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Inequality in Private Health Care Expenditures: A 36-Year Trend Study of Iranian Households

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Objectives: Throughout history, societies have been impacted by inequality. Many studies have been conducted on the topic more broadly, but only a few have investigated inequalities in out-of-pocket health payments (OHP). This study measures OHP inequality trends among the Iranian households.

Methods: This study used data from the Iranian Statistics Center on Iranian household income and expenditures. The analysis included a total of 995 300 households during the 36 years from 1984 to 2019. The Gini coefficient, Atkinson index, and Theil index were calculated for Iranian OHP.

Results: Average Iranian household OHP increased from 33 US dollar (USD) in 1984 to 47 USD in 2019. During this 36-year span, the average ± standard deviation Gini coefficient for OHP was 0.73 ± 0.04, and the Atkinson and Theil indexes were 0.68 ± 0.05 and 1.14 ± 0.29, respectively. The Gini coefficients for the subcategories of OHP of outpatient diagnostic services, medical assistant accessories, hospital inpatient services, and addiction cessation were 0.70, 0.61, 0.84, and 0.64, respectively.

Conclusions: In this study, we scrutinized trends of inequality in the OHP of Iranian households. Inequality in OHP decreased slightly over the past four decades. An analysis of trends among different subgroups revealed that affluent households, such as households with insurance coverage and households in higher income deciles, experienced higher inequality. Therefore, lower inequality in health care expenditures may be related to restricted access to health care services in Iran.

Key words: Health expenditures, Health inequities, Out-of-pocket payments, Socioeconomic factors, Healthcare disparities

INTRODUCTION

A key concern for policymakers has been providing households with financial support for health care services [1,2]. To address this concern, systems involving out-of-pocket health payments (OHP) have been introduced, and their importance has steadily grown in many countries [1,3]. Health care services are commonly financed through a combination of taxation, social health insurance, private health insurance, community financing, and OHP [4,5].

OHP may combat the phenomenon known as "moral hazard," whereby households might use less necessary or unnec-

essary health services too frequently when they are free of charge, whereas household contributions could reduce this. OHP can also serve as a source of health care financing [1,6]. One way to measure fairness in health care financing is by analyzing OHP [7]. A high proportion of OHP can be considered a threat to a health care financing system, since relying on a high-risk source can limit the availability of health services for epidemics or life changes such as aging. While OHP overall is an issue that requires more attention, studying OHP inequality is the more critical aspect, because an unequal distribution of OHP can divert family income away from essential needs such as food, education, shelter, and utilities [8-10]. Numerous studies have calculated inequality in well-being indicators such as income, wealth and consumption, or various indicators of health, such as access to services [11]. In Iran, OHP is a major source of health care financing [5,12,13], and evidence shows that health care expenditures have been increasing over the decades [14-16].

Inequality in OHP has become an increasing health policy challenge for many countries [17,18]. The health care system in Iran was formed from the principles of the Conference of Alma Ata, namely access to health services for all, a focus on primary care and prevention, attention to disadvantaged groups, and investments in public health workers. The system is a public/private partnership, with the public health sector funded by public expenditures, including direct government spending, and reimbursement from the Iranian Social Security Organization and Health Insurance Organization [19]. In 2018, health system funding in Iran consisted of government expenditures (about 24%), social health insurance (about 31%), direct OHP (about 35%), private health insurance (about 6%), and other sources (about 4%), with health care expenditures accounting for 8.4% of Iran's gross domestic product [20].

Indicators of inequality in health expenditures have been widely studied by Iranian researchers, but this study is the first to address the issue comprehensively over a 36-year timeframe [5,21]. Mehrolhassani et al. [22] reported that the distribution of health care expenditures was unequal, especially in OHP, with the highest rate ranging from 0.50 to 0.59 during the study timeframe and the disparity index for OHP fluctuating between 37.01% and 65.85%. Bock et al. [1] reported a mean OHP over three months of €119, with 34% for medical supplies, 22% for dental prostheses, 21% for pharmaceuticals, 17% for outpatient physician and non-physician services, 5% for inpatient care, and 1% for nursing care. In Iran, there is some limited evi-

dence on inequality trends in health care expenditures, particularly Ghaedamini et al. [23] who studied inequality in Iranian household expenditures over a decade. The Gini coefficient (GC) in their study was unusually high for health care expenditures, averaging 0.78. The current study uses the GC as well but has also added two more refined indicators of inequality, the Theil and Atkinson indexes. These incorporate additional qualitative criteria such as inequality aversion and entropy when calculating inequality indexes [24]. This study also considered inequality in OHP among different socio-demographic subgroups. The findings, therefore, make a significant contribution to the understanding of health inequalities and provide valuable input for policymakers in Iran aiming to ensure more equity in health care. In summary, this study measured the trends in inequality indexes for Iranian household OHP over 36 years, and further analyzed this inequality based on household income ranges and insurance coverage status.

