Factors associated with catastrophic health expenditure and impoverishment in Mongolia in 2021

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DECLARATION

I, Michidmaa Chinges, hereby declare that the research “Factors associated with catastrophic health expenditure and impoverishment in Mongolia in 2021” is submitted as a thesis for the completion of my Master’s Degree in the Department of Global Health and Disease Control, Division of Health Policy and Financing at Yonsei University, Seoul. This paper presents an in-depth review of my study, encompassing all ideas, sources, and material with proper acknowledgment. Furthermore, I confirm that the findings of this research have not been previously presented for any academic qualification and are not presently being considered for any academic qualification.

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ABSTRACT

Background: Globally, almost a billion people allocated 10% of their household budget on health, and half a billion people were impoverished due to paying for health out of their pocket in 2017 (WHO, 2021a). Health costs paid directly by individuals, known as out-of-pocket (OOP) expenses, affect the financial resources of households, and it is crucial to avoid exceeding a certain amount of their budget when it comes to spending on health. Mongolia, a country with a lower-middle-income status and extensive social health insurance coverage, has witnessed a significant increase in OOP health spending over the past decade. In 2018, around 7.2% of the population allocated more than 10% of their household budget towards healthcare (WHO, 2022).

Objectives: The objective of this study is to quantify the incidence and financial hardship caused by catastrophic health expenses in Mongolia throughout the year 2021, as well as to determine the factors associated with it.

Methods: This study is a retrospective cross-sectional analysis that examines the factors associated with catastrophic health expenditure (CHE) and destitution in Mongolia in 2021. Two distinct methodologies were utilized in this investigation to compute the incidence rate of CHE: OOP payments made directly by individuals that surpass 10% of the total amount spent by the household (Wagstaff & van Doorslaer, 2003), households that spend more than 40% of their nonfood spending on OOP payments (Ke Xu et al., 2003). Multivariate logistic regression model was used to evaluate the likelihood of incurring CHE on the socio-economic determinants of CHE.

Results: At the threshold is 10% of the total household consumption, 13.8% of households at the threshold of 40% of capacity to pay 5.3% of households experienced CHE in Mongolia. Around 110,000 people were impoverished due to paying for health in 2021 in Mongolia. Households who have elderly members, household heads who are single, who are economically inactive, household members who sought inpatient and outpatient care were more likely to incur CHE at both thresholds.

Conclusion: Despite the mandated status of national health insurance in Mongolia and the

government's efforts to protect citizens from financial hardship during the last decade, it still falls short in terms of providing adequate financial protection and achieving universal health care. The government needs to implement consistent policies in protecting the population from financial burden.

Keywords: catastrophic health expenditure, impoverishment, Mongolia

I. INTRODUCTION

1.1 Background

Financial protection is a fundamental component of achieving universal health coverage (UHC) and is attained when the costs associated with accessing healthcare services do not impose a financial strain on individuals or jeopardize their living standards (WHO, 2019).

Globally, almost a billion people allocated 10% of their household budget on health, and half a billion people were impoverished due to paying for health out of their pocket in 2017 (WHO, 2021a). Healthcare costs are influenced by a household's financial resources, and it is essential for households not to spend medical expenses beyond a specific portion of their budget.

The latest report by the World Health Organization (WHO) on financial protection in health reveals that the majority of the population experiencing financial hardship due to healthcare expenses is primarily located in developing countries. Following the coronavirus disease (COVID-19) pandemic, financial protection for health has been exacerbated, leading to increased foregone care, higher rates of catastrophic spending, and worsening impoverishment (WHO, 2021a).

Previous literature shows that as the proportion of OOP payments increases, more households face catastrophic payments (Xu et al., 2010). Many ow- and middle- income countries (LMICs) still heavily depend on OOP health payments, despite some advancements in health insurance development (Li et al., 2022). Mongolia, a lower-middle-income country with high coverage of social health insurance, has experienced high OOP health expenses over the last decade, ranging from 31 to 37% and 27% in 2020 (WHO, 2020). The incidence of catastrophic payments was 5.5% in Mongolia in 2012, and 20,000 people were pushed into poverty (Dorjdagva et al., 2016). Whereas, in 2018, the incidence increased to 7.2%, and over 200,000 individuals faced financial burden due to healthcare expenses (WHO, 2022).

