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The Variations in Catastrophic and Impoverishing Health Expenditures, and Its Determinants in Iran: A Scoping Review

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Abstract

Background: The high reliance on out-of-pocket (OOP) payments for health financing in Iran have been led to different inequity problems such as catastrophic health expenditure (CHE) and impoverishment. This scoping review has been conducted to understand the variations in CHE and impoverishment, the underlying determinants of CHE, and its inequality in the past 20 years.

Methods: This scoping review is guided by Arksey and O'Malley's scoping review framework. systematically PubMed, Scopus, Web of Science, ProQuest, Scientific Information Database, IranMedex, IranDoc, Magiran Science, Google Scholar, and grey literature were searched systematically from 1 January 2000 to August 2021. We included studies that reported the rate of CHE, impoverishment, inequality, and its influencing factors. Simple descriptive statistics and narrative synthesis were used to present the review findings.

Results: From 112 included articles, the average incidence of CHE was 3.19% at the 40% threshold, and about 3.21% of the households had impoverished. We found an unfavorable status of health inequality indices, including the average of fair financial contribution (0.833), concentration (-0.01), Gini coefficient (0.42), and Kakwani (-0.149). The most widely applied key drivers influencing the rate of CHE in these studies were household economic status, place of residence, health insurance status, household size, head of the household's gender, education level and employment status, having a household member under 5/ above 60 years old, with chronic diseases (in particular cancer and dialysis), disability, using inpatient and outpatient and dentistry services, medicines and equipment, and low insurance coverage.

Conclusion: The result of this review calls for intensifying health policies and financing structures in Iran to provide more equitable access to all populations, especially the poorest and vulnerable. Moreover, the government is expected to adopt effective measures in inpatient and outpatient care, dental services, medicines, and equipment.

Keywords: Catastrophic healthcare expenditures, Impoverishment, Health equity, Out-of-Pocket, Iran

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Introduction

Growth of health expenditures and increase in their share of Gross Domestic Product (GDP) are awesome concerns for both households and governments in most middle and low-income countries (LMICs), especially in developing countries like Iran (1). Financial protection (FP) for the household is a key function of the third goal of sustainable development (SDGs) and a key dimension of Universal Health Coverage (2, 3). Out-of-pocket payments (OOPs), the predominant form of health care financing in Iran, have hindered the drive towards UHC and

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↑What is "already known" in this topic:
In Iran, the share of households that experienced catastrophic health expenditure (CHE) and impoverishment, is non-negligible. This study revealed evidence of inequity in financial hardship particularly for the poor, when accessing health care services Also, the findings of this study can help decision-makers by clarifying the determinants of CHE.

→What this article adds:
This study highlights the need to develop policies aimed to expand access and affordability of dental care, medicines, and equipment to mitigate related financial burdens on a large part of the Iran population.

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the attainment of SDGs (4). Moreover, payments affect the poorest households disproportionately, thereby exacerbating inequality (5). According to World Health Organization (WHO) and the World Bank (6) recommendation, the most commonly used indices to evaluate and control the financial protection status is the rate of households' exposure to catastrophic health expenditure (CHE) and impoverishment (7). CHE has been defined as out-of-pocket payments above a share of total household expenditure or non-food expenditure that forces households to sacrifice other basic needs, sell assets, incur debts, or become impoverished (8). According to the WHO's definition, CHE occurs when households' payments on health reach at least 40% of the family's nonfood expenditures (9). Health expenditures are considered impoverishing when they push a person below the poverty line, i.e., expenditures gross spending on health are above the poverty line but expenditures net of health spending are below the line (10).

In 2019, over 930 million people worldwide experienced financial hardship while obtaining health care, and annually, about 100 million people were impoverished (2). According to the 2019 report by the WHO in the Eastern Mediterranean Regional Office (11), a huge portion of health services in Iran is paid OOPs, which is around 39.49% of the current health expenditure, while this portion amongst EMRO countries is around 36.22% (12). According to a systematic review and meta-analysis study in Iran (Aryankhesal A et al. in 2018), the percentage of households exposed to CHE was 7.5% (95% CI, 6.2–9.1) (13). Another systematic review in Iran (Rezaei S et al. in 2019) showed that on average, about 7 % of the households were exposed to CHE (14). According to another systematic review and meta-analysis study in Iran (Doshmangir L et al. in 2020), the rate of CHE in Iran at the population level is 4.7% and across diseases, the percentage of CHE is 25.3% (8). So, CHE has become major concern for health policy makers in Iran over the past decades. Also, the economic sanctions instituted against Iran have had adverse effects on population health and health equity in Iran. This situation may get worse in view of the coronavirus outbreak that has generated a loss of jobs, revenue, and a decrease in the economic activities accompanied by an ineffective running health system.

Reducing the incidence of CHE and impoverishing is a key policy objective of governments in Iran. However, the design and implementation of appropriate policies require accurate, up-to-date evidence on the rates of CHE and impoverishment and its determinants. There is extensive literature on the determinants of health expenditure in Iran, but based on the same definition and measurement of CHE, most studies in Iran utilized cross-sectional survey data or limited 2 or 3-year longitudinal comparison studies. Our aim was to fill this evidence gap by performing a scoping review of population-based studies of CHE and impoverishment in Iran. In particular, we have focused on variations that exist in the distribution of CHE and/or impoverishment, the associated risk factors, and monitor the trend of financial protection indicators.

Methods

Given the aim of the study, a scoping review was adopted. According to (15), scoping reviews are an interesting tool to determine the scope or coverage of a body of literature on a given topic. Clear indications of the volume of studies available can be obtained, as well as an overview (broad or detailed) of their focus. This scoping review is based on the framework proposed by Arksey and O'Malley (16) and incorporates recommendations proposed by Levac (17). Indications and recommendations from the manual published by the Joanna Briggs Institute (JBI) (18) have also been taken into consideration. In addition, reporting has been elaborated in accordance with the Extended Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement for Scoping Reviews (PRISMA-ScR) (19). This scoping review follows the five recommended steps in completing scoping reviews (16): (a) identifying the research question; (b) identifying relevant studies; (c) study selection; (d) charting the data; (e) collating, summarizing, and reporting the results.

A. Eligibility criteria

Studies were eligible for inclusion in this scoping review on the basis of the following main concepts, established by the Population, Concept, Context (PCC) framework recommended by the (JBI) (18). Based on the initial exploratory search and discussions among the review team members, the full eligibility criteria are described in Table 1.

B. Search strategy and data sources

Studies were identified through electronic database searches, reference citations, online grey literature searches and expert consultation. The electronic database searches were restricted to Web of Science (WoS), PubMed, Scopus Elsevier, Magiran, IranDoc, IranMedex, Scientific Information Database (SID), and Google scholar databases from 2000 to December 2021. Multiple information sources have been chosen in an attempt to develop a search strategy as comprehensive as possible. We have not limited our analysis to studies published in journals or publications. We also searched for gray literature from relevant organizations' virtual libraries such as the WHO , WB, and Ministry of Health and Medical Education (MOHME) by following the methods outlined in "Grey Matters: a practical tool for searching health-related grey literature" (20). We did not use search filters because we aimed to generate a broad list of studies that would be suitable for answering our research question. The search strategy was designed by a medical research librarian and it consists of both text words and Medical Subject Headings (MeSH) terms related to "out-of-pocket expenditure, "financial risk protection", "catastrophic health expenditure", and "impoverishment". We searched in English and Persian. We used published and validated filters to search the following conceptual areas:

1. Primary incidence and intensity of catastrophic healthcare expenditures and impoverishment in Iran.
2. Secondary the determinants of catastrophic healthcare

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Table 1. Eligibility criteria

Inclusion criteria	
Source of information	Studies were included only if they were published in peer-reviewed journals or in grey literature that is accessible publicly.
Time frame	From 2000 to December 2021.
Language	Abstracts in the English language; full-text in English and Persian languages.
Research location	Iran
Study population	This review includes studies that focus on all population groups, including vulnerable groups such as people with disabilities, diseases, the elderly, or children, in rural and urban areas living in Iran.
Types of interventions	Factors or determinants that influence the CHE and impoverishment of Iranian households. We particularly look at the incidence of CHE and healthcare impoverishment, defined as the proportion of households whose out-of-pocket spending on healthcare is catastrophic or drives them into poverty. Also, the most important indicators of financial protection included showing how far we are to accessing goals for UHC
Type of studies	any primary study in English or Persian assessing, measuring, or reporting catastrophic healthcare expenditures and/or household health impoverishment due to out-of-pocket payments in health care and/or factors affecting them across demographics and diseases, and studies conducted in Iran. We reviewed studies that assess the risk factors associated with the observed levels of incidence in CHE.
Types of articles	All types of study designs, applied studies, concept discussion papers, books, theses and dissertations, gray literature, descriptive observational studies including cross-sectional studies, case-series, case-report, comparative or longitudinal studies, analytical observational studies, including prospective and retrospective cohort studies, case-control studies, and analytical cross-sectional studies, and general articles (including commentaries or editorial articles), experimental and quasi-experimental study designs including randomized controlled trials, non-randomized controlled trials, before and after studies, and interrupted time-series studies, were considered for inclusion.
Exclusion criteria	
Type of studies	Methodological studies, discussion papers, general literature reviews, qualitative studies, Case reports, case series, systematic reviews, narrative reviews, letters to editors, commentary pieces and study protocols.
Language	Any other language
Time restriction	Before 2000

expenditures and impoverishment.

A three-step search strategy was utilized (21). The first step was involving a limited search of two initial databases: Medline and PubMed, followed by an analysis of subject headings and search terms based on titles and abstracts identified. A second search was then conducted using all identified subject headings and keywords across all databases identified below. Finally, the reference lists of all articles that were selected for inclusion in this review were searched for additional studies. If required, authors of relevant studies or reviews were approached for supplementary information. After publications were identified, their bibliographies were checked for any relevant papers not found in the first search. An updated record of searches was kept to check when the same search terms were applied in other databases. The search was performed on the 22nd of August 2021. The detailed search chain applied to search for articles in the various databases is provided in Appendix 1.

C. Study selection

The selection was performed based on the inclusion criteria pre-specified in stage A of the review and was conducted in the following two-step process.

Step 1: In the first step and after duplicate removal, one reviewer (M. H) screened the title, abstract, keywords and conclusions of each article. As outlined in the previous section, the search could not be automatically limited to title-abstract-keywords fields in all bibliographic databases, so this initial screening removed all studies that did not include at least one of the keywords in the AND operators of the search in the mentioned fields. Studies non-related to the research questions were also removed through this process.

Step 2: After this first screening process concluded, the remaining studies were divided into four parts so that each article could be reviewed by two authors (M. H, I. MA). The content of the remaining article's title, abstract, keywords, and conclusions were screened and tagged with one of the indicated options: Included, Excluded or Unsure. Reviewers (M. H, I. MA) could leave comments if necessary. However they were highly recommended, especially if studies were not included. If both reviewers tagged an article as Included or Excluded, the decision on the inclusion or exclusion was indicated and the screen resulted in an agreement. Two Unsure tags or any combination of different tags represented a disagreement, which was handled by having the articles reviewed by the rest of the reviewers.

D. Data Charting

Data charting (i.e., extraction) was performed using an Excel worksheet, and the data extraction form was developed by the authors to record study characteristics and variables relevant to our review question. Two reviewers (M. H, S. G) extracted at least 20 percent of the results independently to provide a logical and descriptive summary. As the extraction process was iterative, the draft table was updated and refined during the conduct of the scoping review. Many of the data items to be charted have been previously tested by the authors in systematic reviews of other interventions used in catastrophic health expenditures or have been based on the authors' experience in conducting studies on health equity. Authors of studies included in the review were contacted to obtain or confirm information (i.e., by contacting the first or last authors of studies by email).

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E. Synthesis of Results

The analytical framework was used for data synthesis and thematic analysis. The main reviewer (M. H, I. MA, MR. M) extracted and analyzed data from all articles in consultation with the other authors. Since the dataset included different study designs, and therefore descriptive statistics and narrative synthesis were used.

Although all charted information has been used for the elaboration of this review, some items were not directly shown on tables or figures. The following items are Purpose/aim, Result, and Conclusions. For more details, the full charting form is available in the Appendix section.

Results

Study selection

The initial search identified a total of 848 articles from the main journals and another 2 articles from the additional databases of google scholar. Once duplicates were removed, a total of 730 articles remained. Using title and abstracts, one reviewer (M. H) screened all the identified articles based on some agreed inclusion criteria with the other three authors (I. MA, MR. M, S. G). A total of 500 articles were excluded. The main reason for dropping 500 studies included the fact that the outcome was not examining health equity and financial protection indicators. Also, these articles have not provided us the information about catastrophic and impoverishing health expenditure and its determinants. A total of 149 articles remained that were fully assessed for eligibility; a second reviewer (AA. F) went through these selected articles and provided recommendations. The reviewers had concurrence to include 112 articles in the final review analysis. Figure 1 illustrates the PRISMA-ScR (22) flowchart.

Characteristics of the included studies

The included studies were published between 2000 and 2021, and the data collection was done between 2000 and 2020. All papers used in our analysis were published in English (66 %) and Farsi (34 %). Of the 112 studies assessed, about 49% of the studies are national-level studies, which means they have used data extracted from national surveys for analyzing CHE/impoverishment and the de-

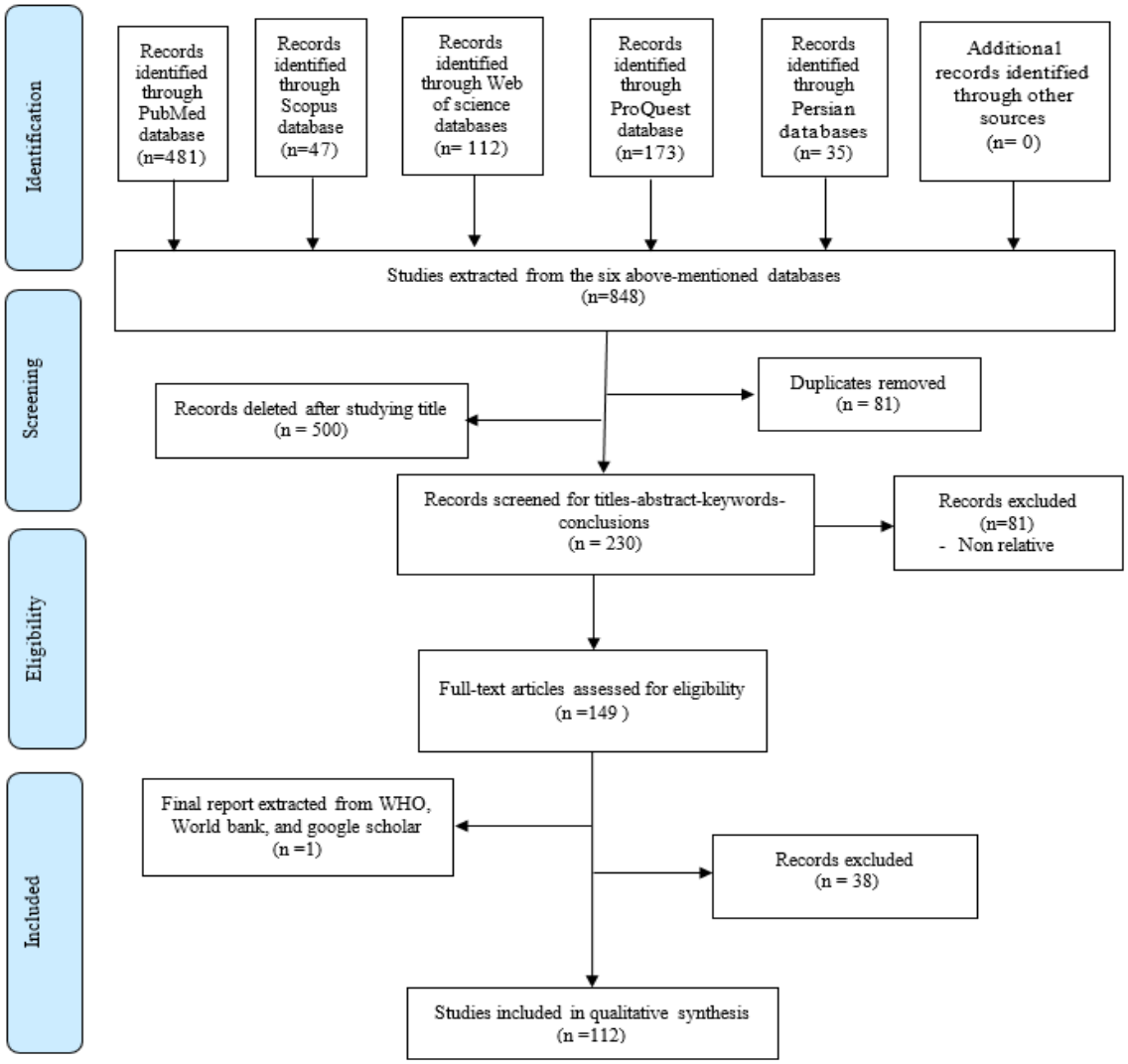

Figure 1. PRISMA-ScR studies flow chart developed

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terminants of CHE, and 51% of studies were across provincial populations. 28% of the studies conducted at the provincial-level have been conducted in Tehran. The main part of the studies (57%) were performed between 2016 through 2021. All the studies identified were observational, of which 62% were cross-sectional studies. 58% of studies used primary data and 42% of studies used secondary data. A review of the studies conducted in Iran revealed that the data required to calculate CHE was provided by 3 different questionnaires. Some studies (11%) calculated CHE and impoverishment based on household income and expenditure survey data issued annually by the Statistical Center of Iran (SCI). Other studies have used the WHO survey (37 papers) or a self-administered questionnaire (16 papers) to collect data. 33% of studies with primary data use the WHO questionnaire for data collection. The sample size ranged from 100 to 1940613. Of the 14 studies that focused on the disease, 5 studies focused on cancer patients, and 3 studies focused on dialysis patients. 44% of studies have used the logistic random effects regression model to analyze the factors affecting the CHE (Appendix 2).