METHODS

Data

This study used data from the Household Income and Expenditure Survey gathered annually by the Statistical Center of Iran. The analysis included a total of 995 300 households over the 36 years from 1984 to 2019. Among Iranian households, OHP (also referred to as out-of-pocket expenditures or co-payments) are paid in 1 of 3 ways: deductibles, or amounts paid for covered health care expenditures before insurance starts paying, additional payments triggered when a stipulated insurance threshold is reached, and direct contributions to health care services, including for outpatient diagnostic services, equipment, supplies, medical assistant accessories, hospital inpatient service, and addiction cessation [25]. This study used Stata version 14.2 (StataCorp., College Station, TX, USA) to analyze the data, with the INEQDECO Stata module used to estimate the full range of inequality indexes [26].

Measures

Inequality in household expenditures was measured using 3 different indicators: the GC, the Theil index of inequality (with its sensitivity to disparities at the top and the bottom of the OHP distribution), and the Atkinson index of inequality (with 2 parameters for inequality aversion).

The GC has many desirable characteristics as a measure of inequality, including mean and population size independence

symmetry and Pigou-Dalton transfer sensitivity. The GC ranges from 0 to 1, where 0 indicates perfect equality (all individuals have the same resources) and 1 indicates perfect inequality (where one person has all the resources and the rest have none). The closer the GC is to 1, therefore, the more unequal the population and vice-versa. Focusing on the GC as a measure of inequality allows comparisons of inequalities in health care expenditures over time and space [27]. Its cumulative frequency curve compares the distribution of total health care expenditures y_i with the cumulative percentage of population x_i. The GC was calculated using the formula [27,28] of Haughton as shown in equation (1):

$$GC = 1 - \sum_{i=1}^{N} (x_i - x_{i-1})(y_i + y_{i-1}) \quad (1)$$

where N is the total number of observations. If N is equal to the interval on the x-axis, the GC can be simplified to equation (2):

$$GC = 1 - \sum_{i=1}^{N} (y_i + y_{i-1}) \quad (2)$$

The Atkinson index shows the percentage of total resources that a population would have to forego in order to have more equal shares of income between the individuals. Atkinson (1970) approached inequality from a normative perspective and proposed welfare-based inequality measures called Atkinson's class measures A(ε). The parameter(ε) represents aversion to inequality and has values between zero and infinity. The larger the parameter(ε), the stronger the inequality aversion in a society. This means that the Atkinson index is more sensitive to the bottom of the income/expenditure distribution [29]. A greater aversion parameter(ε) indicates that social welfare is more sensitive to a shift in the income of a poorer individual than to the same shift for a richer individual [30].

$$A_{\varepsilon} = 1 - \frac{\prod_{i=1}^{N} (y_i^{(\frac{1}{N})})}{\bar{y}} \quad (3)$$
$$\varepsilon = 1$$

$$A_{\varepsilon} = 1 - \frac{\left[\frac{1}{n}\sum_{i=1}^{n} \frac{y_i}{\bar{y}}^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}}}{\mu} \quad (4)$$
$$\varepsilon \neq 1$$

The Theil index was also calculated for OHP among Iranian households. The Theil index is a generalized entropy inequality measure, GE(η). The parameter η represents the weight given to distances between income/expenditure at different parts of the income/expenditure distribution. The parameter η can take any real value, with commonly used values of 0, 1, and 2. When η is equal to 0, the GE(0) index is called the Theil L index, when η is equal to 1, the GE(1) index is called the Theil T index, and when η is equal to 2, the GE(2) index is called the coefficient of variation [31]. With a large and positive η, the GE index is more sensitive to changes at the upper tail of the income/expenditure distribution, while with η values closer to zero, the GE index is more sensitive to changes at the bottom tail of the distribution.

$$E(a) = \frac{1}{n(a^2 - a)} \sum_i \left[\left(\frac{y_i}{\bar{y}}\right)^a - 1\right] \quad (5)$$

$$E(1) = T = \frac{1}{n} \sum_{i=1}^{n} \left(\frac{y_i}{\bar{y}}\right) ln \left(\frac{y_i}{\bar{y}}\right) \quad (6)$$

Ethics Statement

This research was in accordance with the ethical standards of the Committee of Ethics in Research in the University of Social Welfare and Rehabilitation Sciences and approved by ethical code: IR. USWRREC.1398.201.

RESULTS

Profile of Iranian Households

Historically, the heads of most Iranian households have been men (around 90%), while more recently there has been a slight increase in women-headed households (from 10.1% in 1984 to 14.3% in 2019). During this period, the rate of insurance coverage also increased rapidly from 26.6% in 1984 to 88.8% in 2019. The proportions of urban and rural households during this time were consistent, with only slight fluctuations. The literacy rate for heads of households increased considerably from 51.0% in 1984 to 75.5% in 2019. Household size has also dropped over the years, from an average of 5.1 persons per household in 1994 to 3.4 in 2019. Since 2011, health care expenditures have grown at least 12% year over year (Tables 1 and 2).

