hear Us?* New York: Oxford University Press.

O'Donnell O, Van Doorslaer E, Wagstaff A, Lindelow M. 2008. Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation. Washington, DC: World Bank.

Planning and Management Organization of the Islamic Republic of Iran. 2003. Five-Year Economic, Social and Cultural Development Plan of the Islamic Republic of Iran (2004–2009). Tehran: Deputy for Research, Development and Codification of Laws and Regulations.

Pradhan M, Prescott N. 2002. Social risk management options for medical care in Indonesia. *Health Economics* **11**: 431–46.

Rashidian A, Kavosi Z, Majdzadeh R *et al.* 2011. Assessing health system responsiveness: a household survey in 17th District of Tehran. *Iranian Red Crescent Medical Journal* **13**: 302–8.

Razavi SM, Hassanzadeh A, Basmenji K. 2005. Fairness in financial contribution in the health system. Tehran: Andishmand publication. [In Persian]

Shahandeh k, Majdzadeh SR, Kamali SH. 2003. Analysing population characteristics and socioeconomic indicators of the 17th District of Tehran: Population Research Center of Tehran University of Medical Sciences. *Diabetes and Lipid Journal* **3**(Suppl. 1):5–10. [In Persian]

Somkotra T, Lagrada LP. 2008. Payments for health care and its effect on catastrophe and impoverishment: experience from the transition to Universal Coverage in Thailand. *Social Science & Medicine* **67**: 2027–35.

Somkotra T, Lagrada LP. 2009. Which households are at risk of catastrophic health spending? Experience in Thailand after universal coverage. *Health Affairs* **28**: 467–78.

Statistical Centre of Iran. 2007. National Population and Housing Census 2006. Tehran: Statistical Center of Iran.

Steinhardt LC, Waters HR, Rao KD *et al.* 2009. The effect of wealth status on care seeking and health expenditures in Afghanistan. *Health Policy and Planning* **24**: 1–17.

Su TT, Kouyaté B, Flessa S. 2006. Catastrophic household expenditure for health care in a low-income society: a study from Nouna District, Burkina Faso. *Bulletin of the World Health Organization* **84**: 21–7.

Sun X, Jackson S, Carmichael G, Sleigh AC. 2008. Catastrophic medical payment and financial protection in rural China: evidence from the New Cooperative Medical Scheme in Shandong Province. *Health Economics* **18**: 103–19.

Takian AH, Rashidian A, Kabir MJ. 2011. Expediency and coincidence in reengineering a health system: an interpretive approach to formation of family medicine in Iran. *Health Policy and Planning* **26**: 163–73.

Trading Economics. 2011. Health expenditure per capita (US dollar) in Iran. Online at: http://www.tradingeconomics.com/iran/health-expenditure-per-capita-us-dollar-wb-data.html, (Accessed August 2011).

Üstün TB, Chatterji S, Mechbal A, Murray CJL. 2003. The World Health Surveys. In: Murray CJL, Evans DB (eds). *Health Systems Performance Assessment (Debates, Methods and Empiricism)*. 1st edn. Geneva: World Health Organization, pp. 797–808.

Van De Poel E, Hosseinpoor AR, Jehu-Appiah C, Vega J, Speybroeck N. 2007. Malnutrition and the disproportional burden on the poor: the case of Ghana. *International Journal of Equity in Health* **6**: 21.

Van Doorslaer E, Masseria C, Koolman X. 2006a. Inequalities in access to medical care by income in developed countries. *Canadian Medical Association Journal* **174**: 187–8.

Van Doorslaer E, O'Donnell O, Rannan-Eliya RP *et al.* 2006b. Effect of payments for health care on poverty estimates in 11 countries in Asia: an analysis of household survey data. *The Lancet* **368**: 1357–64.

Van Doorslaer E, O'Donnell O, Rannan-Eliya RP *et al.* 2007. Catastrophic payments for health care in Asia. *Health Economics* **16**: 1159–84.

Wagstaff A, Van Doorslaer E. 2003. Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993–1998. *Health Economics* **12**: 921–33.

Wagstaff A, van Doorslaer E, Watanabe N. 2003. On decomposing the causes of health sector inequalities with an application to malnutrition inequalities in Vietnam. *Journal of Econometrics* **112**: 207–23.

Wagstaff A, Lindelow M. 2008. Can insurance increase financial risk? The curious case of health insurance in China. *Health Economics* **27**: 990–1005.

Waters HR, Anderson GF, Mays J. 2004. Measuring financial protection in health in the United States. *Health Policy* **69**: 339–49.

WHO. 2000. *The World Health Report 2000: Health Systems: Improving Performance*. Geneva: World Health Organization.

WHO. 2006. Health System Profile: Islamic Republic of Iran. Cairo: Regional Health Systems Observatory, WHO Eastern Mediterranean Regional Office.

WHO. 2010. *The World Health Report 2010: Health Systems Financing: The Path to Universal Coverage*. Geneva: World Health Organization.

World Bank. 2000. *World Development Report 2000/2001: Attacking Poverty*. New York: Oxford University Press.

World Bank. 2007. Islamic Republic of Iran: Health Sector Review. The World Bank Group Human Development Sector Middle East and North Africa. Report no: 39970. Washington, DC: World Bank.

Wyszewianski L. 1986. Families with catastrophic health care expenditures. *Health Services Research* **21**: 617–34.

Xu K, Klavus J, Evans DB *et al.* 2003a. The impact of vertical and horizontal inequality on the fairness in financial contribution index. In: Murray CJL, Evans DB (eds). *Health System Performance Assessment (Debates, Methods and Empiricism)*. 1st edn. Geneva: World Health Organization, pp. 558–63.

Xu K, Evans DB, Kawabata K *et al.* 2003b. Household catastrophic health expenditure: a multicountry analysis. *The Lancet* **362**: 111–7.

Xu K, Evans DB, Kawabata K *et al.* 2003c. Understanding household catastrophic health expenditures: a multi-country analysis. In: Murray CJL, Evans DB (eds). *Health Systems Performance Assessment (Debates, Methods and Empiricism)*. 1st edn. Geneva: World Health Organization, pp. 565–72.

Xu K, Evans DB, Carrin G *et al.* 2007. Protecting households from catastrophic health spending. *Health Affairs* **26**: 972–83.