Incidence and intensity of catastrophic health expenditure in Iran

112 studies addressed the trends of incidence and intensity of CHE and headcount ratio of impoverishing health expenditure (IHE) due to OOP health expenditure at the national and provincial levels in Iran. Different thresholds were used to define CHE in the different studies; however, 40% of nonfood expenditure was the most commonly used single threshold. Some studies also estimated CHE at multiple thresholds. The following results are reported with a threshold level of 40% of income. The large majority of studies focused only on the incidence of CHE (n = 78), while some focused on both incidence and intensity (n = 5), and a set of others focused on the determinants of CHE (n = 101). Also, 18 studies focused on impoverishment health expenditures.

At the national population level, the average incidence of CHE was 3.19% from 2000 to 2020. The total, urban, and rural CHE incidence all showed a variable trend, ranging from 0.3 to 32.7% for total households. The lowest percentage of CHE in the studies conducted from 2000 to 2020 at the national population level is reported by Hajizadeh M et al. in 2003 among 3514 Iranian households using hospital services (0.3%) (23), while the highest percentage of CHE rate is reported by Moradi, G et al. in 2020 among 2000 Iranian households with disabled children aged 0 to 8 years (32.7.3%) (24). Further analysis reveals that the percentage of CHE is 3.83% in studies that use primary data (N:13) and 3.37% in studies that use secondary data (N:42). Studies with primary data use the questionnaires and interviews for data collection, while those with secondary data use data from the Household Income and Expenditure Survey (HIES) which is collected regularly by the Iran Statistics Center (ISC). Among reviewed studies, three studies conducted at the national level have declared higher CHE percentages (15.31% in 2001 (25), 11.58% in 2013 (23), and 32.7% in 2020 (24)) which have increased the overall mean of CHE from 2.48% to 3.19 %.

At the provincial population level, the average incidence of CHE was 18.51%. The lowest percentage of CHE in the studies conducted from 2000 to 2020 was reported by Yavangi, M. et al. in 2009 among 1172 cases of teaching hospitals in Tehran (0.4%) (23), while the highest percentage of CHE rate is reported by Piroozi, B et al. in 2018 among 189 Kurdistan households with gastrointestinal cancer patients (72.7%) (26). Further analysis reveals that the percentage of CHE is 20.4% in studies that use primary data (N:52) and 4.48% in studies that use secondary data (N:5). 24% of the studies conducted at the provincial level were focused on disease groups, in which the patients with cancer and dialysis experienced the highest incidence of CHE. The percentage of CHE at the diseases level is 35%, ranging from 3.37 to 72.70%. The highest percentage of CHE is observed among households with gastrointestinal cancer patients (72.70%) (26) and dialysis patients (72.5%) (27), while the lowest percentage of CHE at the diseases level is observed among households with at least one of their members suffers from MS (3.37%) (28). In a study by Kavoosi and colleagues on CHE in a southern Iranian city, the CHE rate is reported to be 67.9% among cancer patients (29) (Appendix 3).

The intensity of CHE is calculated using two measures, including overshoot and mean positive overshoot (MPO) measures. Overshoot shows the average degree by which OOP payments exceed the threshold. The overshoot of CHE also varied in rural (11.7–19.7 %) and urban (11.4–20.0 %) areas and for all households (0.26 – 0.65%). The average overshoot intensity of CHE at the national population level was 10.1%. The MPO ranged from 12.26% to 20.86%, respectively and the average MPO was 12.47%. Only one study at the provincial level have reported the intensity of exposure to CHE (30). In this study, the MPO and overshoot for 1065 type 2 diabetes patients in Isfahan, Sabzevar and Sanandaj were 27.7% and 4.6% (30).

Household impoverishment due to catastrophic health expenditure is measured using different poverty lines in different studies, including the subsistence poverty line, the national poverty line (NPL), and the international poverty line (IPL). The review of the papers showed that about 3.21% of the households at the national population level had impoverished due to health care expenditure. The impoverishing health expenditure also varied in rural (0.02–5.4 %) and urban (0.4–4.5 %) areas. and for all households (0.9–11.5%). Also, 4.78% of the households at the provincial population level had impoverished due to health care expenditure. Impoverishment at the provincial level ranged from 0.28 to 10.2% (Appendix 3).

Financial protection indicators

Fair Financial Contribution Index (FFCI) is an indicator that can help policymakers recognize the flaws in the financial protection mechanisms embedded in the health financing system. FFCI generally reflects inequality in the financial contribution of households in health, although it explicitly reflects households that face catastrophic health expenditures. It was constructed to vary from 0 to 1; the

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fairer the health financing system, the closer FFC will be to 1. The average FFCI was 0.833 ranging from 0.75 to 0.90. The worst fair contributions to health expenditure in urban (FFCI = 0.79) and rural areas (FFCI = 0.75) occurred in 2010 which was reported by Raghfar, H et al. among 30000 Iranian (31). Otherwise, the best fair contributions for urban areas (FFCI = 0.901) and rural areas (FFCI = 0.866) were made in 2007, was reported by Ghiasvand, H et al. among 36475 Iranian (23).

Some studies used the concentration index (CI) as the main indicator to analyze equity in health financing. The range of the concentration index (CI) changes is between − 1 and + 1. If the concentration index is + 1, all health expenditures have been paid by the richest person in the population. If the concentration index is − 1, all health expenditures have been paid by the poorest person in the population, and if it is equal to 0, the payments are proportional to income. The average CI was -0.01 and ranged from -0.23 to 0.55. The worst CI was reported by Yazdi-Feyzabadi, V et al. in 2011 among 38434 Iranian (Rural: -0.21, Urban: -0.23) indicating the disproportionate concentration of the health variable among the poor households (32).

The Kakwani index can show the regressivity or progressivity of the health financing system and is a valuable index in the measurement of equity in health financing. The value of Kakwani ranges from -2 to 1. If the index is greater than zero, there will be progressive financing, and if it is less than zero, the financing will be regressive. The average Kakwani index was -0.149 at the national level. The worst Kakwani reported by Rezaei s et al. in 2017 (−0.207) (33).

The Gini coefficient is one of the most popular measures of inequality. The range of the Gini coefficient changes is between zero and one. If the Gini coefficient is zero, there will be perfect equality of income distribution. In contrast, if the Gini coefficient is one, there will be complete inequality in the distribution of income or expenditures. The average Gini coefficient was 0.42 at the national level. The worst GINI was reported by Ghiasvand, H et al. in 2012 (Rural: 0.52, Urban 0.52) (34). Appendix 4 shows four different indices of health inequality extracted from articles.

Determinants of catastrophic health expenditure

One hundred and one (101) studies of the reviewed articles assessed the determinants of CHE in Iran. The articles assessed various determinants; thus, this review will discuss the overarching determinants reported in the majority of studies. The synthesis results are presented in Appendix 5. As the table depicts, 107 criteria were selected from the scoping review. Due to the diversity of determinants in terms of number and nature, they were divided into six categories. The categories included demographic characteristics of the household, socioeconomics characteristics of the household, vulnerable persons in the household, Health care utilization by household members, health expenditure indicators, and macroeconomic indicators. The most widely applied key drivers influencing the rate of CHE in these studies have been shown in Figure 2.

1. Socioeconomics characteristics of households

Studies show that the risk of CHE and impoverishment are closely linked with the socioeconomic characteristics of households. In 51 articles of the reviewed articles, a household's economic status which was categorized as Q1 to Q5, is considered one of the significant factors in facing CHE. Households in poorer quintiles are more at risk of suffering CHE and their impoverishment is more probable. In 36 articles, Household settlement (rural vs. urban) is mentioned as the most important factor in facing CHE. Having health insurance or not has been considered an important driver in describing the condition of being involved in a catastrophic situation (28 studies). Another proxy for socioeconomic status mentioned in 10 studies was the wealth index. Individuals are ranked according to their wealth index value and divided into quintiles with the poorest individuals in the first quintile. There is a correlation between the wealth index and CHE. In addition, 9

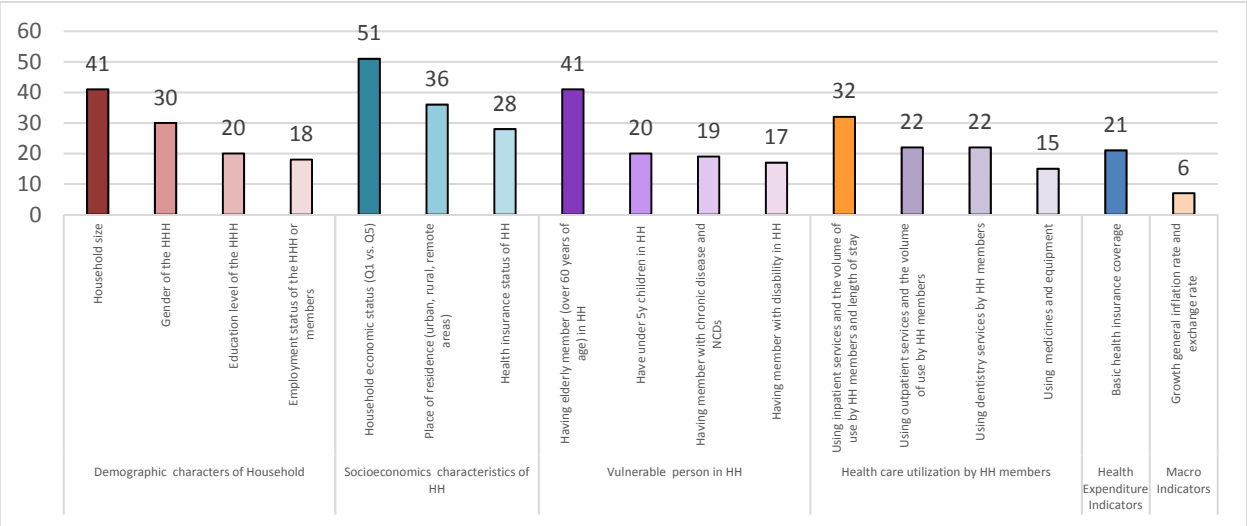

Figure 2. Total Studies that This Factor Analyzed as Determinant of CHE

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studies indicated that homeownership affects the incidence of CHE. Also, per capita household or housing infrastructure was another socioeconomic factor affecting the incidence of CHE mentioned in 3 articles. In 10 articles of the reviewed articles, it is stated that having basic and supplemental health insurance has a meaningful effect on the risk of exposure to catastrophic expenditures. It is stated in 4 studies that CHE rates varied across affiliates of the different insurance schemes.

2. Demographic characters of household

The relationship between the demographic characteristics of the household's head and members and facing CHE was mentioned in the majority of studies. The independent variables include demographic indicators of the household, such as the household size which was recorded as less than five members and more than five members (reported in 41 studies), and the gender of the households headed which was categorized as male and female (reported in 30 studies) have been mentioned in more articles as the most important driver in facing CHE. The education level of the households headed was re-categorized into no education, primary education, secondary education, and post-secondary education (reported in 20 studies). The employment status of the household head was categorized as employed and unemployed (18 studies); the age of the household head (9 studies), and the marital status of HHH was re-categorized into Single, married and widowed (6 studies) were another demographic factors of facing CHE. Other independent variables include the Male ratio of households (2 studies), households in which the head is a student (1 study), and the age of the household's member at disease incidence (1 study).

3. Vulnerable person in the household

It is observed that the presence of vulnerable persons in the composition of the household was the most important factor in facing CHE. The aging population and having an elderly member were significantly associated with a higher incidence of CHE in 41 studies. It is mentioned in 20 studies that when the number of people aged under 5 years is high, the household has higher needs for healthcare services and, thus, is more likely to face a health-related financial disaster. 19 studies mentioned that the people with chronic illness in the household increased the likelihood of household exposure to CHE. 14 studies determined the percentage of households with cancer, dialysis, MS, SMDs, diabetic, and hospitalized patients that face CHE. Among non-communicable diseases (NCDs), cancer and dialysis patients have more likely to face CHE. Furthermore, in 17 articles, it is stated that people with disabilities experience more barriers to accessing health services and the presence of disabled people in the household increases the risk of exposure to CHE. 7 studies also show a direct association between CHE and having a member in the household in need of care. Furthermore, variables such as the health status of the member of the household, households with at least one hospitalized member, and having a smoker member were found to have a statistically significant association with CHE.

4. Health care utilization by household members

Healthcare needs and service utilization are key determinants of CHE. It is clear that increasing the number of admissions raises the services provided to the patient and the subsequent cost of healthcare, which can also amplify the likelihood of facing CHE. Different studies focused on different services, including the using inpatient services and the volume of uses (reported in 32 studies), outpatient services (reported in 22 studies), dental care (reported in 22 studies), medicines and equipment (reported in 15 studies), diagnostic services (reported in 12 studies), physiotherapy and rehabilitation services (9 studies). Also, private health services were positively associated with exposure to CHE because of the high price of treatment, especially for outpatient services (reported in 6 studies). 2 studies found that utilizing cancer treatments (e.g., chemotherapy), utilizing dialysis services and volume of used by household members, have a statistically significant positive association with the occurrence of CHE.

5. Health expenditure indicators

20 studies indicated that limited basic health insurance coverage is a key determinant of CHE. In addition to basic health insurance, complementary health insurance offers introductory packages that include surplus services, but 8 studies indicate that low coverage of services and high levels of co-payment in complementary health insurance lead to households experiencing a higher risk of CHE and economic hardship. Despite the fact that, equitable access to healthcare services is strongly endorsed by the Iranian health care policy and constitution, 7 studies show that financial burden, geographical inaccessibility and cultural barriers to receiving health services were important factors in facing CHE. Moreover, in 6 studies, there was a significant negative relationship between medical density and CHE. 3 studies have considered the structure of Iran's mechanism of healthcare tariff as one of the main factors in increasing CHE. Other health expenditure indicators that affecting CHE rate included: informal payment for healthcare services, inequality in distribution of facilities (income, education, skills, jobs, opportunities, physician, specialized manpower, health expenditures, and expectations), household health expenditures, increasing consumption of expensive high-tech health care services, health care tariff growth rate, physician visits, change of consumption towards branded drugs, time of diagnosis, refraining from using healthcare services, high inflation rates in the health sector, households' willingness to pay for health services, lifestyle pattern and self-care behavior, payment mechanisms, adoption of public insurance law, the implementation of health transformation plan in 2014, Per capita public health costs, Quality of health care, Type of hospital, Induced demand (consumer or supplier), weakness in service delivery and surveillance system, real prices of health services, reduction of accumulation of insurance resources, multiplication of basic insurance funds, clinical guidelines, disease outbreaks, lack of financial protection, Out-of-pocket Share in Total Health Expenditure, Sources of Growth in OOP and Prepayment

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Funds, Referral path system, The costs of dying and time-to-death, Inequality indicators (Horizontal & Vertical), Out-of-pocket changing rules and indicators, differences in health payments among different deciles in urban and rural areas, inefficiency of the insurance system, having made any out of hospital payments linked with the same admission, contingent valuing of health insurance premium, failure in the rules of economic evaluation, lack of well-organized services by the public sector hospitals and clinics or the health insurance support, lack of preventing the private medical persons to work out of the regulated tariff rules or to ignore the insurance organization rules easily, inefficient social health insurance mechanism to reduce the direct payments from households, health financing distribution indicators of FFCI medical education policies.

6. Macroeconomic indicators

At the macro level, 36 Studies have indicated a strong and positive relationship between OOP health expenditures and indicators of macro-economic profiles such as growth general inflation rate, GDP per capita, budget deficit, illiteracy rate, domestic general government health expenditure (GGHE-D) as a percentage of GDP, the general government health expenditure (GGHE) as a share of Total health expenditure (THE), gross national production (GNP), liquidity rate, national income, national consumption, urbanization rate, civil status, Iranian targeted subsidy plan, unemployment rate, life expectancy increase, inequality conditions of the distribution of the risk of financing, quality of life, population aging, population rate, dependency ratio, currency price unification policy, and sanction and war. 6 studies indicated that a major part of the high rate of households' exposure to CHE was related to the high annual inflation rate in Iran's economy.

Discussion

To the best of our knowledge, this is the first scoping review on criteria for determining catastrophic and impoverishing health expenditures and their variations in Iran. Rates of catastrophic health expenditure (CHE) and impoverishment from health expenses provide insight into the level of financial protection that a health care financing system provides for its citizens. Moving toward Universal Health Coverage (2, 3), health systems need to determine factors affecting CHE. In the present review, we attempted to collect the trend of incidence and intensity of CHE, impoverishment, inequality, and the drivers of CHE used in different studies and categorize them.