The primary factors contributing to catastrophic and impoverished health expenses in the countries of the Western Pacific Region of the WHO—China, Cambodia, Vietnam, the Philippines, , the Lao People's Democratic Republic, and Mongolia—were direct OOP expenditures for medicines and a presence of an elderly member or members with chronic disease in the household (WHO, 2021b). In Iran, another LMIC, households with higher incomes, elderly members receiving inpatient and outpatient services, and those living in rural areas faced catastrophic payments (Yazdi-Feyzabadi et al., 2018). In Sub-Saharan Africa, households with lower incomes, larger families, unemployed household heads, individuals over the age of 65, those who have been hospitalized or have chronic illnesses, and those who utilize specialist or private healthcare services were more likelihood of facing catastrophic payments (Eze et al., 2022).

It is therefore necessary to evaluate the level of CHE and impoverishment in Mongolia using the latest available data, taking into account that there are only a few studies that have been carried out, and identify the factors associated with it.

1.2 Purpose

The aim of this study is to calculate the incidence and impoverishment of CHE in Mongolia in 2021 and identify factors related to it.

Objectives:

- To calculate the incidence and intensity of CHE among households in Mongolia in 2021
- To estimate the impoverishment rate before and after paying for healthcare expenses in 2021
- To investigate the factors associated with catastrophic health expenditure and impoverishment.

1.3 Significance of Study

First of all, monitoring catastrophic health expenditure serves as a crucial metric for

assessing progress toward achieving Universal Health Coverage (UHC) on a global scale as outlined in Sustainable Development Goal 3 (SDG 3). Measuring catastrophic health expenditure helps monitor whether individuals and families are still facing significant financial burdens due to healthcare costs, yet Mongolia still has high OOP payments over the last years, as mentioned before.

Second of all, Mongolia has high coverage of social health insurance, however studies have indicated that the percentage of the population with health insurance as a metric is not a good way of assessing their level of financial security (A. Wagstaff et al., 2018). Even in high-income countries, high OOP health payments discourage patients from accessing appropriate and prompt medical care, and lead to financial hardship, particularly the ones with low income (Edmonds & Hajizadeh, 2019; Quintal, 2019).

Third of all, Mongolia's current health system is characterized by the Soviet Union's Semashko health care system, which relied heavily on curative hospital-based treatments, substantial bed use, a high number of unnecessary admissions, and prolonged stays in hospitals (Jigjidsuren, 2021). The public has developed a preference for inpatient care and specialized care, while neglecting preventive and primary outpatient care (Jigjidsuren, 2021). Consequently, the population continues to bypass or refer themselves to higher-level health facilities to receive more specialized care. Adding on that the uncontrolled expansion of private hospitals allows private healthcare providers to offer services that are not covered by insurance policies/benefit packages. As a result, households might find themselves in a situation where they need to make higher out-of-pocket payments.

Furthermore, it is crucial to discover the distribution of health payments in relation to income, and examine how differently health payments affect the poor and the better off. Considering that a lot of policies have been implemented to alleviate the financial burden especially on the vulnerable.

Hence, it holds significant importance to assess the incidence of CHE in Mongolia provide the latest evidence and identify the determinants of CHE. The findings can

provide evidence for the development of targeted interventions that aim to alleviate financial hardship and enhance financial protection for individuals facing substantial healthcare costs.

1.4 Research question

- What is the incidence and intensity of CHE in Mongolia in 2021?
- What percentage of the population is pushed into poverty as a result of high OOP payments?
- What are the main determinants of CHE and impoverishment?

1.5 Definitions

Catastrophic health expenditure: According to United Nations (UN) SDG, indicator 3.8.2 (UN, 2015), CHE is defined as a “This refers to a percent of the population that spends a significant portion of their entire household spending or income on healthcare. Two criteria are employed to determine a "substantial household expenditure on health": surpassing 10% and surpassing 25% of total household expenditure or income.” WHO’s definition of CHE is “OOP costs exceeding 40% of nonfood spending or the ability to afford healthcare bills”

“Capacity to pay” for health care is defined as extracting food consumption from total household consumption (WHO, 2005a).

Impoverishment is “The proportion of households experiencing poverty or increased poverty as a result of health out-of-pocket expenses is determined by utilizing a relative poverty threshold that takes into account essential requirements, such as food, shelter, and utilities (WHO Regional Office for Europe, 2023).