Inequality in Out-of-pocket Health Payments

Using the annual data on Iranian household health expenditures, inequality indexes were calculated over the 36 years. All inequality measures showed inequality slowly declining from

Table 1. Summary statistics of Iranian households' income and health care expenditures

Year	Total population	Family size, n	Average household income		Average health care expenditure		Average per capita health care expenditure		Insurance coverage, %	Growth rate of health care expenditures
			IRR	USD	IRR	USD	IRR	USD		
1984	45 814.000	5.1	44 304	482	3036	33	595	6	26.3	0.12
1985	47 606.000	5.0	43 723	497	3046	35	609	7	25.2	
1986	49 445.000	5.1	35 380	459	3011	39	590	8	24.3	
1987	50 661.000	5.2	51 988	743	3807	54	732	78	25.7	
1988	51 908.000	5.3	62 509	906	4222	61	797	10	25.1	
1989	53 185.000	5.3	73 013	1014	4741	66	894	12	23.0	
1990	54 493.000	5.6	91 012	1360	5345	80	954	14	24.8	
1991	55 837.000	5.6	124 586	1838	7588	112	1355	10	25.2	
1992	56 658.000	5.3	167 670	115	10 588	7	1998	2	26.6	0.32
1993	57 491.000	5.3	203 170	123	11 870	7	2240	2	29.0	
1994	58 336.000	5.4	290 237	166	20 750	12	3843	3	36.1	
1995	59 193.000	5.4	361 812	207	27 269	16	5050	2	37.2	
1996	60 055.000	5.2	483 854	276	33 223	19	6389	4	35.4	
1997	61 070.000	5.1	599 723	342	40 570	23	7955	5	39.4	
1998	62 103.000	5.0	736 224	420	49 467	28	9893	6	37.1	
1999	63 152.000	5.1	859 810	490	65 923	38	12 926	7	37.3	
2000	64 219.000	4.9	1 001 739	571	80 099	46	16 347	9	37.0	
2001	65 301.000	4.9	1 177 110	671	97 268	55	19 851	11	37.1	
2002	66 300.000	4.8	1 499 351	188	125 927	16	26 235	3	28.3	0.60
2003	67 315.000	4.7	1 901 900	230	139 913	17	29 769	4	40.4	
2004	68 345.000	4.6	2 342 928	269	192 559	22	41 861	5	35.4	
2005	9390.000	4.4	2 702 105	299	219 936	24	49 985	6	41.5	
2006	70 496.000	4.3	3 117 117	339	245 596	27	57 115	6	68.1	
2007	71 346.000	4.2	3 639 840	392	294 092	32	70 022	8	64.7	
2008	72 279.000	4.1	3 781 924	395	365 673	38	89 189	9	75.1	
2009	73 223.000	4.0	4 172 805	421	426 953	43	106 738	11	77.4	
2010	74 180.000	3.9	4 780 635	462	523 352	51	134 193	13	77.3	
2011	75 150.000	3.9	6 474 853	591	517 923	47	132 801	12	78.8	
2012	76 082.000	3.8	8 108 269	661	646 568	53	170 149	14	80.8	0.15
2013	77 025.000	3.7	9 639 775	454	843 979	40	228 102	11	81.2	
2014	77 980.000	3.7	11 344 847	528	917 977	35	248 102	9	81.7	
2015	78 947.000	3.7	13 068 728	442	1 014 362	34	274 152	9	87.4	
2016	79 926.000	3.6	14 566 771	464	1 115 497	36	309 860	10	88.7	
2017	81 150.000	3.5	16 672 478	487	1 359 098	40	388 314	11	88.9	
2018	82 200.000	3.5	20 824 220	496	1 874 602	45	535 601	13	87.5	
2019	83 100.000	3.4	24 250 814	577	1 982 000	47	582 941	14	88.8	

IRR, Iranian rial; USD, US dollar.

1984 to 2019. The one exception was 2010, when all the measures suddenly dropped. Inequality in OHP then remained mostly constant until 2019. During this period, the mean ± standard deviation (SD) of the GC was 0.73 ± 0.04, with a minimum and maximum of 0.65 and 0.78 in the years 2011 and 1988, respectively. The mean ± SD of the Atkinson index for in-equality among Iranian households was A(0.5) = 0.46 ± 0.06. Focusing on the OHP of the lowest income group, the Atkinson index is higher with the mean A(1) = 0.68 ± 0.05. Similarly, Figure 1 shows the trends for the Thiel index of inequality using the inequality aversion parameters 1 and 0. Over the 36-year period, the average for GE(1) and GE(0) was 1.39 ± 0.29 and