Based on the reviewed studies, the overall CHE incidence is estimated to be 3.19% (at a 40% threshold), and the average overshoot and MPO intensity of CHE was 10.1% and 12.47% at the national level. At the provincial population level, the average incidence of CHE was 18.51%. Some provinces in Iran incurred higher CHE relative to the other regions. This could be because most studies utilized convenient sampling of pre-selected vulnerable groups or patient groups with small sample sizes. At the level of diseases, the percentage of CHE is estimated to be 35%. Also, a review of articles has shown that 3.21% of the households at the national level faced impoverishment by falling below the poverty line due to healthcare expenditure from 2000 to 2020.

Results showed that the CHE level decreased after the health transformation plan implementation in 2014 (2.92% before plan implementation vs. 2.1% at the national level after plan implementation) (35). Despite the policies developed and actions have been taken to reduce OOPs, levels of CHE increased to 3.7% in 2020 (36). Also, the analysis revealed that studies that use WHO questionnaires for data collection report higher levels of CHE than studies that use the HIES survey. A systematic review conducted by Ghorbanian et al. in 2015 (37) and Doshmangir et al. in 2020 (38) revealed that studies that use the WHO survey for data collection report higher levels of CHE than studies that use the HIES survey. Their review estimates levels of CHE at 3.91% (37) and 4.7% (38) at the population level, which is near to the estimated CHE at the national level in this study.

Despite the fact that health equity and equitable access to healthcare services are strongly endorsed by the Iranian health care policy and constitution, according to reviewed studies, the equity indicators were not favorable. The results of this study showed that the average Gini coefficient among the studied households was 0.42, indicating alert condition inequity in health resources. Given that the concentration had a negative value in most studies and the average was -0.01, it could be concluded that the OOP payments were most concentrated in poor households than in rich ones. The average Kakwani index for health expenses was negative (-0.149) and indicated regressive financing in health care. FFCIs have shown higher inequalities in rural (Mean FFCI=0.818) areas compared to urban (Mean FFCI=0.841) areas. The average FFCI was 0.833, so there is a difference between the present level of FFCI and the targeted amounts (as determined as 0.9) in Iran's national development plans. In another study in 2021, Darvishi et al. showed that an average of more FFCI had been made from 2014 to 2018 after Iran's health transformation program, especially in rural areas (from 0.816 to 0.809), but less than that expected in upstream documents (39).

Finally, six categories of drivers affecting CHE were recognized in terms of demographic characteristics of the household, socioeconomic characteristics of the household, vulnerable persons in the household, health care utilization by household members, health expenditure indicators, and macroeconomic indicators. The findings of the current study are in line with previous studies of CHE and economic impoverishment in Iran (13, 14, 38, 40-42). Another study in China by Xian-zhi Fu shows that the major contribution to CHE incidence was associated with socioeconomic status, receiving inpatient services, having elderly members, and the education of the household head (43). The most important drivers of CHE are summarized in subsequent sections.

Health-care needs, utilization, and capacity to pay

The risk of CHE and impoverishment is closely linked with economic status. Our analysis of CHE incidences

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across economic quintiles found the highest proportion of CHE among the poorest group of households (reported in 51 studies). The poorest households had lower spending capacity (lowest expenditure level), and the OOP spending constituted a large proportion of their total expenditure. Therefore, they were more prone to face CHE, especially in the absence of any insurance program to cover healthcare expenditures. This demonstrates that there is significantly less financial protection going to the poorest sections of the population in Iran. Rahman et al. found that households in Bangladesh were facing CHE higher in the poorest households than in the richest ones (44).

Having members with chronic illness and NCDs in the household increased the likelihood of household exposure to CHE (reported in 19 studies) because the routine medication and complicated long-term hospitalization have incurred high OOP spending and reduced the household's ability to pay for the healthcare of the head or other household members. In some Asian countries, households with members who had a chronic disease and NCDs were at a higher risk of experiencing CHE (45). In Indonesia, Marthias and colleagues show that NCDs were associated with a higher number of outpatient visits (compared with those without NCDs), incidence rate ratio, and inpatient visits and also associated with a greater likelihood of experiencing catastrophic health expenditure (46). Whereas, in Sub-Saharan African countries, Njagi and colleagues show that CHE amongst West African countries and amongst patients receiving treatment for HIV/ART, TB, malaria, and chronic illnesses was higher. Also, socioeconomic factors are seen to drive CHE, with the poor being the most affected (47).

Our review results show that health care needs and service utilization are key determinants of catastrophic health expenditure. The chance of exposure to CHE in households using inpatient and outpatient services was more (reported in 32 studies). Despite having a major reform in this period, we observed that the proportion of households using these services facing CHE increased. One possible reason for this can be that a significant part of outpatient services including dental services, general practitioner and specialist visits, medical diagnostic services, medicines, and medical equipment, are provided by the private sector. Dentistry services are among the more expensive healthcare services in Iran and are not usually covered by basic health insurance benefit packages (reported in 22 studies). This finding supports the results of other studies conducted in other countries such as Brazil (48) and Korea (49).

Demographic factors

The majority of the socioeconomic inequality in CHE is due to inequalities in residency in rural areas, household size, having at least a child under five years old and over 65 years old member, education level of household head, and employment status of the household head or members. We discuss these findings in the paragraphs that follow:

The aging population and having an elderly member were significantly associated with a higher incidence of CHE (reported in 41 studies). This is because older people are more vulnerable to any illness, including chronic conditions and geriatric health problems. A neighboring country, like India, also experienced a higher risk of CHE among households with older people (50, 51).

A large household size (five or more persons per household) is significantly associated with high CHE (reported in 41 studies). These households tend to devote a high share of their budget to rival goods such as food, and they have less capacity and ability to pay. Researchers have expressed a concern that a large number of households in developing countries are vulnerable to CHE (52).

we find that residency in rural areas contributes to the majority of socioeconomic inequality in catastrophic health expenditures (reported in 36 studies). The relative positive contribution to socioeconomic inequality indicates that residency in rural areas increases inequality in catastrophic expenditure, disfavoring the poor. Huge rural-urban income inequalities coupled with poor geographic accessibility of public health facilities in rural areas create inequality in access to and use of health services disfavoring poor rural households. So, the family physician and rural insurance policies have not made much improvement in the trend of exposure to CHE in rural areas. Due to poor geographical accessibility of public facilities poor rural households may incur other costs associated with seeking care such as transportation which puts them at risk of CHE, as observed by other studies in Malawi (53, 54). Also, the study in China demonstrated the incidence of CHE was higher in rural compared with urban areas (43).

The education level of the head of the household and members might affect CHE (reported in 20 studies). With education, individuals are more likely to take care of their health, thus reducing OOPs and the likelihood of incurring CHE. More education is generally associated with more income. This provides an incentive for people to take care of their health which results in lower healthcare spending. Moreover, the employment status of the household head or household members was another driver of facing CHE (reported in 18 studies). It's because unemployed households were more likely to experience CHE, and this may be because of the interruption of household income and low-income families with members who had either lost a job or were already unemployed were more likely to incur CHE. Households headed by a male or by someone with higher education or employment are less likely to suffer catastrophic health expenditure. This finding supports the results of other studies conducted in Vietnam (55) and China (56). 15 studies included in this review showed that the medicines, equipment, and supplies alongside the medical diagnostic procedures are the main determinant of households' exposure to CHE. These results were consistent with the study in Poland (57).

Health insurance

The findings from this review indicated that the role of health insurance in protecting individuals from CHEs in Iran is limited. It means that there was no significant difference between insured and uninsured people in facing CHE, and therefore, it seems that individuals incurred

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financial hardship due to health care usage regardless of the existence of health insurance coverage. Some previous studies in low and middle countries also have found partial or no impact of health insurance on out-of-pocket and CHE depending on the structure and services offered by the scheme (58-60). In Iran, health insurance coverage increased from 83 percent in 2010 to 96 percent in 2014 (61). Despite the improvement in population coverage, the benefits packages and also the costs covered by health insurance schemes remain limited in Iran. For instance, several health services such as some diagnostic tests, dental care, physiotherapy, and rehabilitation services, are not covered by health insurance. Moreover, the services included in the benefits package are not fully covered by their costs. Also, the basic insurers tried to reduce their costs and then raise productivity; therefore, they could not play effective roles in decreasing the households' OOP payments. In addition to basic health insurance, complementary health insurance offers introductory packages that include surplus services such as hospitalization, treatment, and dialysis services. But 8 studies indicate that low coverage of services and high levels of co-payment in complementary health insurance lead to households experiencing a higher risk of catastrophic expenditures and economic hardship (34, 62-67).

It seems that the implementation and design of insurance plans in Iran have been done without considering important factors such as demographic characteristics of households, socioeconomic status of the households, macroeconomic indicators, trend patterns, and finally, the epidemiology of diseases. Also, we believe the absence of strategic purchasing among basic insurance agencies leads to an increase in the probability of incurring CHE.

Study Limitation

We observed some limitations that should be considered when interpreting the findings. First, the studies utilized different survey data, including national household surveys, provincial household surveys, and targeted population surveys. Secondly, there were variations of the thresholds applied across the different studies to measure catastrophic health expenditure. Also, the proportion of households that experience CHE is dependent on the threshold used to define it. Thirdly, the scope of studies and the year and sample size of surveys were varied. Furthermore, impoverishment was measured using different poverty lines including subsistence, the national and international poverty lines. The main focus of the studies was on CHE, and none of the studies aimed to assess impoverishment, but some of them were a representation of those that assessed both CHE and impoverishment. Outcome measures varied widely. However most studies were interested in investigating factors affecting CHE, and Some studies, however addressed the trends of incidence and intensity of CHE and headcount ratio of impoverishing health expenditure (IHE) due to out-of-pocket at the national and provincial population. There is also a possibility that some studies which have been classified as 'grey literature' were missing and thus, there may be some risk of publication bias. Despite these limitations, our study provides important evidence for discussions on policy and health financing reform.

Conclusions and recommendation

The catastrophic health expenses experienced by many people in Iran threaten poverty alleviation efforts. Stronger financial protection is critically needed if continued progress is to be made toward achieving UHC and meeting the attendant SDGs.

The result of the study showed that basic health insurance is not effective in reducing CHE in Iran. So, Iranian health financing systems must be designed not only to allow people to access services when they are needed but also to protect households from financial catastrophe by reducing out-of-pocket spending. A more integrated reform strategy is needed to enhance the breadth, depth, and height of insurance coverage. In the long run, the various insurance schemes will need to be integrated and harmonized. Policy-makers will need to consider how to protect the patients, disadvantaged and vulnerable, by designing a benefits package and also deciding the level of cost-sharing by the patients. The size of the benefits package should be increased for outpatient treatment and poor populations and also expand drug benefits for chronic patients.

In moving towards such a system, flexible short-term responses will be needed, which will depend on the social and political situation in the country. More systematic monitoring of catastrophic health expenditures will assist in steering the development of health financing policies in Iran. Also, the government of Iran should consider increasing its contribution to the health sector through tax funding to reduce OOP payment dependency.

This review underscores the importance of studies that assess CHE in Iran, and we notice the increased interest in this area, given the rise in the number of studies over time. However, we observe that the majority of the studies were cross-sectional, thus not sufficient for longtime analysis. Further research in Iran would be more longitudinal to facilitate the monitoring of trends and robust over-time analysis on CHE and impoverishment.

Availability of data and materials

Not applicable. No original data were collected over the course of this study; all documents and articles examined are publicly available secondary sources (see Appendix 1 to Appendix 5).

Abbreviations

CHE: Catastrophic health expenditure
OOP: Out of packet
MPO: Mean positive overshoot
FFCI: Fair in financial contribution index
CI: Concentration index
GINI: Gini coefficient
WHO: World health organization
WB: World bank
NCDs: Noncommunicable diseases
GNP: Gross national product
GDP: Gross domestic product

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GGHE-D: Domestic general government health expenditure

THE: Total health expenditure

Ethics approval and consent to participate

This study received ethical approval from the School of Health Management, Iran University of Medical Sciences. IR.IUMS.REC.1399.717

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Conflict of Interests

The authors declare that they have no competing interests.

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Appendix 1. Search string for various databases

Searched databases: PubMed, Scopus, Web of Science, and Scientific Information Database (SID)	
Strategy #1 AND #2 AND #3 AND #4 AND #5	
#1	Direct Expenditure OR Health expenditures OR Out of Pocket Expenditures OR Out-of-Pocket Costs OR Out-of-Pocket Payments OR Out-of-Pocket Spending OR Direct expenditure OR Indirect expenditure OR Health Care Cost OR Medical Care Costs OR Treatment Costs OR catastrophic health expenditure OR Health impoverishment OR impoverishing health expenditures OR impoverishment due to health costs OR Health poverty.
#2	Health System Equity OR value-based health insurance OR Cost sharing OR Insurance Design OR Fair financial contribution OR socioeconomic inequality OR Financial inequity OR Disparity
#3	Factors OR characteristics OR Driving forces OR Characteristic OR Criteria OR Determinants
#4	Patient OR Family OR Household
#5	Iran

Source	Search strategy	Number of citations retrieved
PubMed	((((((((((((((((((((((((((((((("health expenditures"[MeSH Terms])) OR ("health care costs"[MeSH Terms])) OR ("health care cost*"[Title/Abstract])) OR ("health cost*"[Title/Abstract])) OR ("treatment cost*"[Title/Abstract])) OR ("health expenditure*"[Title/Abstract])) OR ("direct expenditure*"[Title/Abstract])) OR ("out-of-pocket expenditure*"[Title/Abstract])) OR ("out-of-pocket cost*"[Title/Abstract])) OR ("out-of-pocket payment*"[Title/Abstract])) OR ("out-of-pocket spending*"[Title/Abstract])) OR ("indirect expenditure*"[Title/Abstract])) OR ("Health impoverishment"[Title/Abstract])) OR ("impoverishing health expenditures"[Title/Abstract])) OR ("private health financing"[Title/Abstract])) OR("catastrophic health expenditure"[Title/Abstract])) OR ("Health poverty"[Title/Abstract])) AND ("health equity"[MeSH Terms])) OR ("value-based health insurance"[MeSH Terms])) OR ("Insurance Design"[Title/Abstract])) OR ("Health System Equity"[Title/Abstract])) OR ("Fair financial contribution"[Title/Abstract])) OR ("socioeconomic inequality"[Title/Abstract])) OR (Disparity[Title/Abstract])) OR ("Financial inequity"[Title/Abstract])) OR ("cost sharing"[Title/Abstract])) AND ("socioeconomic factors"[MeSH Terms])) OR ("family characteristics"[MeSH Terms])) OR (Trend*[Title/Abstract])) OR (Determinants[Title/Abstract])) OR (Factors[Title/Abstract])) OR (characteristics[Title/Abstract])) OR ("Driving forces"[Title/Abstract])) AND ("Health Policy"[MeSH Terms])) OR ("Healthcare Policies"[Title/Abstract])) OR ("National Health Policies"[Title/Abstract])) OR (strategies[Title/Abstract])) AND (patients[MeSH Terms])) OR (Household*[Title/Abstract])) AND (Iran[MeSH Terms])	481
Scopus	(TITLE-ABS-KEY(Catastrophic health expenditures) OR TITLE-ABS-KEY(Health expenditures) OR TITLE-ABS-KEY(Catastrophic health payments) OR TITLE-ABS-KEY(catastrophic illness) OR TITLE-ABS-KEY(Financial Catastrophe) OR TITLE-ABS-KEY(Household impoverishment) OR TITLE-ABS-KEY(Health impoverishment) OR TITLE-ABS-KEY(Health care expenditure) OR TITLE-ABS-KEY(Medical expenditure) OR TITLE-ABS-KEY(Health shocks) OR TITLE-ABS-KEY(Health poverty) OR TITLE-ABS-KEY(out-of-pocket) OR TITLE-ABS-KEY(OOP payments) OR TITLE-ABS-KEY(Economic burden) OR TITLE-ABS-KEY(Financial burden) OR TITLE-ABS-KEY(Hardship financing) OR TITLE-ABS-KEY(Financing health care) OR TITLE-ABS-KEY(private health financing)) AND (TITLE-ABS-KEY(Health Equity) OR TITLE-ABS-KEY(Health System Equity) OR TITLE-ABS-KEY(Fair financial contribution) OR TITLE-ABS-KEY(Fair health financing) OR TITLE-ABS-KEY(Health Financing Equity) OR TITLE-ABS-KEY(Inequality) OR TITLE-ABS-KEY(socioeconomic inequality) OR TITLE-ABS-KEY(Disparity) OR TITLE-ABS-KEY(Financial inequity)) AND (TITLE-ABS-KEY(Determinants) OR TITLE-ABS-KEY(Factors) OR TITLE-ABS-KEY(characteristics) OR TITLE-ABS-KEY(Driving forces) OR TITLE-ABS-KEY(Health policies) OR TITLE-ABS-KEY(Trend)) AND (TITLE-ABS-KEY(Health policy) OR TITLE-ABS-KEY(strategies) OR TITLE-ABS-KEY(STEPs survey)) AND (TITLE-ABS-KEY (Household) OR TITLE-ABS-KEY(insured households) OR TITLE-ABS-KEY(Patients)) AND (TITLE-ABS-KEY(Iran))	47
Web of Science	TS= ((catastrophic OR Impoverish* OR financial burden OR economic burden) AND (health expenditure OR healthcare costs) AND Iran)	112
ProQuest	((("Catastrophic health expenditures") OR ("CHE") OR ("Household impoverishment") OR ("Health impoverishment") OR ("out-of-pocket") AND ("Determinant") AND "Iran"))	173
Persian databases	(("Catastrophic health expenditures" OR "impoverishment") AND (Determinants OR Trend) AND (Households OR Patients) AND "Iran")	35