Out-of-pocket health expenditure is defined as the portion of healthcare expenses that individuals pay directly from their own financial resources, rather than being covered by insurance or other third-party payers when they receive any type of care (WHO, 2018).

Incidence of catastrophic health expenditure: "the proportion of households or individuals within a population that incur healthcare costs exceeding a certain threshold of their income or expenditure" (O'Donnell & Doorslaer, 2007).

The intensity of catastrophic health expenditure: "the extent to which healthcare costs exceed the threshold among those households or individuals who experience CHE" (O'Donnell & Doorslaer, 2007).

II. LITERATURE REVIEW

2.1 Health system

The health system encompasses “all the organizations, institutions, and resources that are committed to carrying out activities aimed at enhancing health” (WHO, 2000). The World Health Report emphasized the primary objectives of a health system “achieving good health outcomes, meeting the population’s expectations and ensuring equitable financial contributions”.

The measurement of equity in healthcare funding is based on the extent of inequality in healthcare payments among households that have different financial capacities (Doorslaer et al., 1992). In other words, ensuring fair and proportional distribution of financial responsibilities implies that the burdens are equitably shared among individuals, irrespective of their economic status, whether they are less affluent or more prosperous.

2.2 Health financing

The method in which the health system is funded has a considerable impact on the population's health and general well-being (Yardim et al., 2010). The World Health Report 2000, as well as the World Health Report on Health System Financing with WHO resolution on "Sustainable financing, universal health coverage, and social health insurance," all highlighted the financial burden faced by people who do not have access to affordable, high-quality health care.

Health finance entails managing and allocating financial resources within the health system to ensure that everyone has access to necessary health care services without financial hardship (WHO, 2019).

2.3 Social health insurance

Funding for healthcare can come from diverse sources, encompassing government

tax-based systems funded through taxation, social health insurance supported by premiums from employers and employees, private health insurance obtained by individuals or employers, and OOP payments when seeking care. Many countries introduced health insurance to diminish financial burdens, asserting that these measures have led to a decrease in catastrophic payments (Atun et al., 2015). Recent multi-country studies indicate that the proportion of the population with insurance coverage is insufficient to demonstrate a sufficient level of financial protection in healthcare. Instead, increasing the portion of total healthcare spending that is pre-paid, notably through taxes and mandatory contributions, has proven to be successful (A. Wagstaff et al., 2018). This is the same with the principles of health financing reforms that guide to accelerate progress towards UHC to encourage countries progressively rely more on compulsory (public) funding sources (WHO, 2019).

2.4 Universal Health Coverage

In 2005, the WHO adopted a resolution urging on countries to establish health financing systems that are both sustainable and equitable, to reach UHC. (WHO, 2005b). The metrics proposed in studies for measuring catastrophic spending and impoverishment, "Catastrophe and Impoverishment in paying for health care" (Wagstaff & van Doorslaer, 2003) and “Household catastrophic health expenditure: a multi-country analysis” (K. Xu et al., 2003), have emerged as the fundamental methodologies in empirical investigations concerning financial protection in the healthcare sector (A. Wagstaff et al., 2018). Numerous country- and region-specific studies have been conducted, delving into various aspects such as trends in financial protection or the impact of reforms on this domain.

Further, the concept expanded into the SDG indicator framework. The rationale behind including this indicator in the SDGs is to highlight the importance of providing equitable access to healthcare services, as well as preventing people from suffering from catastrophic payments due to health expenses (UN, 2015). By tracking CHE, policymakers can better understand the impact of healthcare costs on households and implement policies that

work towards achieving UHC and protecting individuals and families from excessive financial burdens.

2.5 Empirical research

Several factors contribute to the incidence of catastrophic health expenditure and impoverishment, varying across countries and settings. Studies conducted at the country level mostly investigate the incidence of CHE and/or factors influencing it by considering demographic aspects (like age, household composition, presence of elderly or disabled individuals etc.) and socio-economic factors (including income, education, employment status etc.) through household surveys, as well as health system-related and disease-related factors, depending on data availability. While surveys covering multiple countries aim to analyze CHE in conjunction with macroeconomic indicators (such as Gross Domestic Product (GDP) and the percentage of total health expenditure to GDP etc.) to facilitate a comparison of CHE incidences among countries.