Table 2. Average income and insurance coverage based among income deciles

| Year	Variable	Income deciles									
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1984	Insurance coverage status										
	Not covered	77.9	94.3	93.6	87.3	85	75.2	65	55.5	48.3	51.7
	Covered	22.1	5.7	6.4	12.7	15	24.8	35	44.5	51.7	48.3
	Average income										
	IRR	294	4935	12 672	20 887	29 344	38 138	47 895	60 182	78 537	150 414
	USD	3	54	138	227	319	415	521	654	854	1635
1991	Insurance coverage status										
	Not covered	98.4	96.1	88.6	83.3	73.9	64.3	58.4	56.9	61.2	67.1
	Covered	1.6	3.9	11.4	16.7	26.1	35.7	41.6	43.1	38.8	32.9
	Average income										
	IRR	11 942	23 997	45 306	63 363	80 010	97 771	118 710	147 863	195 788	485 319
	USD	176	354	668	935	1180	1442	1751	2181	2888	7158
2001	Insurance coverage status										
	Not covered	85.1	89.5	82.8	72.7	62.9	53.9	48.2	45.5	41.6	47.1
	Covered	14.9	10.5	17.2	27.3	37.1	46.4	51.8	54.5	58.4	52.9
	Average income										
	IRR	117 667	327 331	485 204	633 371	786 131	960 988	1 174 255	1 460 254	1 921 026	3 907 941
	USD	67	187	276	361	448	548	669	832	1095	2227
2011	Insurance coverage status										
	Not covered	30.6	27.4	26	25.9	23.29	19.7	17.7	15.5	13.8	12
	Covered	69.4	72.6	74	74.1	76.8	80.3	82.3	84.5	86.2	88
	Average income										
	IRR	1 032 514	2 482 310	3 522 558	4 366 017	5 134 680	5 940 038	6 884 306	8 115 208	10 103 478	17 179 676
	USD	94	226	321	398	468	541	628	740	922	1567
2019	Insurance coverage status										
	Not covered	17.5	14	12.6	12	9.8	11.8	9.5	8.9	8.4	7.2
	Covered	82.5	86	87.4	88	90.2	88.2	90.5	91.1	91.6	92.8
	Average income										
	IRR	3 500 858	8 454 445	12 192 852	15 399 604	18 315 671	21 644 567	25 794 321	31 081 806	38 882 903	67 303 983
	USD	834	2012	2903	3666	4360	5153	6141	7400	9258	16 024

IRR, Iranian rial; USD, US dollar.

1.14±0.14, respectively. It is clear that more sensitivity to inequalities at the top of the OHP distribution has led to higher levels of inequality. This is evidenced by the fact that inequality was much more pronounced among households with higher OHP. In 2010 the inequality converged for both inequality aversion parameters, most likely indicating that households with better economic conditions were less able to meet their health needs.

Figure 2 shows the inequality trend in OHP among sample subgroups (note that data for expenditures on addiction cessation are only available for 2005 onward). The mean of the GCs for expenditures on equipment, supplies, and medical assistant accessories was 0.61±0.02, suggesting it was the least important factor measured here affecting inequality in health care expenditures. The mean of the GC for outpatient diagnostic services expenditures was 0.70±0.01, with the coefficient at its highest level in 1995 (0.74). Among all the components of OHP, hospital services expenditures had the highest level of inequality (0.84±0.08). Inequality in expenditures for addiction cessation, despite a few peturbations, was almost constant.

The mean GCs were 0.74±0.05 for households covered by insurance and 0.71±0.04 for those without insurance coverage (Table 3). The trend of inequality had slight fluctuations
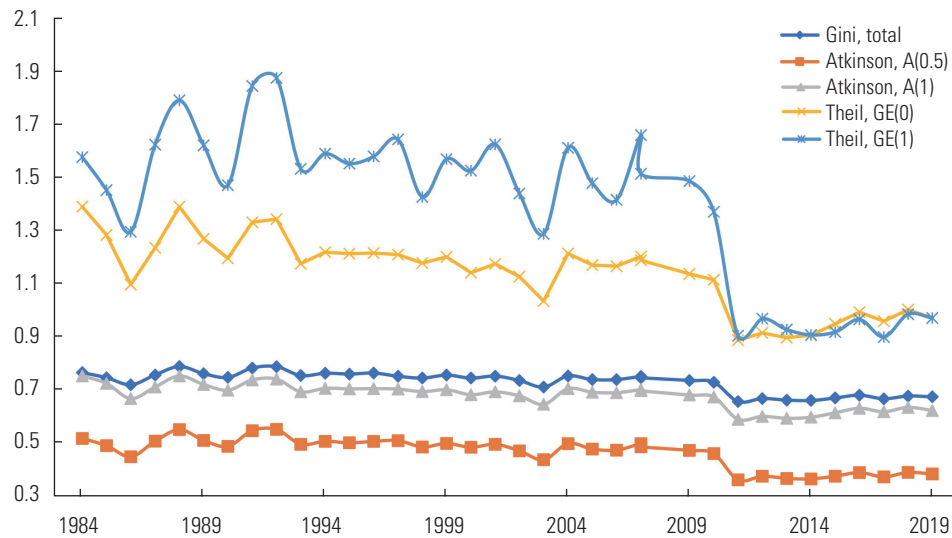
Figure 1. Inequality indexes for Iranian households' out-of-pocket health payment (1984-2019).
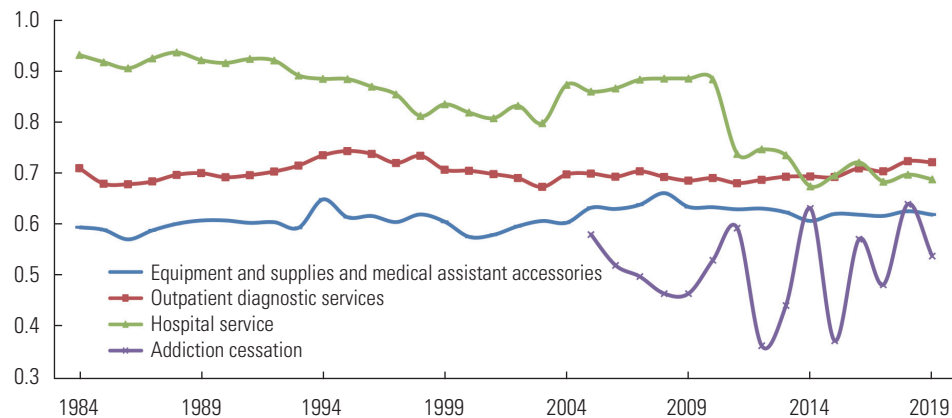
Figure 2. Trends in the Gini coefficients for coefficients of out-of-pocket health payment expenditures (1984-2019).