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Appendix 2. Summary Characteristics of Included Studies

The data extraction incidence and intensity of CHE, % (National population level)									
No.	First author (year)	Objective(s)	Study design	methodology	Has Logit Mode	Data collection method	Publication Type/ language	Years of data collection	Study population
1	Razavi, S et al. 2005 (68)	Measuring equity in household's health care payments according to fairness in financial contribution (FFC) 1995 to 2002.	cross-sectional study	WHO method	NO	SCI questionnaire	Journal Article-Persian	1995 to 2002	Iranian households
2	Hanjani, HM et al. 2006 (69)	A performance assessment of health system based on its financial function.	cross-sectional study	WHO method	Yes	Secondary data	Journal Article-Persian	2002	Iranian households
Determinants of exposure to CHE: insurance status(-), urbanization(-), The age of the head of the household (over 65+)(+), Household settlement (rural+), household head literacy level (+), household head employment(-), household size (less than 5 member)(-), household head gender(men)(+), Marital status of the head of the household(-)									
3	Mehrara,Mohsen et al. 2010 (70)	Investigated the extent of catastrophic health expenditure as a first step to developing appropriate policy responses.	descriptive-analytic cross-sectional study	WHO method	Yes	Secondary data	Journal Article-Persian	2003-2007	Iranian households
Determinants of exposure to CHE: rural families (+), Per capita household housing infrastructure(-), the families with children below 12 years and old above 60 year(+), the families who have no insurance(+), employment of the head of the household(-), Number of working members in the household(-), marital status(-), wealth index or the quantile in which the household is located(-), equivalent household(-).									
4	Masaeli, Arashk et al. 2011 (71)	Determine the extent of high health costs, and catastrophic and impoverishment expenditures.	Analytical research	WHO method	No	WHO questionnaire	Journal Article-Persian	2011	Iranian households
Determinants of exposure to CHE: the economic status(-), households with a chronic patient(+).									
5	Razavi, Seyed Moaven et al. 2011 (72)	Employed multivariate analysis regressions (Probit), with the catastrophic payment event as a binary dependent variable, based on data from HIES for 1995 (pre-SAP) and 2002 (post-SAP).	cross-sectional study	WHO method Probit models	Yes	WHO questionnaire	Original Article/ English	1995 vs 2002	Iranian households
6	Hajizadeh, M et al. 2011 (73)	Provide a greater understanding about the inequality and determinants of the OOPE and the CHE for hospital services in Iran using a nationwide survey data	Cross-sectional study	WHO method Concentration index Heckman selection model	No	Secondary data	Original Article/ English	2003	Inpatient services in Iran
Determinants of exposure to CHE: length of stay(+), admission to a hospital owned by private sector(+) or Ministry of Health and Medical Education(-), lower household wealth index(+), and living in remote areas(+), being self-employed(-), male ratio of household(-) , education level(-), household size(+), health insurance coverage(-)									
7	Nekoei Moghadam, M et al. 2012 (74)	Measure percentage of Iranian households exposed to CHE and to explore its determinants.	Cross-sectional basis descriptive-analytica	WHO method	Yes	Secondary data	Original Article/ English	2008	Iranian households
Determinants of exposure to CHE: Utilizing ambulatory, hospital, and drug addiction cessation services as well as consuming pharmaceuticals(+), health insurance coverage(-), household size(+), and economic status(-), use of outpatient service(+).									
8	Soofi, M et al. 2013 (25)	Measure Iranian households' exposure to CHE and surveying the factors affecting this expenditure.	cross-sectional study	WHO method	Yes	Secondary data	Journal Article-Persian	2001	Iranian households
Determinants of exposure to CHE: having a family member suffering from a chronic disease(+), member in need of care(+), family`s financial condition(-), and living in rural areas(+), health insurance(-), use of outpatient service(+).									
9	Raghfar, H et al. 2013 (31)	Assess the fair financial contribution index and influencing factors in the rate of households in nine regions in Iran.	Longitudinal study	WHO method	NO	Secondary data	Journal Article-Persian	1984-2010	Iranian households
Determinants of exposure to CHE: Age and number of household members(+), inpatient services(+), dental services(+).									
10	Abolhallaje, M. et al. 2013 (75)	Identify measures of fair financing of health services and determinants of fair financing contribution, regarding the required share of households that prevents their catastrophic payments.	cross-sectional analytical study	Statistical analysis	NO	Secondary data	Original Article/ English	2002-2005-2008	Iranian households.
Determinants of exposure to CHE: quality/social determinants: employment situation of the head of family(-), no(-)/low(-)/high(+) education of the head, sex of the head(male+), age of the head(+), number of the members of family(+), number of the members over 60(+), number of kids below 12(+), number of the employed persons in family(-), having health insurance(-), large housing(-)/ socio-economic indicators (in the earlier studies): out-of-pocket share in total expenditure(+), horizontal & vertical inequality indicators(+), health financing distribution indicators of FFCI(+)/ measurement indicators: out-of-pocket changing rules and indicators(+), households' willingness to pay for health services(+), sources of growth in OOP and prepayment funds(+), contingent valuing of health insurance premium(+), differences in health payments among different deciles in urban and rural areas(+), links between health & other essential payments among different deciles in urban and rural areas(+), number of the uninsured in the informal sector(+), needs for special programs in government(+) budget to support the uninsured(+), needs for health insurance rules of managed care(+), needs for health insurance contracts with private providers(+), households' socio-economic status(+), equality/inequality conditions of the distribution of risk of financing(+), and economic aspects of health expenditure distribution(-), high inflation rates in the health sector and in the average for total consumption expenditure (+), growing the numbers of physicians and other educated health workers (+), increasing the number of insured people from less than 20 million urban residents to more than 80 % of the total population (+), most of the payment by the public in OOP sources goes to services from the private sector and for under-the-counter payment for services covered by the insurance organizations (+), unsatisfaction by the public sector services or the health insurance support (+), lack of preventing the private medical persons to work out of the regulated tariff rules or to ignore the insurance organization rules easily (+), inefficient social health insurance mechanism to reduce the direct payments from households (+), lack of well-organized services by the public sector hospitals and clinics (+),Baumol variable.									

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Appendix 2. Continued

11	Samadi, A et al. 2013 (76)	Surveyed the determinants of health expenditures in Economic Cooperation Organization (ECO) countries.
Determinants of exposure to CHE: Health expenditures per capita and GDP per capita(-), the proportion of population below 15 and above 65 years old(+), number of physicians(-), and urbanization(-).		
12	Zare, Hossein et al. 2014 (77)	An inequalities assessment of health care expenditures in Iran.
13	Mohammadzadeh Y et al. 2014 (78)	Evaluate the impact of household socio-economic status on the probability of facing with impoverishing health expenditure
Determinants of exposure to CHE: the employment of household head(-), homeownership(-), the most educated people in the family(-), more per capita area of residence(-), family being in high income deciles(-), insurance coverage and increases with a growth in household size(-), living in more developed provinces(-).		
14	Ahmadi, AM et al. 2014 (79)	Assessing the factors affecting in household OOP payments in health system of Iran and using a two part model for assessing these factors
Determinants of exposure to CHE: the economic status(+), the elderly(+), household dimension(+), urbanization and not having insurance coverage(+)		
15	Fazaeli, Ali Akbar et al. 2015 (80)	Determination of main factors on catastrophic health expenditures in Iranian households.
Determinants of exposure to CHE: rural households(+), the number of individuals older than 65 years in each household(+), the number of individuals younger than 5 years(+), illiterate or low literacy householder(+), employed householder status(-), the number of employed persons in household(-), insured household status(-), Gender of the head of the household(female+), presents equivalent household size(–), household expenditures increases nonlinearly(+), increase of the number of household member(+), Marital status of the head of the household(-), Number of household expenditure deciles(+).		
16	Ghiasvand, H et al. 2015 (81)	Investigate 3 objectives: First, the mean of OOP among Iranian households for health services; second, the headcount and overshoot measures of CHE; and finally the level of inequality in its distribution.
17	Fazaeli, Amir Abbas et al. 2015 (82)	Present a trend analysis for the indicators related to fairness in healthcare's financial burden in rural and urban population of Iran.
18	Masaeli,Arashk et al. 2015 (83)	Determine the extent of high health costs, and catastrophic and impoverishment expenditures for informed policy making.
Determinants of exposure to CHE: the economic status(-), households with a chronic patient(+).		
19	Yousefi, Mehdi et al. 2015 (84)	Determine and present some indices of household financial contribution in health system in Iran.
20	Rezaei, Satar et al. 2015 (85)	Determine the impact of some of the key explanatory variables on household healthcare expenditures across the provinces of Iran.
Determinants of exposure to CHE: household healthcare expenditures per capita(+), number of physicians per 10,000 population(+), the degree of urbanization(+), the proportion of the population that was 65 or older(+), household income per capita(-), and literacy rate(+)		
21	Ghiasvand, H. et al. 2015 (34)	Investigated the Iranian rural and urban households' inequality in payments on food and OOP health expenditures from 1998 to 2012.
Determinants of exposure to CHE: gender of the household's head, health status of the member of household, the size of household, residency in Tehran city, number of previous hospitalization, having a house, the level of income and finally complementary health insurance coverage.		
22	Fazaeli, A. A et al. 2016 (86)	Illustrating the consequences of Iranian household to health system financial contribution in terms of burden and incomes approaches.
Determinants of exposure to CHE: insurance status(-), urbanization(+).		

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Appendix 2. Continued

23	Amin, E. et al. 2016 (87)	Explore the impact of independent variables that had a direct relationship with household economic status (household total expenditure and insurance expenditure) and household access to health services (distribution of physicians over the household) in an urban and rural area.	Retrospective longitudinal study	OLS Regression technique Panel dataset	Yes	Secondary data	Journal Article-Persian	1981 to 2011	Iranian households of 24 section
Determinants of exposure to CHE: household economic status (household total expenditure (+) and insurance expenditure (+)), household access to health service (distribution of physician over the household (+)) in urban and rural area, demographic characteristics (proportion of elderly over the household(+)), technological improvement(-), live in urban areas(+), Failure in the rules of economic evaluation(+), Inefficiency of the insurance system(+), Weakness in service delivery and surveillance system(+)									
24	mohammad alizadeh et al. 2016 (88)	Identify the robust determinants of health sector costs in Iran under the uncertainty of the model.	Retrospective descriptive study	Bayesian Averaging of Classical Estimates (BACE)	NO	Secondary data	Journal Article-Persian	during 1979-2013	Iranian households
Determinants of exposure to CHE: Per capita income(-), urbanization rate(+), per capita public health costs(-), dependency ratio(+), physician per capita(+), and unemployment rate(+).									
25	Rezaei, Satar et al. 2016 (89)	Examine the determinants of healthcare spending in Iran over the periods of 1978-2011.	Retrospective descriptive study	A time series analysis, Autoregressive distributed lag approach Error correction method	NO	Secondary data	Original Article/ English	1978 to 2011	Iranian household
Determinants of exposure to CHE: GDP per capita(+), illiteracy rate(+), degree of urbanization(+), population aging(+), total number of physician per 10,000 populations(-), literacy(+), advancement of new technology(+), the costs of dying and time-to-death(+),									
26	Rad, E. H et al. 2016 (90)	Assess the taxation system and health insurance contribution of Iranians.	descriptive- analytical study	Data survey, Kakwani index, A regression model	NO	Secondary data	Original Article/ English	2012	Iranian household
Determinants of exposure to CHE: persons older than 65 years old(+), urbanization(+), income status(-), employing status(-), literacy(+).									
27	Vahid Yazdi-Feyzabadi et al. 2017 (91)	Measure the percentage of households impoverished due to OOP payments in Iran provinces	Retrospective descriptive study	Mann-Whitney U test and descriptive statistics	NO	Secondary data	Journal Article-Persian	2008-2014	Iranian households
Determinants of exposure to CHE: Burden of chronic diseases(+), Lack of adequate health insurance at the time of illness in terms of the method of payment to the provider(+), the amount of coverage of treatment costs (+), the type of service package committed and the population covered (+), Existence of elderly people in the family (+), Living in the rural(+), Per capita household expenditure(+), disability (+), 7.Inadequate geographical distribution of specialized manpower.									
28	Yazdi Feyzabadi, V, 2017 (92)	Measure the incidence and intensity of CHE in Iranian provinces 2008-2014.	Retrospective study	Data surveys, Descriptive statistics , Mann-Whitney U test, and index of disparity (ID)	NO	Secondary data	Journal Article-Persian	2008-2014.	Iranian provinces
Determinants of exposure to CHE: Socioeconomic status(+),inequality in access to health services(+), incidence of chronic and incurable diseases and disabilities(+),Scheme on health service utilization (+),Unemployment(+), Per capita income and its distribution(+), Inflation rate(+).									
29	Nouraei Motlagh, S et al. 2017 (93)	Investigate affecting factors on probability of households facing to CHE, estimate FFCI and Gini indices in deprived states of Iran.	descriptive analytical study	Bayesian econometrics model	Yes	Secondary data	Journal Article-Persian	2012	Iranian households
Determinants of exposure to CHE: dentistry and hospital services(+), Increased number of family members with >65 year old(+), low literacy and unemployed parent(+), female guardian and without insurance coverage(+), expenditure deciles(+), inpatient service(+), equivalent households size(+), gender of the head of household (female)(+), living in the urban(+).									
30	Homaie Rad, Enayatollah et al. 2017 (94)	Test the hypothesis "CHE increase the probability of retirees to go back to work."	cross-sectional study	Xu method	Yes	Secondary data	Original Article/ English	2012	Iranian households who have been receiving retirement pension
Determinants of exposure to CHE: Chronic diseases like cancer(+), renal diseases(+), and cardiovascular diseases(+), increase in household size(+), households headed by male retirees(+).									
31	Ali Mohammad Ahmadi et al. 2017 (53)	Analyze the impact of family's socio-economic status, and government health policies on different levels of health expenditures of households in Iran.	descriptive-analytic cross-sectional study	Probit, model, Data analysis	NO	SCI questionnaire	Journal Article/ Persian	2014	Iranian households
Determinants of exposure to CHE: Householder education level(-), Age(+), Gender (male householders(+), Per capita income(+), Size of household(+), health insurance coverage(-),households with rural insurance(-), social security insurance(-), complementary insurance(-) and medical treatment insurance(-),households with better socioeconomic situation (-).									
32	Fazaeli, Ali Akbar et al. 2017 (95)	Investigated the financial participation of Iranian urban households in the health sector before and after the development plan.	Cross-sectional retrospective study before and after analysis	Data survey, Descriptive statistics, Data analyzes		Secondary data	Journal Article-Persian	2004-2016	Iranian households in urban
Determinants of exposure to CHE: inflation rate(+), health transformation plan in 2014(-).									