2.5.1 Demographic factors

It is evident that age is an important determinant of CHE, certain age groups, such as the elderly and children, are particularly vulnerable to experiencing CHE. Elderly individuals often require more frequent and specialized healthcare services, which result in increased financial burden (Eze et al., 2022; Li et al., 2012; Liu et al., 2019). Additionally, several studies have indicated that households consisting of children aged below five are more susceptible to experiencing financial difficulties as a result of healthcare costs (Özgen Narcı et al., 2015; Van Minh et al., 2013), while others found it as a not significant factor (Xu et al., 2015). Moreover, households that have members suffering from chronic illnesses and poor health conditions incur higher levels of catastrophic health expenditures compared to households without such members (Bogale & Kassa, 2022; Fu, 2022; Swetha et al., 2020). The geographical location of households can influence the incidence of CHE with disparities often observed between regions, as

well as residing in either rural or urban areas can also exert an influence of CHE. (Njagi et al., 2018; Ramirez-Agudelo & Pinilla-Roncancio, 2023)

2.5.2 Socioeconomic factors

A significant body of literature indicates that income level plays a crucial role in determining the likelihood of experiencing CHE. Households with lower income levels are particularly vulnerable to CHE as they face a higher risk of exceeding the threshold of out-of-pocket payments relative to their income. (Azzani et al., 2019; Coelho, 2022; Njagi et al., 2018). Urban and rural households had a lower probability of incurring catastrophic health expenditure (CHE) if the household head had a high degree of education or was employed (Fu, 2022). Unemployed individuals or those in informal and precarious employment often face challenges in accessing health insurance and adequate healthcare services, increasing their risk of financial burden due to medical expenses. Several studies conducted in South Korea have found that households where individuals experienced changes in employment status, such as transitioning from employed to unemployed had higher risk to experience catastrophic payments compared to households where individuals were consistently employed (Choi et al., 2016; Lee et al., 2020).

2.5.3 Health system and disease-related factors

Several studies examined the association between CHE and some health systems-related factors like healthcare facility's level (Atake & Amendah, 2018), type of healthcare facility (Dorjdagva et al., 2021), distance to the healthcare facility and the number of healthcare facilities in the district/county, social insurance schemes (Njagi et al., 2018). In Sub-Saharan Africa, health facility type and level were strongly associated with having CHE (Eze et al., 2022). In South Korea, the prevalence of CHE was higher and either increased or remained unchanged among households whose heads experienced health issues compared to other households (Kim & Kwon, 2023).

Furthermore, a studies carried out in Mongolia revealed that patients who had

hospitalization at tertiary level and private hospitals (Dorjdagva et al., 2021) had higher incidence of CHE, as well as households having a member with non-communicable disease and multiple morbidities were more likely to experience financial hardship than those with infectious diseases (Dugee et al., 2019).

2.5.4 COVID-19 Pandemic

Along with all the above factors the COVID-19 pandemic had a substantial worldwide effect, some say it was one of the largest macroeconomic shocks after the Great Depression and World War II (Miguel & Mobarak, 2022). The majority of households in LMICs reported severe drops in income (wage reductions), employment (job losses), and consumer spending (Miguel & Mobarak, 2022). Significantly, the COVID-19 pandemic and the implemented actions have had a profound influence on an important goal of health system: universal availability of health services (Pujolar et al., 2022). There were changes, notably decrease in healthcare utilization (Fersia et al., 2020; Yamamoto et al., 2022). In several countries, health systems were unable to deal with the COVID-19 pandemic, simultaneously delivering care and implementing existing interventions, as well as fewer people sought healthcare to address non-COVID-19 health concerns (Bambra et al., 2021). According to a 2020 study conducted in China, the COVID-19 pandemic had a major negative impact on healthcare utilization, as reflected by a huge decrease in healthcare expenditure (Zhang et al., 2020).

Different approaches taken by different countries, health systems, and the OOP expenditures due to healthcare were varying across countries during COVID-19. Especially, in cases where there was no financial protection for healthcare, the costs incurred were devastating. A study in Indonesia found that just the precautious measures taken due to COVID-19 cost households an average of 7.25% of their income. Notably, people who were under various health coverage schemes still had high OOP expenditure (Hafidz et al., 2023). Analyzing various factors related to COVID-19 expenditure should be studied elsewhere, as going deeply into this topic using standard household socioeconomic

surveys can be challenging.