before 2011, but in 2011 it dropped significantly, and inequality between the 2 groups of households has since converged. Table 3 also gives the GCs for different income deciles, to help understand differences in inequality between households with different income levels. The OHP was highly unequal in the topmost decile subgroup, with a mean GC for 1984 to 2019 of 0.75 ± 0.05. All deciles showed decreased inequality in 2011, with the mean of GCs for the bottom decile (first) of 0.70 ± 0.06.

DISCUSSION

This study calculated inequality measures in OHP among Iranian households over 36 years and provided a breakdown of inequality trends. All inequality indicators showed slightly

decreases in OHP inequality in line with previous studies [16,31]. A similar trend of declining inequality in health spending has been reported in some other countries. According to Çinaroğlu [32], GC results indicated decreasing inequality in OHP expenditures between 2003 (0.75), 2009 (0.71), and 2015 (0.69). The level of progressivity decreased from 2003 to 2015, with less progressivity in distribution of OHP expenditures [32].

The highest inequality has been detected in hospital services expenditures (Figure 2), with outpatient diagnostic services and equipment and medical supplies showing a relatively smooth trend over the 36 years. Ghaedamini et al. [23] showed that Iranian households experienced severe inequality in health care expenditures. The present study found that the highest level of inequality was among households with insurance coverage as well as households in the tenth income de-

Table 3. Gini coefficient (decomposed), Theil index, and Atkinson index of inequality