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33	Vahid Yazdi-Feyzabadi et al. 2018 (96)	Estimate the prevalence and intensity of CHE and investigate main factors that influence the probability of CHE in Iran.	Retrospective descriptive study	WHO method	Yes	SCI questionnaire	Original Article/ English	2008 to 2015	Iranian households
Determinants of exposure to CHE: Expenditure quintiles (+), Household settlement(rural+), Household head gender(female+), Hospitalized person in household(+), Household using outpatient care(+), + 60 member living in Household(+), higher income(-), receiving inpatient services(+),Interestingly, limited geographical and cultural accessibility (-).									
34	Ghiasvand, H et al. 2018 (23)	Present a clear picture of the financial protection situation in Iran from 2003-2014.	cross-sectional study	WHO method	Yes	Secondary data	Original Article/ English	2003-2014	Iranian households
Determinants of exposure to CHE: Living in rural regions(+), having literate heads(+), owning a house,(-) living in a rental house(+), and placing in higher total expenditures quartiles(+).									
35	Moradi, T et al. 2018 (97)	Decompose inequality in financial protection of Iranian households after the implementation of the Health Transformation Plan.	cross-sectional study	WHO method	Yes	Secondary data	Original Article/ English	2015 to 2016	Iranian households
Determinants of exposure to CHE: Economic status(-), Education level of household head(-), access to healthcare services(+), household size(+), age of household head(+), the gender of household head(female+), outpatient services such as diagnostic services(+), dentistry(+), rehabilitation(+), outpatient consultations(+), medicines and equipment (+).									
36	Behzadifar, M. et al. 2018 (98)	Evaluate the temporal pattern of OOP expenditures related to Iranian healthcare services during 1995–2014.	Longitudinal study	Data collection, Trend analysis by an exhaustive and comprehensive review.	NO	Secondary data	Original Article/ English	1995–2014	Iranian households
Determinants of exposure to CHE: patient gender (males+), diagnostic services(+)									
37	Assari Arani, A et al. 2018 (99)	Evaluated the effects of the plan on health equity indices.	cross-sectional study	WHO method	NO	Self-administered questionnaire.	Original Article/ English	Dec 2015 to mid-Mar 2017.	Iranian households
38	Fazaeli, A. A. et al.2018 (100)	Calculated financial contribution of people in Iran health system in 2015.	descriptive analytical study	Statistical analysis	NO	Secondary data	Journal Article-Persian	2015	Iranian households
Determinants of exposure to CHE: using dental care(+), using medical services or diagnosis(+)									
39	Yazdi-Feyzabadi Vahid et al. 2019 (32)	Investigate the occurrence, intensity and inequality in distribution of CHE in the years before and after HTP.	cross-sectional survey before and after analysis	WHO method World Bank method	No	Secondary data	Original Article/ English	2011 to 2017 (before and after HTP)	Iranian households
40	Rezaei Satar et al. 2019 (62)	Quantify socioeconomic inequality in facing CHE and to identify the main factors contributing to socioeconomic inequality in CHE in Iran.	Retrospective descriptive study	WHO method	Yes	SCI questionnaire	Original Article/ English	2017	Iranian households
Determinants of exposure to CHE: Household size(-); age(+), sex(female+), and educational status of the head of household(-); having a senior member (over 65 years) or a child member (5 years or younger) of the household(+); residential place of the household (rural+ vs. urban-); province(Tehran+); health insurance coverage(-); use of inpatient care(+), dental care(+), and outpatient care(+); and the wealth index of the household(-).									
41	Ahmadnezhad, E et al. 2019 (63)	Investigate the impact of the HTP on the level and pattern of OOP payments for health care.	descriptive-analytic cross-sectional study	WHO method	NO	Secondary data	Original Article/ English	2013 and 2016	Iranian households
Determinants of exposure to CHE: medicines (+)									
42	Kheibari, M. J et al. 2019 (64)	Assessed the reform by changes in variables representing distribution of health payments and CHE.	descriptive-analytic cross-sectional study	WHO method	NO	SCI questionnaire	Original Article/ English	2010 to 2016	Iranian households
43	Amiresmaili, Mohammadreza et al. 2019 (65)	Calculated the population at risk of facing catastrophic expenditure due to purchasing three selected medicines (metformin, atorvastatin and amoxicillin) in Iran.	cross-sectional study	WHO method	NO	Secondary data	Original Article/ English	2013	Iranian households
44	Masoudi Asl, Iravan et al. 2019 (66)	Investigating the health costs trend in Iran and the policies adopted to manage them better.	descriptive-analytical study	General review, Semi-structured interviews, Data analysis, Thematic framework	NO	Secondary data	Journal Article-Persian	2002-2013	Iranian households
Determinants of exposure to CHE: NCDs disease(+), chronic disease(+), private outpatient health services(+), Tariff increase(+), Lack of financial protection(+), Low density of health care providers in disadvantaged areas(+),Expand public sector services to disadvantaged areas(-), Adoption of public insurance law(-), Free insurance for rural(-), Multiplication of basic insurance funds(+), reduction of accumulation of insurance resources(+), a high number of people without health insurance(+), Currency price unification policy(+), Rising exchange rates and high inflation(+), The financial burden of targeted subsidy plan(+), Migration from rural to urban areas and increasing marginalization and increasing the number of uninsured due to these migrations(+), Increasing the level of public awareness and creating consumers induced demand(+), Change of consumption towards branded drugs(+), supplier induced demand(+) and performing unnecessary diagnostic and therapeutic interventions(+), Lifestyle changes and adopting a lifestyle pattern associated with high-risk health behaviors(+).									

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45	Shabani, Hamed et al. 2019 (67)	Investigate the determinants of health expenditures in Iran and the other member countries which are the members of Perspective Documents of 1404 (Hijri) of Iran.	descriptive-analytic study	Panel data from World Bank.	NO	Secondary data	Journal Article-Persian	1995 to 2014	Iranian households
Determinants of exposure to CHE: GDP per capita(+), urbanization rate(+), the percentage of the population older than 65 years and above(+), NCDs and chronic disease(+).									
46	Pakdaman, Mohsen et al. 2019 (101)	Determine the effect of macroeconomic indicators on health expenditure.	descriptive analytical study	Time series models in econometrics, Vector Auto Regression, Granger causality technique.	NO	Secondary data	Original Article/ English	1995–2014	Iranian households
Determinants of exposure to CHE: gross domestic production (GDP)(+), gross national production(+), national income(+), and national consumption countries income(+), Unemployment(+), liquidity rate(+), inflation rate(+), budget deficit(+), population rate(+).									
47	Rezaei, Satar et al. 2020 (102)	Measure equity in OOP payments for healthcare and the incidence of CHE among Iranian households over time.	Retrospective descriptive study (measurement)	WHO method Trend series regression.	NO	Self-administered questionnaire.	Original Article/ English	1991 to 2017	Iranian households
48	Abdi,ZH et al. 2020 (35)	Undertake a descriptive analysis of changes in health spending associated with implementation of the latest health sector reform in Iran, namely the Health Transformation Plan (HTP).	descriptive analytical study	WHO method	NO	Secondary data	Original Article/ English	2014 and 2015	Iranian households
49	Kazemi-Karyani, Ali et al. 2020 (103)	Estimate socioeconomic inequality differences in CHE between urban and rural areas of Iran after the implementation of the HTP during 2017.	Representative survey	WHO method, Wagstaff's normalized concentration index	Yes	Secondary data	Original Article/ English	2017	Iranian households
Determinants of exposure to CHE: Socioeconomic status (SES) (+), outpatient services (+), health insurance coverage (-).Sex(Female headed)(+), households with an elderly person(+), with no under-5-year-old children(+), with a family size of 1–2 people (+), living in rural areas (+), with individuals having chronic specific diseases (+), and those who utilize inpatient (+) and outpatient (+), region of residency (+).									
50	Kavosi, Z et al. 2020 (104)	Identify and explain the interactions and network of the relationship between influential factors of out-of-pocket payments for health services.	futures study	futures study and cross-impact analysis	NO	Square-matrix questionnaire	Original Article/ English	2015	Iranian household
Determinants of exposure to CHE: context factors: Health sector inflation(+), Exchange rate(+), the aging population and life expectancy increase(+), disease pattern change(+), disease outbreaks(+), clinical guidelines (complication, application for monitoring and establishing basic benefits package)(-), the tariff growth rate(+), population coverage/ Risk factors: service coverage(-), cost coverage(-)/ Target factors: referral path system(-), the use of expensive services(+), under the table fees and informal payments(+), induced demand due to information asymmetry between patient and doctor(+)/ Supplementary insurance(-), quality of health care(+), private sector outpatient services consumption(+), use of outpatient services of the public sector (public-armed-charity)(+), private inpatient services consumption(+), use of public inpatient services(+), access to health services(+), privatization and amount of private sector activity development(+), rational prescription of medicines and services(-), medicine prices (internal-external)(+)/ Discrete factors: monitoring and ensuring the implementation of policies(-), the willingness of people to use special service or the taste of people(+), medical education policies(+), health services tariff (process and base of tariffs)(+), state social support organizations/ Second lever and discrete factors: life style and self-care behavior(+), different tariff of private and public sectors(+), aggregation of insurance institutions(-), the allocation of resources to the health sector (budgeting)(+), increase in ran population(+), high tariff of dental services(+).									
51	Hajibabaei, Hamidreza et al. 2020 (105)	Estimate the health expenditures function and find out the determinants of health expenditures	Analytical research	Panel data method	NO	Secondary data	Original Article/ English	2010 until 2014	Developing countries and Iranian household
Determinants of exposure to CHE: Income (GGHE-D as percentage of GDP) (+), The demographic growth the proportion of the young (e.g. under 15 years old) and old people (e.g. above 65 or 75 years old) (+), The technological progress (+), the role of real prices in determining the demand for health care (+), the medical density (It is defined by physicians as per thousand population) (+), and used to account for the supply of healthcare (+), Institutional factors (Two approaches are used. The first distinguishes the effects of instructions on remuneration. The second distinguishes the effects of the type of national health system (e.g. contractual system or integrated system), Social characteristics: distribution of income, distribution of education, skills, jobs, opportunities, and expectations for the future(+), Education(-). Determinants of exposure to CHE: Socioeconomic status (SES) (+), live in rural and urban (+), outpatient services (+), health insurance coverage (-).Sex(Female headed)(+), households with an elderly person(+), with no under-5-year-old children(+), with a family size of 1–2 people (+), living in rural areas (+), with individuals having chronic specific diseases (+), and those who utilize inpatient (+) and outpatient (+), region of residency (+).									
52	Yahyavi Dizaj, Jafar et al. 2020 (106)	Evaluate the effect of the presence and age of elderly members on health care costs of the households in Iran.	secondary analysis	Linear regression analysis	No	Secondary data	Journal Article-Persian	2016	Elderly people over 65 years old in Iran
Determinants of exposure to CHE: having a smoker member(+), having an income-earner member(-), living in urban areas(+), household head education(-), health development rate of the province of residence(+), Elderly population(+).									
53	Hsu, Justine. 2020 (107)	Protect the Iranian population from the consequences of catastrophic and impoverishing OOP payments and to ensure more equitable financing of the health system.	descriptive analytical report	Report	No	Secondary data	Original Article/ English	2007-2015	Iranian households
Determinants of exposure to CHE: year, area of residence of the household (i.e. rural or urban), characteristics of the household head (i.e. sex, insurance status, educational level, employment status, literacy, civil status), whether at least one household member was younger than 5 years and whether at least one household member was older than 60 years. the household is in a rural or an urban area and the employment status of the household head. employment status, the composition of the household also influences the probability of catastrophe (Those with an elderly member over the age of 60 years or with a child under 5 years of age), the level of education of the head of the household, households in which the head is a female or a student.									

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54	Woldemichael, A et al. 2021 (108)	Analyses impact of OOP payments for dental services on prevalence CHE among Iranian households during 2018.	cross-sectional analysis	WHO method	Yes	United Nations designed and approved questionnaire	Original Article/ English	2018	Iranian households
Determinants of exposure to CHE: Demographic variables: Sex of household head (Female+), Age of household head (≥ 66 +), Household had ≤5-year-old child (No+), Household had ≥66-year-old member (Yes+), Socioeconomic variables: Educational status of household head (illiterate+), Wealth index of households (Poorest+) , Insurance coverage (Yes+) , Ecological variables: Geographical location of household (Rural +), HDI*of province (High +)									
55	Moradi, G et al. 2021 (24)	Investigate the percentage of households with disabled children aged 0 to 8 years who had faced CHE due to the health costs of these children in Iran.	cross-sectional study	WHO method	Yes	WHO questionnaire	Original Article/ English	2020	Households with disabled children aged 0 to 8 years in five provinces in Iran
Determinants of exposure to CHE: Head of household being female(+), poor economic status of the household(+), lack of supplementary insurance by a child with disabilities(+), having a child with mental disability(+), and type of basic health insurance((having Iranian Health Insurance+).									
The data extraction and incidence and intensity of CHE, % (Provinces population level)									
56	Karami, M et al. 2009 (109)	Describe the magnitude and distribution of CHE in Kermanshah western Iran.	descriptive study	WHO method	NO	WHO questionnaire	Original Article/ English	2008	Kermanshah
Determinants of exposure to CHE: have a family member younger than 12 year old or older than 60 year old(+), families have a member suffering from chronic condition(+), families headed with old people(+), females and those with disabilities(+), the unemployed or poor people(+), and those with reduced access to health insurance(+), Insurance coverage and complementary insurance coverage status(-).									
57	Kavousi,z et al. 2009 (110)	Quantify and compare the proportion of households facing CHE in years 2003 compared to 2008, and to identify the factors that contributed to these expenditures.	Longitudinal study	WHO method Chi-square test.	NO	WHO questionnaire	Journal Article-Persian	2003-2008	Tehran
Determinants of exposure to CHE: use of expensive inpatient care(+), use of essential dental care (not covered in insurance packages)(+), number of outpatient services(+), having member over 65y(+), having disabled member(+), and lower economic status(+)									
58	Moghimi, M et al. 2009 (111)	Exploring the performance of Government Rule in Supporting and Decreasing CHE of Cancer Patients in Zanjan Province in 2007-2008	descriptive-analytic cross-sectional study	WHO method	NO	Self-administered questionnaire.	Journal Article-Persian	2007-2008	Zanjan
Determinants of exposure to CHE: household income status(-), household size(+), disability of the head of the family due to illness(+), wife, or child(+), rented house(+), insufficient coverage of supplementary insurance(+), lack of access to all medical services in the city(+), village and the need to continue treatment in large cities(+), use of private diagnostic services(+), lack of coverage expensive drug by insurance organizations(+), diagnosis of the disease in advanced stages(+)									
59	Ghiasvand, H/2010 (112)	Identify factors that influence CHE in patients of teaching hospitals affiliated to Iran University of Medical Science in 2009.	cross-sectional study	Data analyzes	NO	Self-administered questionnaire.	Journal Article-Persian	2008-2009	Tehran
Determinants of exposure to CHE: gender of the household's head (Female+), health status of the member of household (+), the size of household, residency in Tehran city(+), number of previous hospitalization(+), having a house(-), the level of income(-), and finally complementary health insurance coverage(-).									
60	Daneshkohan, A et al. 2011 (113)	Estimate FFCI and quantify extent of household CHE	A cross-sectional study	WHO method	No	Self-administered questionnaire.	Original Article/ English	2008	Kermanshah
Determinants of exposure to CHE: retrospective payment mechanisms(+), especially fee-for-service(+), Insurance Coverage(-), member with chronic condition(+), member older than 60 years old(+), member younger than 12 year old(+), Gender of the head of the household(women+)									
61	Ghiasvand, Hesam et al. 2011 (114)	Assessed the performance of Iranian health insurance schemes in protection the patients against catastrophic medical payment.	cross sectional analytical study	Logit regression model	Yes	self-administered questionnaire.	Journal Article-Persian	2009	Tehran
Determinants of exposure to CHE: Household's head gender(women-), Number of hospitalization(+), Residency in Tehran(-), Income level(-), other family member's illness(+), Ownership of house(-), Number of household's members(+), the coverage of complementary health insurance(-)									
62	Kavosi, Z et al. 2012 (115)	Assessed change in household CHE and inequality in facing such expenditures in south-west Tehran	longitudinal study	WHO method	Yes	WHO questionnaire	Original Article/ English	2003-2008	Tehran
Determinants of exposure to CHE: health care utilization(+) and health care insurance status(-), Socioeconomic status(+), utilization of dentistry(+), and outpatient services(+), general inflation in the country(+) and in part because of increasing health care tariffs(+), increasing consumption of expensive high-tech health care services(+), member over 65years(+), having disabled members(+).									

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63	Amery, H et al. 2013 (116)	Measure the catastrophic expenditures of health services and effective indicators	cross sectional	WHO method	Yes	WHO questionnaire	Journal Article- Persian	2012	Torbat Heydarieh
Determinants of exposure to CHE: Under the age 5 in the family(+), the existence of a 65 or older family member(+), family size(+), The use of medicines, and diagnostic tests(+).									
64	Amery, H et al. 2013 (117)	Examine the CHE and its influential factors.	cross sectional	WHO method	Yes	WHO questionnaire	Journal Article- Persian	2011	Yazd
Determinants of exposure to CHE: The use of medicine, diagnosis, and inpatient services (+), members below 5 years old in household (+) and family size (+).									
65	Asefzadeh, Saeed et al 2013 (118)	Calculate households encountered with CHE in Qazvin, Iran.	descriptive-analytic cross-sectional study	WHO method	NO	Self-administered questionnaire.	Journal Article- Persian	2011	Qazvin
Determinants of exposure to CHE: Household economic status(-), frequency of use of outpatient services(+), inpatient services(+), and Out-of-Pocket (OOP) payment for medicine, laboratory, dentistry, radiology, Physiotherapy and rehabilitation(+)									
66	Nekoeimoghadam, Mahmood et al. 2013 (119)	Measure CHE in Kerman province, Iran, and the affecting factors.	descriptive-analytical retrospective research	WHO method, chi-square test and logistic regression	Yes	Secondary data	Journal Article- Persian	2008	Kerman
Determinants of exposure to CHE: health services utilization(+), particularly inpatient(+), outpatient and dental care services(+), radiology, sonography, radiotherapy, echocardiography, MRI, exercise test(+).									
67	Rezapour, Aziz et al. 2013 (120)	Determine the effects of OOP for health care services on households in Tehran (2013)	cross-sectional study	WHO method	Yes	WHO questionnaire	Original Article/ English	2013	Tehran
Determinants of exposure to CHE: education status of household head(-), household size(+), and number of the times that outpatient health services(+), preschool children living in HHs(+), member with chronic illness(+).									
68	Sadeghiyeh Ahari, Saeid et al. 2013 (27)	Exposure rate of the catastrophic health care costs in patients with ESRD in Buali Hospital dialysis department.	descriptive-analytic cross-sectional study	WHO method	NO	WHO questionnaire	Journal Article- Persian	2013	Ardabil
Determinants of exposure to CHE: The place of residence(+), presence of side income in other members of family(-), going on vacation(-).									
69	Yavangi, M. et al. 2013 (121)	Determine the total expenditure and OOP on pregnancy complications in Tehran, the capital of Iran.	cross-sectional study	WHO method	NO	Self-administered questionnaire.	Original Article/ English	2009	Tehran
70	Anbari, Z et al. 2014 (122)	Evaluating some health expenditure of inpatient and outpatient care as well as assessing the predictors of catastrophic costs for inpatient care in one of central provinces of Iran.	cross-sectional	WHO method	Yes	standard questionnaire in health utilization care	Original Article/ English	2014	Markazi
Determinants of exposure to CHE: age range 40-59 years(+), and being in the lower levels of wealth index (+).									
71	Ghafoori, Mohammad Hossein et al. 2014 (123)	Determine disparities in health expenditures by means of different approaches. FFC, CI in health expenditure, Lorenz curve.	A cross-sectional population based study	WHO method	No	WHO questionnaire	Original Article/ English	2012	Tehran
72	Ghiasvand, Hesam et al. 2014 (124)	Calculate the proportion of hospitalized patients exposed to CHE, its determinant factors and its distribution.	cross sectional health survey	WHO method	Yes	Self-administered questionnaire.	Original Article/ English	2012	Tehran
Determinants of exposure to CHE: The weakness of economic status of households(+), the not well designed prepayments schemes(+), the educational level of the patient's family head(-), the sex of the patient's family head(male-), hospitalization day numbers(+), having made any out of hospital payments linked with the same admission(+) and households annual income levels(-)									
73	Ghoddoosinejad, Javad et al. 2014 (125)	Calculate households encountered with CHE in Ferdows, Iran.	descriptive-analytic cross-sectional study	WHO method	No	Self-administered questionnaire.	Original Article/ English	2014	Ferdows
Determinants of exposure to CHE: Use of dentistry services and hospital care(+).									

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74	Kavosi, Zahra et al. 2014 (126)	Investigated the Household Financial Contributions (HFCs) to the health system.	cross-sectional descriptive study	WHO method	Yes	WHO questionnaire	Original Article/ English	2012	Shiraz
Determinants of exposure to CHE: household economic status(-), the basic and supplementary insurance status of the head of the household(-), existence of individuals in the household who require chronic medical care(+), use of dental and hospital care(+), rural location of residences(+), frequency of use of outpatient services(+), and Out-of-Pocket (OOP) payment for physician visits(+), Existence of persons over age 65(+), Existence of persons under age 5(+), Percentage of household capacity to pay devoted to healthcare service(+).									
75	Kavosi, Z et al. 2014 (29)	Determine the percentage of households with cancer patients that face CHE.	descriptive-analytic cross-sectional study	WHO method	NO	WHO questionnaire	Original Article/ English	2011	Shiraz
Determinants of exposure to CHE: Insurance status (-), Type of insurance (-), residence (+), use of outpatient services (+), type of treatment and other family members who refrained from using healthcare services (+), Age of head of household (+), Economic status (+), Family size (+), Type of cancer (+), Type of treatment (+), Refraining from using healthcare services (+).									
76	Asma Sabermahani et al. 2014 (127)	Investigate factors affecting the probability of CHE exposure among households in Tehran.	Retrospective descriptive study	WHO method	Yes	Secondary data	Journal Article-Persian	2011	Tehran
Determinants of exposure to CHE: Households with the number of members under 5 years or over 65 years (+), Unemployed or less educated head (+), Households with a chronic patient (+), Households without insurance supports (+), Percapita household expenditure (+) Number of the employed person in household(-).									
77	Panahi, Hossein et al. 2014 (128)	Identify factors that influence CHE by patients in of Tabriz, Iran.	A descriptive analytical study	WHO method	NO	Self-administered questionnaire.	Journal Article-Persian	2011-2012.	Tabriz
Determinants of exposure to CHE: age of members(elderly people/ children)(+), and gender (female patients(+), person with chronic diseases(+), admission to a private hospital and lower household wealth									
78	Khammarnia, M et al. 2014 (129)	Investigate the households' impoverishment due to the healthcare costs in Shiraz in 2012.	cross sectional study	WHO method	Yes	WHO questionnaire	Original Article/ English	2012	Shiraz
Determinants of exposure to CHE: household's economic status(+), place of living(+), and consumption of outpatient services(+).									
79	Hatam, Nahid et al. 2015 (130)	Identify the determinants of exposure to CHE in the hospitalized patients, in the selected hospitals of SUMS, Iran.	descriptive-analytic cross-sectional study	WHO method, chi-square test, T-test, Mann-Whitney, Logistic regression	Yes	WHO questionnaire	Original Article/ English	2013	Shiraz
Determinants of exposure to CHE: Household economic status (-), Type of hospital (+), Ward (+), Household head's state of health insurance (-), Patient's supplementary insurance status (-), Household head's complementary insurance status (-), Household size (+), Gender of patient(female+), Gender of household head(female+), Person under 5 years old (+), Person over 65 years old (+), Time of diagnosis (+), Hospitalization duration (+), Ability to pay (-).									
80	Tofighi, Shahram et al. 2015 (131)	Calculation of catastrophic costs were extracted from both of old and non- old groups	cross-sectional study	WHO method	NO	WHO questionnaire	Original Article/ English	2011	Tehran
Determinants of exposure to CHE: over 60 years of age (aging)(+).									
81	Davari, Majid et al. 2015 (132)	Determining and comparing socioeconomic status (SES) among different periods, and made an attempt to evaluate households' health financial protection in different quintiles after implementation of Family Physician (FP) program.	A time trend study	WHO method	NO	Secondary data	Original Article/ English	2004 and 2011	Chaharmahal and Bakhtiary
Determinants of exposure to CHE: Hospitalization(+), quintiles status(+), education(-), income(-), occupation(-), home status(-) and family size(+), rural areas(-), unemployment rate(+), insurance coverage(+), utilization rate of inpatient and outpatient services(+).									

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82	Fattahi, Shahram et al. 2015 (133)	Identified the factors affecting the cost of misery burden of health to be able to reduce these costs and can be effective step to identify vulnerable groups.	cross-sectional study-case study	Data collection and data analyzes	NO	self-administered questionnaire.	Journal Article- Persian	2012-2013	Hossein Abad District of Uremia
Determinants of exposure to CHE: wealth index(-), gender of household head(female+), household size(+), presence of household members less than 12 years(+), job status of household head(-), and number of hospital services to be covered by compulsory insurance and supplemental insurance(-).									
83	Bagheri faradonb, S et al. 2016 (134)	Investigate the catastrophic and impoverishing health expenditure in Tehran urban population.	cross-sectional study	WHO method	Yes	WHO questionnaire	Journal Article- Persian	2013	Tehran
Determinants of exposure to CHE: Head of household education level(-), the presence of people over 60 years in household(+), the use of inpatient services and the volume of use(+), informal payment(+).									
84	Ghiasi, A et al. 2016 (135)	Investigates the CHE and its determinants among the household residents of Zabol.	cross sectional study	WHO method	Yes	WHO questionnaire	Journal Article- Persian	2013-2014	Zabol
Determinants of exposure to CHE: Education of the head of the household (-), medical expenditure(+), pharmaceutical expenses(+).									
85	Juyani, Yaser et al. 2016 (28)	Investigate on what extent Multiple sclerosis patients face catastrophic costs.	descriptive-analytic cross-sectional study	WHO method	Yes	Self-administered questionnaire.	Original Article/ English	2014	Ahvaz
Determinants of exposure to CHE: Brand of drug(+), housing, income(-), health insurance(-), hospitalization(+), doctor visit(+), rehabilitation services(+).									
86	Piroozi, B et al. 2016 (26)	Explore the percentage of households facing CHE after the implementation of HSEP and the factors that determine CHE.	descriptive-analytic cross-sectional study	WHO method	Yes	WHO questionnaire	Original Article/ English	2015	Sanandaj
Determinants of exposure to CHE: household economic status(-), presence of elderly or disabled members in the household(+), Household having member(s) under 5 years old(+), utilization of inpatient, rehabilitation services(+), dental care(+), Status of the basic health insurance(-), status of supplementary health insurance(-), gender of the household head(male-), Household size(+).									
87	Rezapour, A et al. 2016 (136)	determine the equity in health care payments and determining factors among households in Hamedan	cross-sectional study	WHO method	Yes	WHO questionnaire	Original Article/ English	2014	Hamedan
Determinants of exposure to CHE: having members under 6 years or over 60 years in household(+), household size(+), household head gender(female+), employment of household head(-), households' income quintile(+), existence of the disabled member in households(+), and the education level of the household's head(-).									
88	Rezapour, A et al. 2016 (137)	Estimate the odd-ratio of factors affecting families' exposure to catastrophic and impoverishing health expenditures	cross-section study	WHO method	Yes	WHO questionnaire	Journal Article- Persian	2013	Tehran
Determinants of exposure to CHE: The presence of people over 60 years in households (+), the use of inpatient services and the volume of use (+), Informal payments (+), insurance coverage (+), insurance coverage status (+).									
89	Khadivi, Reza et al. 2016 (138)	Determine the utilization rate of health services among construction workers and their families.	Descriptive analytical study	WHO method	NO	WHO questionnaire	Journal Article- Persian	2013	Isfahan
Determinants of exposure to CHE: Hospitalization (+)									
90	Almasi, Mojtaba et al. 2016 (139)	Factors affecting the crippling cost of dialysis patients	descriptive-analytic cross-sectional study	A Probit model	NO	WHO questionnaire	Journal Article- Persian	2014	Urmia
Determinants of exposure to CHE: wealth index(-), gender of household head(male+), place of residence(rural+), presence of members in need of care(+), job status of household head(-), number of dialysis services to be covered by compulsory insurance and supplemental insurance(-), number of dialysis services(+), presence of members in need of care(+).									

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91	Homaie Rad, E et al. 2017 (140)	Evaluated OOP for outpatient, inpatient, and drug services, and CHE using a before-and-after the reform analysis	cross-sectional research Before and after analysis	WHO method	NO	Secondary data	Original Article/ English	2013 and 2015	Guilan
Determinants of exposure to CHE: Family income(-), the presence of children under 5 years of age(+), members of the family more than 70 years old(+), the number of illiterate people in the family(+), and the number of women in the family(+).									
92	Moradi, G et al. 2017 (141)]	Exploring the likelihood of facing CHE among households with members suffering from dialysis, kidney transplant, or (MS) after the implementation of HSEP.	descriptive-analytical study	WHO method	Yes	WHO questionnaire	Original Article/ English	2015	Kurdistan
Determinants of exposure to CHE: patient's education(-), household income(-), patient supplementary insurance status(-), type of special disease(+) a family member with a special disease(+) patient residence(rural+), frequency of using inpatient services(+) use of dental care(+) and use of rehabilitation services(+).									
93	Rezapour, A et al. 2017 (142)	Analyze CHE among households with and without chronic NCDs in Hamedan.	descriptive-analytic cross-sectional study	WHO method	Yes	WHO questionnaire	Original Article/ English	2011	Hamedan
Determinants of exposure to CHE: Lower economic status(+), lower household size(+), and high utilization of health care(+), households with chronic NCDs(+)									
94	Mobaraki, Hosein et al. 2018 (143)	Determine the percentage and characteristics of older adults facing with the CHE in Tehran, Iran.	cross-sectional study	WHO method	Yes	WHO questionnaire	Original Article/ English	2017	Tehran
Determinants of exposure to CHE: Household income quintile(-), Home ownership(-), employment status(-), household size(+), Disabled family member(+), and supplementary insurance(-).									
95	Khammarnia, Mohammad et al. 2018 (144)	Evaluate the effectiveness of the health transformation plan, this study was conducted with the goal of determining the health expenditures by households after implementation of this new plan.	cross sectional- descriptive study	WHO method	NO	WHO questionnaire	Journal Article-Persian	2015 and 2016	Zahedan
Determinants of exposure to CHE: Drug fees(+), use physiotherapy services(+), outpatient services(+), having a family member who needs to be taken care of at home(+), and a family member who needs to be taken care of at a hospital(+), Lack of access to healthcare services(+), high dispersion of the population(+), insurance status(-), income status(-).									
96	Khammarnia, M.et al. 2018 (145)	Examine the households' impoverishment due to health expenditure after HTP.	cross-sectional study	WHO method	Yes	WHO questionnaire	Original Article/ English	2017	Sistan and Baluchestan
Determinants of exposure to CHE: Living in a rural area(+), unemployment(+), economic status(-),inpatients and outpatient costs(+), having supplementary insurance(-)									
97	Motlagh, S. N. et al. 2018 (146)	To measure the fairness of health care financing and to identify incidence rate of CHE and its most important determinants before and after implementing the HSEP among households in one province of Iran (Lorestan).	cross-sectional research	WHO method	Yes	SCI Questionnaire	Original Article/ English	4/2012-3/2015	Lorestan
Determinants of exposure to CHE: Economic status of households(-), location of households (urban or rural+), number of people over the age of 65 and under the age of 5 in the household(+), age and sex(female) of household head(+), insurance status of households(-).									
98	Piroozi, B et al. 2019 (147)	Measure the proportion of households facing CHE and identifying the effective factors on household's exposure to CHE.	cross-sectional study	WHO method	Yes	WHO questionnaire	Original Article/ English	2018	Kurdistan
Determinants of exposure to CHE: low socio-economic status (+), supplementary health insurance (-).									
99	Mehdizadeh, P et al. 2019 (148)	Analyzed exposure to CHE and factors affecting them among the health staffs affiliated to army medical universities in Tehran	descriptive-analytic cross-sectional study	WHO method	Yes	WHO questionnaire	Original Article/ English	2016	Tehran
Determinants of exposure to CHE: used dental services (+), households with 3 members and less(+), households with lower education level(+), households with two or more outpatient visits(+).									
100	Rezaei, Satar et al. 2019 (149)	Measure and decompose socioeconomic inequality in CHE among households in Kermanshah province, Western of Iran.	cross-sectional study	WHO method	NO	Secondary data	Original Article/ English	2017	Kermanshah
Determinants of exposure to CHE: socioeconomic status(-), health insurance coverage(-).									
101	Kazemi-Galougahi, M. H et al. 2019 (150)	Analyze CHE trend over time and to determine its determinants.	descriptive study	WHO method	Yes	WHO questionnaire	Original Article/ English	2003, 2008 and2015	Tehran
Determinants of exposure to CHE: Lack of Insurance(+), economic status(-), Female household head(+), Having member ≥65 in Household(+), Having member ≤5 in Household(+), Household size(+), Having disabled member in household(+), Dentistry service usage(+), Inpatient service usage(+), Outpatient service usage(+), Inflation(+), the implementation of the Iranian targeted subsidy plan(+).									

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102	Barfar, Eshagh. et al. 2019 (151)	Measure CHE for households with severe mental disorders (SMDs) patients.	cross-sectional study	WHO method, Logistic regression, concentration index, Decomposition analysis	NO	World Health Survey questionnaire	Original Article/ English	July 2017 to March 2018	Tehran
Determinants of exposure to CHE: the age range of 40 to 59-years-old for the household heads(-), a rising education level of the household head(-), utilization of dental(+), rehabilitation(+), and medication services(+), Households in the higher economic quintile(-),increasing the households' monthly expenditure(-).									
103	Nemati, Esmat et al. 2020 (152)	Investigating the OOP and exposure of households with CHE following the implementation of a health transformation plan in Tabriz, Iran.	descriptive-analytic cross-sectional study	WHO method	Yes	WHO questionnaire	Original Article/ English	2017	Tabriz
Determinants of exposure to CHE:Gender(female), Age(+), Marital status(+), Education(-), Employment status(-), Covered by insurance(-), Income(-), Size of the household(+), Dentist services(+), Pharmaceutical services(+), Radiology services(+), Physiology services(+), The presence of people under care(+), Marital status(+).									
104	Piroozi Bakhtiar et al. 2020 (30)	Assess the prevalence and intensity of CHE relating to type 2 diabetes mellitus care and inequality in facing such expenditures in Iran.	cross-sectional study	WHO method	Yes	Self-administered questionnaire.	Original Article/ English	2019	Isfahan, Sanandaj,Sabzevar
Determinants of exposure to CHE: Socioeconomic status(-), being female(+), older age(+), education(-), marital status(+), employment status(-), use of inpatient services(+), household size(+), household assets(-), living place(rural+), type of health insurance(-), duration of diabetes(+), and the complications of diabetes(+)									
105	Ahmadi, Razieh et al. 2020 (153)	Calculate the percentage of CHE after implementing the plan and compare that with CHE before the plan at the same households.	descriptive-analytic cross-sectional study	WHO methodology	Yes	WHO questionnaire	Original Article/ English	2020	Yazd city
Determinants of exposure to CHE: household size(+), member ≥65 years in household(+), the economic status(-), dental services(+), and using inpatients services(+).									
106	Dabbaghi, F. et al. 2020 (154)	Determine the burden of CHCs on patients admitted to selected hospitals in Semnan and Shahrood.	Descriptive-analytic study	WHO methodology	Yes	Researcher-made questionnaire	Original Article/ English	2017	Semnan and Shahrood
Determinants of exposure to CHE: Type of illness or disability of family members(+), Presence of people aged > 65 years or < 5 years in the household(+), Household income level(-), Household head's gender(female-), Number of hospitalization(+), Household supplementary insurance coverage(-), Number of household members(+), Basic insurance coverage of household members(-), Type of household head's occupation(-).									
107	Khammarnia, M.et al. 2020 (155)	Measure the household CHE and FFCI in Sistan-Baluchistan Province after the implementation of HTP.	cross-sectional study	WHO methodology	Yes	WHO questionnaire	Original Article/ English	2017	Sistan-Baluchistan
Determinants of exposure to CHE: place of residence(+), having members aged more than 65 years(+), having members with disabilities and in need of care(+), the use of health services(+),the use of dental(+), rehabilitation(+), diagnostic and laboratory(+), and inpatient services(+).									
108	Vahedi, S et al. 2020 (156)	Explain the contributors of the unequally distributed among disadvantaged populations in Hamadan, Iran.	descriptive-analytic study	WHO methodology	Yes	WHO questionnaire	Original Article/ English	2014	Hamedan
Determinants of exposure to CHE: poor economic status(+), lower household size(-), lack of supplementary insurance(+), and the number Masoudi hospitalizations(+)									
109	Ahmadi, F et al. 2021 (157)	Calculated OOP, CHE, and impoverishing health spending attributed to breast cancer in Iran.	cross-sectional household study	WHO methodology	Yes	WHO questionnaire	Original Article/ English	2019	Urmia
Determinants of exposure to CHE: Place of living (+), Household dimension (+), Age(+), Having insurance(-), Education level(-), Marital status(-).									
110	Sabermahani, A et al. 2021 (158)	Analyze all aspects of OOP, especially after the Health Transformation Plan in Iran	cross-sectional study	Interview	No	self-administered questionnaire	Original Article/ English	October 2017 to March 2018	Kerman
Determinants of exposure to CHE: length of stay in hospitals(+), the need for the presence of next of kin(+), and provision of healthcare services out of hospitals(+).									
111	Ravangard Ramin et al. 2021 (159)	Measure the percentage of households facing CHEs and the factors associated with the occurrence of CHEs in Shiraz, Iran in 2018.	cross-sectional study	WHO methodology	Yes	WHO questionnaire	Original Article/ English	2018	Shiraz
Determinants of exposure to CHE: households living in rented houses(+), households with disabled members(+), households with children under 5 years old(+), those without supplementary health insurance coverage(+).									
112	Farid Gharibi et al. 2021 (160)	Evaluate multiple sclerosis (MS) treatment costs and the resulting economic impact imposed on MS patients in Iran.	cross-sectional study	WHO methodology	No	self-administered questionnaire	Original Article/ English	2018	the East Azerbaijan province
Determinants of exposure to CHE: medication (+), rehabilitation care (+), and physician visits (+), Type of basic insurance (+), Resident (in Tabriz+), Age of patient at disease incidence (+), Duration of disease (years) (+).									