| Year | Gini coefficient | | | | | | | | | | Theil index | | Atkinson index | |
| | OHP | Health care expenditures sub-categories | | | | Insurance status | | Income decile | | | | | | |
		Medical accessories	Outpatient services	Hospital service	Quitting addiction	Covered	Not covered	1st	5th	10th	GE(0)	GE(1)	A(0.5)	A(1)
1984	0.76	0.59	0.71	0.93	-	0.78	0.75	0.74	0.73	0.80	1.39	1.57	0.52	0.75
1985	0.74	0.59	0.68	0.91	-	0.77	0.73	0.76	0.65	0.78	1.28	1.45	0.49	0.72
1986	0.72	0.57	0.68	0.90	-	0.78	0.68	0.76	0.73	0.76	1.09	1.29	0.45	0.66
1987	0.75	0.59	0.68	0.92	-	0.80	0.73	0.62	0.66	0.80	1.23	1.62	0.50	0.71
1988	0.79	0.60	0.70	0.93	-	0.80	0.78	0.82	0.82	0.73	1.39	1.79	0.55	0.75
1989	0.76	0.61	0.70	0.92	-	0.78	0.68	0.79	0.67	0.78	1.26	1.62	0.51	0.72
1990	0.74	0.61	0.69	0.91	-	0.76	0.74	0.75	0.73	0.74	1.19	1.47	0.49	0.70
1991	0.78	0.60	0.69	0.92	-	0.81	0.77	0.75	0.69	0.80	1.33	1.84	0.54	0.73
1992	0.78	0.60	0.70	0.92	-	0.82	0.77	0.75	0.77	0.84	1.34	1.87	0.55	0.74
1993	0.75	0.59	0.71	0.89	-	0.77	0.74	0.72	0.71	0.76	1.17	1.53	0.49	0.69
1994	0.76	0.65	0.73	0.88	-	0.77	0.75	0.77	0.73	0.78	1.21	1.59	0.50	0.70
1995	0.76	0.61	0.74	0.88	-	0.77	0.75	0.77	0.74	0.76	1.21	1.55	0.50	0.70
1996	0.76	0.62	0.74	0.87	-	0.78	0.75	0.75	0.72	0.79	1.21	1.57	0.50	0.70
1997	0.75	0.60	0.72	0.85	-	0.78	0.74	0.73	0.71	0.80	1.21	1.64	0.51	0.70
1998	0.74	0.62	0.73	0.81	-	0.76	0.74	0.77	0.73	0.74	1.17	1.42	0.48	0.69
1999	0.75	0.60	0.71	0.83	-	0.78	0.73	0.73	0.71	0.78	1.20	1.56	0.50	0.70
2000	0.74	0.58	0.70	0.82	-	0.75	0.73	0.69	0.68	0.78	1.14	1.52	0.48	0.68
2001	0.75	0.58	0.70	0.81	-	0.75	0.74	0.74	0.70	0.80	1.17	1.62	0.49	0.69
2002	0.73	0.60	0.69	0.83	-	0.75	0.72	0.69	0.69	0.78	1.12	1.44	0.47	0.67
2003	0.71	0.61	0.67	0.80	-	0.72	0.69	0.65	0.65	0.74	1.03	1.28	0.44	0.64
2004	0.75	0.60	0.70	0.87	-	0.77	0.74	0.71	0.68	0.75	1.21	1.61	0.50	0.70
2005	0.74	0.63	0.70	0.86	0.58	0.75	0.72	0.71	0.72	0.75	1.17	1.47	0.48	0.69
2006	0.74	0.63	0.69	0.86	0.52	0.75	0.71	0.72	0.73	0.76	1.16	1.41	0.47	0.69
2007	0.75	0.64	0.70	0.88	0.50	0.76	0.71	0.68	0.71	0.82	1.20	1.65	0.50	0.70
2008	0.74	0.66	0.69	0.88	0.46	0.75	0.72	0.70	0.69	0.78	1.18	1.51	0.48	0.69
2009	0.73	0.63	0.68	0.88	0.46	0.72	0.76	0.69	0.71	0.74	1.13	1.48	0.47	0.68
2010	0.73	0.63	0.69	0.88	0.53	0.73	0.72	0.69	0.72	0.74	1.11	1.37	0.46	0.67
2011	0.65	0.63	0.68	0.74	0.59	0.65	0.64	0.63	0.65	0.67	0.88	0.90	0.36	0.59
2012	0.66	0.63	0.69	0.75	0.36	0.66	0.66	0.62	0.68	0.68	0.91	0.97	0.37	0.60
2013	0.66	0.62	0.69	0.73	0.44	0.66	0.67	0.62	0.63	0.68	0.89	0.92	0.36	0.59
2014	0.66	0.61	0.69	0.67	0.63	0.66	0.66	0.65	0.63	0.68	0.90	0.90	0.36	0.59
2015	0.67	0.62	0.69	0.69	0.37	0.67	0.66	0.62	0.65	0.67	0.95	0.91	0.37	0.61
2016	0.68	0.62	0.71	0.72	0.57	0.68	0.67	0.63	0.65	0.69	0.99	0.96	0.39	0.63
2017	0.66	0.62	0.70	0.68	0.48	0.67	0.65	0.60	0.63	0.67	0.96	0.90	0.37	0.62
2018	0.67	0.62	0.72	0.70	0.64	0.68	0.65	0.69	0.64	0.67	1.00	0.98	0.39	0.63
2019	0.67	0.62	0.72	0.69	0.54	0.67	0.66	0.63	0.65	0.68	0.97	0.97	0.38	0.62

OHP, out-of-pocket health payment.

cile. More access to health care services, often facilitated by insurance coverage and high income, appeared to be an important factor in this higher inequality in health care spending.

To understand the overall status of inequality in health care expenditures, all the observed trends should be analyzed simultaneously. In 2011 there was a sudden and significant decline in all measures of inequality. The Theil index showed that an important part of this reduction in inequality was related to households with higher health expenditures. This analysis has also shown that inequality in hospital spending has decreased

significantly. It appears that households with insurance coverage and higher incomes have become more similar in terms of inequality to households without insurance coverage and with lower incomes. Households that used to experience higher inequality in health care expenditures, namely high-income and insurance-covered households, are now experiencing declining inequality. Reduced household spending inequality should be distributed unequally because of unequal health needs. The observed reductions, however, may be a result of limited access to health care services, especially expensive hospital services. In 2011, the Iranian economy experienced a shock in foreign exchange rates that destroyed the purchasing power of Iranian households. This sharp decline in real incomes has made health care services more unaffordable for families [33] especially for those with extensive needs, such as people with disabilities and families with other specialized needs. According to Rezapour et al. [34], economic problems are making patients less likely to seek out medical services, with Kordbache and Ahmadi [35] showing that the exchange rate has significant and direct impacts on medical care prices both in the short and long term. They showed effects of exchange rate changes on medical care price indexes for consumers and producers of 0.23 and 0.14 in the short term and 0.327 and 0.256 in the long term, respectively. Atkinson index values show the proportion of total OHP which would be required to achieve an level of social welfare equal to the present state if expenditures were perfectly distributed. The mean Atkinson index values of A(0.5)= 0.46 and A(1)=0.68 suggest that Iran's health system could achieve the same level of social welfare with only 1-0.46=0.54 and 1-0.68=0.32 the amount of current OHP. In the last decade, the "target subsidies plan" was implemented in Iran with the aim of reducing government subsidies in the economy. This plan started in 2010 and sought to expand government funding for social insurance and health care services, as well as affordable medical care for specific diseases. The high inflationary effects of this policy [36], however, worsened the inequality in health care financing and made access to health care services more limited than before. Reducing the inequality in household OHP was considered auspicious in previous study [37], but the current study showed that high inequality in health spending was related to affluent families (households with insurance coverage and high-income households) in society. As a result, inequality should be interpreted cautiously in counties with high OHP shares in health care expenditures.