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Appendix 3. Incidence and intensity of catastrophic health expenditure and impoverishment at 40% threshold

At the national level						
Year of data collection	First author	Sample size	Prevalence of CHE	Intensity of CHE		Impoverishment
				Overshoot	MPO	
2000	Razavi, S (68)	26873	2.2%	-	-	-
2000	Raghfar, H (31)	30000	-	-	-	Rural: 3.6% Urban: 4.3%
2001	Razavi, S (68)	26898	2.2%	-	-	-
2001	Rezaei, S (33)	26714	4.08%	-	-	-
2001	Soofi, M (25)	10300	15.31%	-	-	-
2002	Razavi, S (68)	32086	2.3%	-	-	-
2002	Hanjani, HM (69)	32000	3.94%	-	-	11.50%
2003	Ghiasvand, H (23)	36475	Rural:1.32% Urban:1.4%	Rural:14.6 Urban: 13.7	-	Rural: 0.85% Urban: 0.87%
2003	Fazaeli, AA (82)	23134	2.28%	-	-	
2003	Mehrara, M (70)	31283	2.3%	-	-	
2003	Hajizadeh, M (73)	3514	0.3%	-	-	
2004	Ghiasvand, H (23)	36475	Rural:1.35% Urban:1.30%	Rural: 13.0 Urban: 16.7	-	Rural: 0.76% Urban: 1.3%
2004	Fazaeli, AA (82)	24534	1.91%	-	-	
2004	Mehrara, M (70)	31283	1.9%	-	-	
2005	Ghiasvand, H (23)	36475	Rural:1.29% Urban:1.04%	Rural: 16.0 Urban: 16.7	-	Rural: 1.14% Urban: 0.82%
2005	Raghfar, H (31)	30000	-	-	-	Rural: 4.0% Urban: 3.8%
2005	Fazaeli, AA (82)	26895	2.37%	-	-	
2005	Mehrara, M (70)	31283	2.4%	-	-	
2006	Ghiasvand, H (23)	36475	Rural:1.22% Urban:1.42%	Rural: 13.20 Urban: 18.0	-	Rural: 0.8% Urban: 0.92%
2006	Fazaeli, AA (82)	30910	2.27%	-	-	
2006	Mehrara, M (70)	31283	2.3%	-	-	
2006	Rezaei, S (33)	31 111	1.75%	-	-	
2007	Ghiasvand, H (23)	36475	Rural:1.80% Urban:1.20%	Rural: 16.10 Urban: 20.0	-	Rural: 0.9% Urban: 0.83%
2007	Fazaeli, AA (82)	38170	2.49%	-	-	
2007	Mehrara, M (70)	31283	2.5%	-	-	
2007	Mohammadzadeh, Y (78)	31283	-	-	-	2%
2008	Fazaeli, AA (82)	38170	2.46%			
2008	Yazdi-Feyzabadi, V (92)	39008	2.57%	0.44	17.25	0.86%
2008	Ghiasvand, H (23)	36475	Rural:1.38% Urban:1.44%	Rural: 15.60 Urban: 17.20		Rural: 1.0% Urban: 1.0%
2008	Nekoei Moghadam, M (74)	39088	2.8%	-	-	
2008	Raghfar, H (31)	30000	-	-	-	Rural: 4.7% Urban: 4.5%
2009	Fazaeli, AA (82)	38170	2.82%	-	-	
2009	Yazdi-Feyzabadi, V (92)	39008	2.91%	0.58	19.83	1.07%
2009	Ghiasvand, H (23)	36475	Rural:1.78% Urban:1.50%	Rural: 19.70 Urban: 16.20	-	Rural: 1.46% Urban: 1.02%
2010	Fazaeli, AA (82)	38170	3.06%		-	
2010	Yazdi-Feyzabadi, V (92)	39008	3.09%	0.65	20.86	0.94%
2010	Ghiasvand, H (23)	36475	Rural:1.98% Urban:1.65%	Rural: 18.70 Urban: 17.0	-	Rural:0.65 % Urban: 0.72%
2010	Kheibari, M. J (64)	38283	2.77%	-	-	1.013%
2010	Fazaeli, AA (82)	28997	2.1%	-	-	
2010	Raghfar, H (31)	30000	5.76%	-	-	Rural: 5.4% Urban: 4.0%
2010	Zare, H (77)	651267	6.97%	-	-	
2011	Rezaei, S (33)	38 220	3.38%	-	-	
2011	Yazdi-Feyzabadi, V (92)	38434	1.99%	0.27	13.51	0.52%
2011	Ghiasvand, H (23)	36475	Rural:1.00% Urban:1.94%	Rural: 13.20 Urban: 11.50	-	Rural: 0.02% Urban: 0.05%

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2011	Kheibari, M. J (64)	38513	2.44%	-	-	0.904
2011	Masaeli, A (71)	38437	1.56%	-	-	1.49%
2011	Yousefi, M (84)	36071	3.38%	-	-	1.52%
2011	Assari Arani, A (99)	NR	2.9%	-	-	0.34%
2011	Mohammadzadeh, Y (78)	38513	-	-	-	2%
2012	Yazdi-Feyzabadi, V (92)	39008	2.36%	0.29	12.26	0.84%
2012	Ghiasvand, H (23)	36475	Rural:1.30% Urban:0.74%	Rural: 11.90 Urban: 12.90	-	Rural: 0.87 % Urban: 0.75%
2012	Kheibari, M. J (64)	38192	2.91%	-	-	1.139%
2012	Nouraei Motlagh, S (93)	22057	6.25%	-	-	
2012	Fazaeli, A. A (86)	36551	2.85%	-	-	Rural: 2% Urban: 0.4%
2012	Homaie Rad, E (94)	6307	0.6%	-	-	
				-	-	
2013	Yazdi-Feyzabadi, V (92)	39008	3.15%	0.44	14.0	0.94%
2013	Ghiasvand, H (23)	36475	Rural:0.87% Urban:0.66%	Rural: 11.70 Urban: 11.45	Rural: 0.5 Urban: 0.48	Rural: 0.03% Urban: 0.03%
2013	Kheibari, M. J (64)	38316	3.20%	-	-	1.360%
2013	Ahmadnezhad, E (63)	1940417	2.50%	0.329	13.16	
2013	Ghiasvand, H (81)	38325	Rural:11.7% Urban:11.45%	Rural: 14.90 Urban: 15.60		Rural: 0.33% Urban: 0.28%
2014	Yazdi-Feyzabadi, V (32)	39008	3.15%	0.42	13.5	0.95%
2014	Ghiasvand, H (23)	36475	0.5% rural 0.48% urban	Rural: 14.90 Urban: 15.60	-	
2014	Kheibari, M. J (64)	38275	3.25%	-	-	1.291%
2014	Abdi, Zh (35)	9535	2.90%	-	-	
2014	Assari Arani, A (99)	NR	2.35%	-	-	0.5%
2015	Abdi, Zh (35)	9543	2.1%	-	-	
2015	Yazdi-Feyzabadi, V (32)	39008	3.25%	0.42	12.8	
2015	Kheibari, M. J (64)	38252	3.23%	-	-	0.941%
2016	Yazdi-Feyzabadi, V (32)	39008	3.30%	0.29	12.26	
2016	Kheibari, M. J (64)	38146	3.45%	-	-	0.912%
2016	Ahmadnezhad, E (63)	1940613	2.37%	0.292	12.32	-
2016	Moradi, T (97)	39886	5.65%rural 4.58%urban	-	-	-
2017	Yazdi-Feyzabadi, V (32)	37866	3.46%	0.42	12.35	-
2017	Rezaei, S (33)	37 860	5.26%	-	-	-
2017	Kazemi-Karyani, A (161)	37959	3.32%	-	-	-
2018	Woldemichael, A (108)	38858	4.9%	-	-	-
2020	Moradi, G (24)	2000	32.7%	-	-	-
Average		94045	3.40%	10.1%	12.47%	3.21%
Upper limit		1940613	32.7%	20.0%	20.86%	5.4%
Lower limit		3514	0.3%	0.27%	0.48%	0.02%
At provincial level						
Year of data collection		First author	Location of study	Sample size	Prevalence of CHE	impoverishment
2003		Kavousi,z (110)	Households in zone 17 of Tehran	579	12.60%	
2003		Kazemi-Galougahi, M. H (162)	Households in a non-affluent area of Tehran	579	12.60%	10.2%
2004		Davari, M (132)	Chaharmahal and Bakhtiary	715	Rural:2.1% Urban:1.7% related quintile 2	-

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Appendix 3. Continued

2007	Moghimi, M (111)	Cancer Patients in Zanjan Province-Valiasr hospital	746	52%	-
2008	Moghimi, M (111)	Cancer Patients in Zanjan Province-Valiasr hospital	746	42%	-
2008	Nekoeimoghadam, M (119)	All households living in Kerman province	1480	4.1%	-
2008	Kavousi,z (110)	Households in zone 17 of Tehran	592	11.8%	-
2008	Kazemi-Galougahi, M.H (162)	Households in a non-affluent area of Tehran	592	11.8%	5.5%
2008	Karami, M (109)	Residents of Maskan's population in Kerman-shah	189	22.2%	-
2008	Daneshkohan, A (113)	Residents of Maskan's population-based re-search center (Maskan Center) in Kermanshah	217	22.2%	-
2009	Yavangi, M (121)	The cases of teaching hospitals of Tehran ac-cording to pregnancy complication	1172	0.4%	-
2011	Amery, H (117)	The families of Yazd province	400	8.3%	-
2011	Asefzadeh, Saeed (118)	Households who were lived in Qazvin	416	24%	-
2011	Davari, M (132)	Chaharmahal and Bakhti-ary	1001	Rural:0.5% Urban:1.2% related quintile 1 and 2	-
2011	Kavosi, Z (29)	Cancer patients who referred to the chemo-therapy and radiotherapy wards of Namazi Hospi-tal of Shiraz	245	67.9%	-
2011	Sabermahani,A (127)	People leave in Tehran	34700	11.3%	-
2011	Panahi, H (128)	patients hospitalized in general hospitals of Ta-briz	300	30%	-
2011	Tofighi, Sh (131)	People who lived in Tehran	15030 over 60 and 102355 under 60 years	9.74%	-
2011	Ahmadi, R (153)	Households who were lived in Yazd	400	8.2%	4.3%
2012	Amery, H (116)	Families who were sup-ported by Torbat Hey-darieh University of Medical Science	384	6.77%	-
2012	Ghafoori, M.H (123)	Households residing in 22 districts of Tehran	792	7.2%	-
2012	Ghiasvand, H (124)	Five hospital affiliated with TUMS	400	15.05%	-
2012	Kavosi, Z (29)	Households living in Shiraz	800	14.20%	-
2012	Motlagh, S.N (146)	Households who lived in Lorestan	1060	6.70%	1.96%
2013	Motlagh, S.N (146)	Households who lived in Lorestan	1060	4.9%	1.03%
2013	Rezapour, A (163)	Households living in Tehran	2200	6.45%	3.6%
2013	Sadeghiyeh Ahari, S (27)	Dialysis patients who lived in Ardabil	200	72.50%	
2013	Khadivi, R (138)	Married construction workers in Isfahan	400	4.75%	-
2013	Hatam, N (130)	Patients hospitalized in similar wards of a public and a semi-private hospi-tal in Shiraz	376	47.3%	-

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Appendix 3. Continued

2013	Bagheri faradonb, S (134)	Urban household members with at least one year residence in Tehran	625	3.8%	6.70%
2013	Ghiasi, A (135)	Households residing in Zabol	393	20.6%	-
2013	Rezapour, A (137)	Households who had lived in Tehran	625	8.50%	-
2013	Homaie Rad, E (140)	Households living in both urban and rural regions of Guilan	1217	5.75%	-
2013	Ghoddoosinejad, J (164)	Households living in Ferdows	100	24%	-
2014	Anbari, Z (122)	Households who were lived in Markazi	760	11.2%	-
2014	Anbari, Z (122)	Households who were hospitalized in Markazi	248	42.6%	-
2014	Anbari, Z (122)	Households who were need inpatient care in Markazi	512	9.3%	-
2014	Motlagh, S. N	Households who lived in Lorestan	1060	4.47%	1.12%
2014	Juyani, Y (28)	Households that at least one of their members suffers from MS in Ahvaz	322	3.37%	-
2014	Rezapour, A (136)	Families of patients, who were being discharged from hospitals in Hamedan	772	20.70%	-
2014	Almasi, M (139)	Dialysis patients referred to Ayatollah Taleghani Hospital in Urmia	108	30%	-
2015	Piroozi, B (26)	Households who lived in Sanandaj	663	4.80%	-
2015	Homaie Rad, E (140)	households living in both urban and rural regions of Guilan	1205	3.82%	-
2015	Motlagh, S. N (146)	Households who lived in Lorestan	1060	4.34%	0.28%
2015	Kazemi-Galougahi, M.H (162)	Households in a non-affluent area of Tehran	600	29.9%	9.8 %
2015	Moradi, G (141)	Households with members suffering from (MS) in Kurdistan province	141	20.6%	-
2015	Moradi, G (141)	Households with members suffering from dialysis in Kurdistan province	87	8.70%	-
2015	Moradi, G (141)	Households with members suffering from kidney transplant in Kurdistan province	107	13.80%	-
2015	Khammarnia, M (145)	Rural and urban households in Zahedan	816	12.99%	-
2016	Mehdizadeh, P (148)	All health staffs of a Tehran university of medical sciences	240	7.50%	-
2017	Mobaraki, H (143)	Older adults who lived in 22 districts of Tehran.	550	11.1%	-
2017	Rezaei, S (149)	Households who lived in Kermanshah province	1188	4.12%	-
2017	Barfar, E (151)	Households with SMDs patients who referred to four psychiatric university centers located in Tehran for outpatient services.	400	25.75%	-
2017	Nemati, E (152)	Households who lived in 10 regions of Tabriz	400	11.25%	-
2017	Dabbaghi, F (154)	All patients referred to Semnan and Shahrood hospitals	385	23.63%	-
2017	Khammarnia, M (155)	The households in Sistan-Baluchistan Province	2400	20.20%	5.4%
2018	Piroozi, B (26)	Households with gastrointestinal cancer patients in Kurdistan	189	72.70%	-
2018	Ahmadi, F (157)	Women with breast cancer in Urmia	138	13.77%	-
2018	Gharibi, F (160)	MS patients registered at a MS patient association in the East Azerbaijan province	300	54%	-
2018	Ravangard, R (159)	Households from different districts of Shiraz	740	16.48%	-
2018	Sabermahani, A (158)	Patients referring medical centers of Kerman	800	37%	-
2019	Bakhtiar, P (165)	All type 2 diabetic patients who had been referred to diabetic clinics in Isfahan, Sanandaj and Sabzevar.	1065	11.40%	-
2020	Ahmadi, R (153)	Households who were lived in Yazd	400	14.25%	7.5%
Average			2980	18.51%	4.78%
Upper limit			102355	72.70%	10.2%
Lower limit			87	0.4%	0.28%

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Appendix 4. Summary of articles focusing on inequality in health outcomes

Year of data collection	First Author	Location of study	Sample size	Inequality (FFCI)
2000	Raghfar, H (31)	Country	30000	Rural:0.75, Urban:0.78
2002	Hanjani, HM (69)	Country	32000	0.815
2003	Fazaeli, AA (166)	Country	23134 to 38170	Rural:0.829, Urban:0.841
2003	Ghiasvand, H (23)	Country	36475	Rural:0.854, Urban:0.870
2003	Mehrara, M (70)	Country	31283	0.834
2004	Fazaeli, AA (166)	Country	23134 to 38170	Rural:0.826, Urban:0.842
2004	Ghiasvand, H (23)	Country	36475	Rural:0.851, Urban:0.873
2004	Mehrara, M (70)	Country	31283	0.834
2005	Raghfar, H (31)	Country	30000	Rural:0.76, Urban:0.81
2005	Fazaeli, AA (166)	Country	23134 to 38170	Rural:0.826, Urban:0.853
2005	Ghiasvand, H (23)	Country	36475	Rural:0.862, Urban:0.874
2005	Mehrara, M (70)	Country	31283	0.836
2006	Fazaeli, AA (166)	Country	23134 to 38170	Rural:0.825, Urban:0.854
2006	Ghiasvand, H (23)	Country	36475	Rural:0.851, Urban:0.833
2006	Mehrara, M (70)	Country	31283	0.835
2007	Fazaeli, AA (166)	Country	23134 to 38170	Rural:0.824, Urban:0.841
2007	Ghiasvand, H (23)	Country	36475	Rural:0.866, Urban:0.901
2007	Mehrara, M (70)	Country	31283	0.833
2008	Raghfar, H (31)	Country	30000	Rural:0.75, Urban: 0.83
2008	Fazaeli, AA (166)	Country	23134 to 38170	Rural:0.824, Urban:0.840
2008	Ghiasvand, H (23)	Country	36475	Rural:0.850, Urban:0.871
2009	Fazaeli, AA (166)	Country	23134 to 38170	Rural:0.819, Urban:0.836
2009	Ghiasvand, H (23)	Country	36475	Rural:0.850, Urban:0.874
2010	Raghfar, H (31)	Country	30000	Rural:0.75, Urban:0.79
2010	Fazaeli, AA (166)	Country	23134 to 38170	Rural:0.820, Urban:0.829
2010	Kheibari, M. J (64)	Country	38283	0.831
2010	Ghiasvand, H (23)	Country	36475	Rural:0.861, Urban:0.871
2011	Kheibari, M. J (64)	Country	38513	0.846
2011	Ghiasvand, H (23)	Country	36475	Rural:0.853, Urban:0.870
2011	Masaeli,A (71)	Country	38437	0.86
2011	Assari Arani, A (99)	Country	NR	0.861
2012	Kheibari, M. J (64)	Country	38192	0.838
2012	Ghiasvand, H (23)	Country	36475	Rural:0.860, Urban:0.852
2012	Fazaeli, A. A (86)	Country	36551	Rural: 0.82, Urban: 0.85
2012	Nouraei Motlagh, S (93)	Country	22057	0.82
2012	Assari Arani, A (99)	Country	NR	0.858
2013	Kheibari, M. J (64)	Country	38316	0.835
2013	Ghiasvand, H (23)	Country	36475	Rural:0.836, Urban:0.858
2013	Assari Arani, A (99)	Country	NR	0.831
2014	Kheibari, M. J (64)	Country	38275	0.835
2014	Assari Arani, A (99)	Country	NR	0.831
2015	Kheibari, M. J (64)	Country	38252	0.838
2015	Assari Arani, A (99)	Country	NR	0.839
2016	Kheibari, M. J (64)	Country	38146	0.837
Average				0.833

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Appendix 4. Continued

Year of data collection	First Author	Location of study	Sample size	Inequality (CI)
2003	Kavosi, Z (115)	south-west Tehran	71 000	−0.17
2008	Kavosi, Z (115)	south-west Tehran	71 000	−0.19
2011	Yazdi-Feyzabadi, V (32)	Country	38434	Rural:-0.21, Urban:-0.23
2012	Yazdi-Feyzabadi, V (32)	Country	38434	Rural:-0.17, Urban:-0.12
2012	Rad, E. H (90)	Country	12547	Insurance contribution: −0.036, Tax payment: 0.50
2012	Ghafoori, MH (123)	22 districts of Tehran	792	-0.044
2013	Yazdi-Feyzabadi, V (32)	Country	38434	Rural:-0.16, Urban:-0.14
2013	Ahmadnezhad, E (63)	Country	1940417	0.146
2013	Homaie Rad, E (140)	Country	1217	0.43
2013	Rezapour, A (163)	Tehran	2200	0.375
2014	Yazdi-Feyzabadi, V (32)	Country	38434	Rural:-0.23, Urban:-0.07
2014	Abdi,ZH (35)	Country	9535	0.49
2015	Yazdi-Feyzabadi, V (32)	Country	37866	Rural:-0.15, Urban:-0.2
2015	Moradi, T (97)	Country	39886	−0.003
2015	Abdi,ZH (35)	Country	9543	0.55
2015	Kazemi-Galougahi, M. H (162)	non-affluent area of Tehran	600	- 0.017
2015	Homaie Rad, E (140)	Country	1205	0.41
2016	Yazdi-Feyzabadi, V (32)	Country	37866	Rural:-0.14, Urban:-0.12
2016	Ahmadnezhad, E (63)	Country	1940613	0.191
2017	Yazdi-Feyzabadi, V (32)	Country	37866	Rural:-0.14, Urban:-0.15
2017	Rezaei, S (62)	Country	37860	-0.17
2017	Kazemi-Karyani, A (161)	Country	37959	Rural:−0.150, Urban:−0.218
2019	Piroozi,B (30)	All of type 2 diabetic patients who had been referred to diabetic clinics in Isfahan, Sanandaj, and Sabzevar.	1065	−0.20
2020	Vahedi, S (156)	All households that utilized inpatient services in hospitals of Hamadan.	770	−0.163
Average				-0.01
Year of data collection	**First Author**	**Location of study**	**Sample size**	**Inequality (Kakwani index)**
2001	Rezaei, S (33)	Country	26714	− 0.554
2006	Rezaei, S (33)	Country	31111	− 0.265
2010	Zare, H (77)	Country	651267	0.4458
2011	Rezaei, S (33)	Country	38220	− 0.225
2012	Rad, E. H (90)	Country (The families for health insurances and tax payments)	12547	insurance contribution: −0.4374932, Tax payment: 0.01015436
2012	Ghiasvand, H (34)	Country	NR	Rural: 0.021, Urban: 0.025
2014	Abdi, ZH (35)	Country	9535	0.12
2015	Abdi, ZH (35)	Country	9543	0.15
2017	Rezaei, S (33)	Country	37860	− 0.207
Average				-0.149
Year of data collection	**First Author**	**Location of study**	**Sample size**	**Inequality (GINI index)**
2003	Rad, E. H (90)	Country (The families for health insurances and tax payments)	12547	0.40
2012	Rad, E. H (90)	Country (The families for health insurances and tax payments)	12547	0.4009
2012	Fazaeli, A. A (86)	Country	36551	Insured: 0.35, Non Insured: 0.36, Urban: 0.34, Rural: 0.33
2012	Ghiasvand, H (124)	Five hospital affiliated with TUMS	400	0.8
2012	Ghiasvand, H (34)	Country	NR	Rural: 0.52, Urban 0.52
2012	Motlagh, S. N (146)	Lorestan	1060	0.43
2013	Motlagh, S. N (146)	Lorestan	1060	0.29
2014	Motlagh, S. N (146)	Lorestan	1060	0.42
2014	Abdi, ZH (35)	Country	9535	0.38
2015	Abdi, ZH (35)	Country	9543	0.39
2015	Motlagh, S. N (146)	Lorestan	1060	0.43
2017	Nemati, E (152)	10 regions of Tabriz	400	0.45
Average				0.42

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Appendix 5. Factors associated with catastrophic health expenditure

Category	Criteria	Total Studies that This Factor Analyzed as Determinant of CHE	References
Socioeconomics characteristics of HH	Household economic status (Q1 vs. Q5)	51	(24), (26-30), (34), (53), (73-75), (77), (84), (86-87), (89-90), (93), (96), (100), (103-104), (107), (111), (114), (116-117), (119-123), (131-134), (135-136), (137-149).
	Place of residence (urban, rural, remote areas)	36	(23), (25), (27), (29-30), (34), (53), (62), (66), (69), (71-72), (80), (86), (89-90), (104), (115-117), (124-126), (135), (137-139), (142), (145, 147-148), (150, 151, 152), (153, 154).
	Health insurance status of HH	28	(24), (25), (69-71), (80-81), (26, 28-30), (92, 97), (104), (107), (116), (125-126), (150), (131, 134-135), (53), (141, 145, 147, 151), (66, 153).
	Supplementary insurance status of HH (head and members)	10	(24), (107), (116-117), (119), (127), (133), (147), (149), (155).
	Wealth index (income deciles)	10	(71-72), (86), (98), (113-115), (62), (135), (156).
	Homeownership	9	(23), (28), (34), (73), (89), (119), (135), (139), (154).
	The type of health insurance	4	(24), (29), (30), (160)
	Per capita household or housing infrastructure	3	(70), (78), (75)
	Household total expenditure or Per capita household expenditure	3	(127), (91), (76)
	Number of the Insured / Uninsured in the Informal Sector	2	(75), (66)
	Insurance expenditure	1	(87)
Demographic characters of Household	Household size	41	(26-30), (31), (34), (53), (62), (69-72), (73), (75), (80-84), (89, 90), (95, 100, 101), (107), (111), (114), (118-119), (122-123), (125), (133-136), (134), (135-141), (151), (154), (156), (158).
	Gender of household head (HHH)	30	(24), (26), (30), (34), (53), (62), (69), (80-82), (84-86), (93), (98), (103-104), (107), (114-115), (122-123), (135), (137-139), (141), (151-154), (156).
	Education level of HHH	20	(30), (53), (62), (72), (84-86), (89), (103), (108-109), (114), (118), (121-122), (125), (135), (138), (142), (153), (158).
	Employment status of the HHH or members	19	(69-72), (74), (80), (30), (92), (97), (114), (117), (119), (122), (73), (132), (135), (151), (153), (159).
	Education level of household members or patient	10	(30), (72), (73), (89), (103), (116), (118), (122), (125), (138).
	The age of HHH	9	(29), (53), (62), (69), (84), (86), (104), (135).
	Marital status of HHH	6	(30), (69), (71), (122), (125), (151).
	Gender of patients	3	(128), (130), (98)
	Male ratio of household	2	(73).
	Households in which the head is a student	1	(107).
	Age of patient at disease incidence	1	(160).
Vulnerable person in HH	Having elderly member (over 60 years of age) in HH	41	(69-71), (80), (86-87), (92-94), (97-101), (104), (107-108), (110-111), (113-114), (121, 123-124), (131-132), (62, 135-138), (141, 142, 144-145, 147), (150, 151-153), (157), (67).
	Have under 5y children in HH	20	(24), (26), (62), (86), (95), (97-98), (101), (104), (107), (111), (114), (123), (127), (137-138), (141), (147), (153), (158).
	Having member with chronic disease and NCDs (In particular; cancer, dialysis, MS, SMDs, diabetic)	19	(25), (29), (66-67), (74-77), (82), (92-93), (97-98), (115), (137-138), (140), (143), (147), (158).
	Having member with disability in HH	17	(24), (26), (37-38), (41), (74), (87), (90), (92), (114), (119), (123-124), (127), (131), (141), (150).
	Under 12 y member living in Household	8	(38), (71), (92-93), (135), (138), (156-157).
	Having member in HH in need of care	7	(25), (38), (115), (122), (124), (128), (134).
	Health status of the member of household	2	(34), (112)
	Having a smoker member	1	(106)

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Appendix 5. Continued

Health care utilization by HH members	Using inpatient services and the volume of use by HH members and length of stay	32	(26-31), (34), (62), (72), (80), (87), (89-91), (95-96), (100), (103), (106-108), (110), (116-117), (123-124), (128), (133), (137-139), (141), (152), (154-155).
	Using outpatient services and the volume of use by HH members	22	(25), (29), (62), (66), (75), (84), (87), (89), (91), (96), (117-118), (131), (134), (137-138), (141), (147-148), (152), (155), (158).
	Using dentistry services by HH members	22	(26), (31), (37-38), (62), (80), (84), (87), (91), (96), (100), (116), (118), (121-122), (124), (131), (141), (147), (155), (161-162).
	Using medicines and equipment	15	(28), (37-38), (63), (84), (90), (95-96), (101), (109), (121), (126), (134), (155).
	Using diagnostic services (clinical services of Pathology and Laboratory Medicine, Radiology, sonography, radiotherapy, echocardiography, MRI, exercise test, and Nuclear Medicine)	12	(38), (84), (90-91), (95-96), (101), (122-124), (160), (161).
	Using Physiotherapy and rehabilitation service	9	(26), (28), (84), (96), (116), (121), (124), (126), (134).
	Using private services by HH members	6	(66), (77), (90), (98), (135), (155)
	Health services utilization	4	(92), (119), (115), (142)
	Utilizing cancer treatments	2	(29), (119)
	Utilizing dialysis services and the volume of use by HH members	1	(139)
	Utilizing ambulatory	1	(74)
	Use of drug addiction cessation services	1	(74)
Health Expenditure Indicators	Basic health insurance coverage	20	(53), (62), (72-73), (75), (80), (86), (89-93), (110), (115), (120), (123), (135), (137-138), (150), (155-156).
	Complementary health insurance coverage status	8	(34), (90), (92), (123), (127), (139), (154), (156).
	Access (financial, geographical and cultural) to healthcare services and safe water	6	(74), (84), (90), (134), (145), (152), (155).
	The medical density (It is defined by physicians as per thousand population and other educated health workers.)	6	(66), (135), (138), (144), (146), (163).
	Informal payments or under-the-counter payment	5	(38), (108), (110), (135), (155).
	Distribution of income, education, skills, jobs, opportunities, physician, specialized manpower, health expenditures, and expectations	5	(74), (135), (138), (145), (150).
	Household health expenditures	4	(109), (135), (144), (157).
	Increasing consumption of expensive high-tech health care services	4	(87), (89), (105), (115)
	Health care tariff growth rate	3	(66), (104), (115)
	Physician visits	3	(126), (148), (160),
	Change of consumption towards branded drugs	3	(28), (38), (66)
	Time of diagnosis	2	(111), (130)
	Refraining from using healthcare services	2	(29), (38)
	High inflation rates in the health sector	2	(75), (104)
	Households' Willingness to Pay for Health Services	2	(75), (104)
	Lifestyle pattern and self-care behavior	2	(66), (104)
	Payment mechanisms	1	(113), (124)
	Adoption of public insurance law	1	(75), (66)
	The implementation of health transformation plan in 2014	1	(95)
	Per capita public health costs	1	(88)
	Quality of health care	1	(104)

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Appendix 5. Continued

Health Expenditure Indicators	Type of hospital	1	(130)
	Induced demand (consumer or supplier)	1	(104)
	Weakness in service delivery and surveillance system	1	(87)
	Real prices of health services	1	(105)
	Reduction of accumulation of insurance resources	1	(66)
	Multiplication of basic insurance funds	1	(66)
	Clinical guidelines	1	(104)
	Disease outbreaks	1	(104)
	Lack of financial protection	1	(66)
	Out-of-pocket Share in Total Health Expenditure (OOP/THE)	1	(75)
	Sources of Growth in OOP and Prepayment Funds	1	(75)
	Referral path system	1	(104)
	The costs of dying and time-to-death	1	(89)
	Inequality indicators (Horizontal & Vertical)	1	(75)
	Out-of-pocket changing rules and indicators	1	(75)
	Differences in health payments among different deciles in urban and rural areas	1	(75)
	Inefficiency of the insurance system	1	(87)
	Having made any out of hospital payments linked with the same admission	1	(124)
	Contingent valuing of health insurance premium	1	(75)
	Failure in the rules of economic evaluation	1	(87)
	Lack of well-organized services by the public sector hospitals and clinics or the health insurance support.	1	(75)
	Lack of preventing the private medical persons to work out of the regulated tariff rules or to ignore the insurance organization rules easily	1	(75)
	Inefficient social health insurance mechanism to reduce the direct payments from households	1	(75)
	Health Financing Distribution Indicators of FFCI	1	(75)
	Medical education policies	1	(104)
Macroeconomic Indicators	Growth general inflation rate and exchange rate	6	(66), (92), (95), (115), (101), (150)
	Civil status (Development rate) or Human Development Index (HDI)	4	(78), (108), (106), (107)
	GDP per capita	4	(67), (76), (101), (89)
	Urbanization rate	3	(66), (67), (85), (88)
	Iranian targeted subsidy plan	2	(150), (66)
	Unemployment rate	2	(132), (88)
	Budgeting or budget deficit and Budget to Support the Uninsured	1	(75), (104)
	Illiteracy rate	1	(89)
	GGHE-D as percentage of GDP	1	(105)
	Gross national production (GNP)	1	(101)
	Life expectancy increase	1	(104)
	Inequality conditions of the distribution of the risk of financing	1	(75)
	Liquidity rate	1	(101)
	National income and national consumption	1	(101)
	Population aging	1	(89)
	population rate	1	(101)
	Dependency ratio	1	(88)
	Currency price unification policy	1	(66)
	Sanction and war	1	(130)

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