This study used a large raw data set from Iranian households to calculate inequality indexes. The measures of inequality included the GC and the Theil and Atkinson indexes. For the first time, a long-term trend of for inequality was established and analyzed based on households' income decile and insurance coverage status. The data suggest that implementation of the "targeted subsidies plan" and the following exchange rate shock has reduced inequality in OHP since 2011. The higher inequality rates seen for households with higher socioeconomic status suggest that lowering inequality in Iran may have been due to limited access to health care services. The trend of inequality indexes as well as more detailed analysis of the 36 years of data reinforce this viewpoint. A significant reduction in the inequality of hospital services' expenditures, for example, suggests that some households in need of expensive medical services may have been deprived of these services, possibly with devastating health consequences. This study provides a time series of data that can be used for further health inequality analysis.

CONFLICT OF INTEREST

The authors have no conflicts of interest associated with the material presented in this paper.

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AUTHOR CONTRIBUTIONS

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REFERENCES

1. Bock JO, Matschinger H, Brenner H, Wild B, Haefeli WE, Quinzler R, et al. Inequalities in out-of-pocket payments for health care services among elderly Germans--results of a population-based cross-sectional study. Int J Equity Health 2014;13:3.

2. Organization for Economic Cooperation and Development (OECD). Health data 2022 [cited 2022 Mar 5]. Available from: http://www.oecd.org/health/healthdata.

3. Tambor M, Pavlova M, Woch P, Groot W. Diversity and dynamics of patient cost-sharing for physicians' and hospital services in the 27 European Union countries. Eur J Public Health 2011; 21(5):585-590.

4. Gottret P, Schieber G. Health financing revisited: a practitioner's guide; 2006 [cited 2021 Oct 17]. Available from: https://openknowledge.worldbank.org/handle/10986/7094.

5. Rezaei S, Woldemichael A, Ebrahimi M, Ahmadi S. Trend and status of out-of-pocket payments for healthcare in Iran: equity and catastrophic effect. J Egypt Public Health Assoc 2020; 95(1):29.

6. Corrieri S, Heider D, Matschinger H, Lehnert T, Raum E, König HH. Income-, education- and gender-related inequalities in out-of-pocket health-care payments for 65+ patients - a systematic review. Int J Equity Health 2010;9:20.

7. Pourasghari H, Jafari M, Bakhtiari M, Keliddar I, Irani A, Afshari M. Analysis of equality in Iranian household healthcare payments during Iran's fourth development program. Electron Physician 2016;8(7):2645-2649.

8. Ekholuenetale M, Barrow A. Inequalities in out-of-pocket health expenditure among women of reproductive age: after-effects of national health insurance scheme initiation in Ghana. J Egypt Public Health Assoc 2021;96(1):6.

9. Akazili J, McIntyre D, Kanmiki EW, Gyapong J, Oduro A, Sankoh O, et al. Assessing the catastrophic effects of out-of-pocket healthcare payments prior to the uptake of a nationwide health insurance scheme in Ghana. Glob Health Action 2017;10(1): 1289735.

10. Kanmiki EW, Bawah AA, Phillips JF, Awoonor-Williams JK, Kachur SP, Asuming PO, et al. Out-of-pocket payment for primary healthcare in the era of national health insurance: evidence from northern Ghana. PLoS One 2019;14(8):e0221146.

11. O'Donnell O, van Doorslaer E, Wagstaff A, Lindelow M. Analyzing health equity using household survey data: a guide to techniques and their implementation; 2008 [cited 2021 Oct 17]. Available from: https://openknowledge.worldbank.org/handle/10986/6896.

12. Chu A, Kwon S, Cowley P. Health financing reforms for moving towards universal health coverage in the Western Pacific Region. Health Syst Reform 2019;5(1):32-47.

13. Fakhri MA, Juni MH, Rosliza AM. Assesing progressivity of out-of-pocket expenditures for health care: evidence from households in Malaysia. Int J Public Health Clin Sci 2019;6(3):187-202.

14. Hajimahmoudi H, Zahedi F. Justice in the healthcare system: payment and reimbursement policies in Iran. Iran J Med Ethics Hist Med 2014;6(3):1-16 (Persian).

15. Abolhallaje M, Mousavi SM, Jafari M. Implementation of performance-based budgeting in the health system: luxury or necessity? Iran J Public Health 2014;43(11):1593-1594.

16. Hajimahmoudi H, Zahedi F. Justice in the healthcare system: payment and reimbursement policies in Iran. Iran J Med Ethics Hist Med 2013;6(3):1-16 (Persian).

17. Murray CJ, Knaul F, Musgrove P, Xu K, Kawabata K. Defining and measuring fairness in financial contribution to the health system. GPE Discussion Paper Series: No. 24; 2000 [cited 2021 Dec 12]. Available from: https://apps.who.int/iris/handle/10665/68706.

18. Jafari M, Bastani P, Ibrahimipour H, Dehnavieh R. Attitude of health information system managers and officials of the hospitals regarding the role of information technology in reengineering the business procedures: a qualitative study. HealthMED 2012;6(1):208-215.

19. Bazyar M, Rashidian A, Alipouri Sakha M, Vaez Mahdavi MR, Doshmangir L. Combining health insurance funds in a fragmented context: what kind of challenges should be considered? BMC Health Serv Res 2020;20(1):26.

20. Doshmangir L, Rashidian A, Kouhi F, Gordeev VS. Setting health care services tariffs in Iran: half a century quest for a window of opportunity. Int J Equity Health 2020;19(1):112.

21. Jalali FS, Jafari A, Bayati M, Bastani P, Ravangard R. Equity in healthcare financing: a case of Iran. Int J Equity Health 2019; 18(1):92.

22. Mehrolhassani MH, Yazdi-Feyzabadi V, Lashkari M. Measuring

inequalities in the selected indicators of National Health Accounts from 2008 to 2016: evidence from Iran. Cost Eff Resour Alloc 2020;18:37.

23. Ghaedamini GH, Sharifian Sani M, Raghfar H, Salehi M. Inequality trend of selected items of consumption household basket in Tehran: 1989-2006. Soc Welf Q 2011;11(40):315-339 (Persian).

24. Kawachi I, Subramanian SV, Almeida-Filho N. A glossary for health inequalities. J Epidemiol Community Health 2002;56(9): 647-652.

25. Statistical Center of Iran. Household, Expenditure and Income Survey, 2022 [cited 2021 Jun 6]. Available from: https://www.amar.org.ir/english/Statistics-by-Topic/Household-Expenditure-and-Income#2220530-releases.

26. Jenkins SP. INEQDECO: Stata module to calculate inequality indices with decomposition by subgroup; 2001 [cited 2021 Feb 22]. Available from: https://ideas.repec.org/c/boc/bocode/s366007.html.

27. Haughton J, Khandker SR. Handbook on poverty and inequality; 2009 [cited 2021 Oct 12]. Available from: https://openknowledge.worldbank.org/handle/10986/11985.

28. Raghfar H, Zargari N, Sangari MK. Measuring inequality in households' health care expenditures in Iran. Hakim Res J 2013;16(2): 89-97 (Persian).

29. Statistics South Africa. Inequality trends in South Africa: a multidimensional diagnostic of inequality; 2019 [cited 2021 Oct 12]. Available from: http://www.statssa.gov.za/publications/Report-03-10-19/Report-03-10-192017.pdf.

30. Tregenna F, Tsela M. Inequality in South Africa: the distribution of income, expenditure and earnings. Dev South Afr 2012; 29(1):35-61.

31. Ghiasvand H, Naghdi S, Abolhassani N, Shaarbafchizadeh N, Moghri J. Iranian households' payments on food and health out-of-pocket expenditures: evidence of inequality. Iran J Public Health 2015;44(8):1103-1113.

32. Çinaroğlu S. Inequality and inequity in financing out-of-pocket health expenditures: an applied econometric approach. J Bus Res Turk 2018;10(1):876-897.

33. Zandian H, Takian A, Rashidian A, Bayati M, Zahirian Moghadam T, Rezaei S, et al. Effects of Iranian economic reforms on equity in social and healthcare financing: a segmented regression analysis. J Prev Med Public Health 2018;51(2):83-91.

34. Rezapour A, Mahmoudi M, Gorji HA, Faradonbeh SB, Asadi S, Zadeh NY, et al. A survey of Unmet health needs and the related barriers to access them. J Health Adm 2014;17(57):87-98 (Persian).

35. Kordbache H, Ahmadi Z. Evaluation the effect of exchange rate fluctuations on medical care price indexes in Iran. J Healthc Manag 2018;8(4):17-27 (Persian).

36. Noferesti M, Jalouli M. Analyzing the impact of the removal of basic commodity subsidies on the main macroeconomic variables within a structural macro econometric framework. J Econ Model 2010;1(1):81-105 (Persian).

37. Jalali FS, Jafari A, Bayati M, Bastani P, Ravangard R. Equity in healthcare financing: a case of Iran. Int J Equity Health 2019; 18(1):92.