2.6 Overview of Mongolia

Mongolia is classified as a lower middle income country, with a population of 3.4 million people, and is recognized as one of the most densely resided countries globally. Following the breakdown of the Soviet Union in the 1990s, Mongolia initiated a systemic shift from a centrally planned to a market economy. GDP per capita is at $4946 (World Bank, 2022), while the poverty rate was recorded at 27.8% (World Bank, 2020).

In 2021 General government expenditure on health accounted for 3.6%, while health expenditure as a proportion of the GDP was 1.3 %. The per capita health expenditure was reported as $59 by the National Statistics Office (NSO) (NSO, 2021a). OOP expenditure has been consistently over 30% (31-37%) from 2013 constituted 27% in 2020 (World Bank, 2020b) and the health insurance coverage rate stood at 94%.

2.6.1 Service delivery

Mongolia's health administration is structured into two primary divisions: one dedicated to the capital city of Ulaanbaatar and another responsible for the country's 21 regions. A two-tier referral system represents these administrative divisions: primary care and specialized care, which encompasses secondary and tertiary care. The government requires that its people receive free primary healthcare.

There are a total of 4,952 healthcare facilities, including primary health centers, state-owned general, regional, and specialized hospitals and centers, private hospitals and clinics, as well as research facilities in Mongolia. Among these, there are 239 private hospitals, 1548 private clinics, and 1790 pharmacies. Although the private sector appears to be dominant in terms of quantity, there is a limited number of private hospitals that closely resemble public hospitals in both size and the scope of services offered. The government lacks a comprehensive coherent policy over private hospitals, hence the rapid growth of private hospitals, characterized by heavy reliance on OOP payments is a

concern (Tsevelvaanchig et al., 2017). OOP payments include both copayments required for services or good covered by social health insurance and full payments for services that are not part of the social health insurance benefits package.

2.6.2 Health financing reforms:

Over the last two decades, Mongolia has undertaken significant healthcare financing reforms aimed at improving access to quality healthcare and reducing financial burdens on its population. Some of the key reforms include:

Introduction of social health insurance

In 1994, the Mongolian government successfully implemented Social Health Insurance, as well as introducing user fees and co-payments, which marked a departure from the centrally planned Semashko model where healthcare services were provided free of charge.

Pooling of sources

In 2021, the government consolidated its government health budget and health insurance funds under a unified single-purchaser scheme. Previously, the two different funding sources functioned with different benefit packages, causing a fragmentation of financing sources and service coverage, which led to the substantial financial burdens that patients experienced through OOP expenses (Jigjidsuren, 2022). This integration aimed to eliminate fragmentation in financing sources and ensure more efficient and equitable healthcare funding distribution.

Expansion of Benefit Packages

The benefit package was continuously expanded. In 2017, the Ministry of Health had a policy aiming to restrict OOP expenses to 25% of the total health spending.

Following these reforms in 2021 approximately 2.2 million medication services at reduced cost were delivered to individuals who were beneficiaries of the health insurance fund, which was higher 1.5 times than the previous years (NHIC, 2022). Diagnostics and drugs were the main drivers of catastrophic payments in Mongolia (Dugee et al., 2019).

Table 1. Table of evidence: Factors associate with CHE

Author/ Year	Country	Methods		Results
		Design	CHE calculation method	
(Dorjdagva et al., 2016)	Mongolia	cross-sectional study	1. Total household expenditure 2. Capacity to pay	Around 5.5% of households experienced CHE at the threshold of 10% of total household expenditure, while 1.1% of households experienced catastrophic payments at the threshold of 40% of capacity to pay, approximately 20,000 people were pushed into poverty due to paying for health.
(Eze et al., 2022)	Sub-Saharan Africa	systematic review	various	The study identified 29 variables at the population level and 38 factors specific to diseases that contribute to the occurrence of CHE in the region. Significant population-level factors associated with CHE include living in rural areas, having a low socioeconomic status, lacking health insurance, having a large household size, having an unemployed household head, being elderly, being having a chronic illness, using specialist healthcare, and using private healthcare providers.
(Li et al., 2012)	China	cross-sectional study	40% of capacity to pay	The CHE rate was 13.0%, whereas the impoverishment rate was 7.5%. Households with hospitalized, elderly, or chronically ill individuals, as well as those in rural or poorer areas, had greater rates of CHE. The combination of adverse factors enhanced the likelihood of incurring catastrophic health expenses.
(Yazdi-Feyzabadi et al., 2018)	Iran	cross-sectional study	40% of capacity to pay	Households residing in rural area, with higher income, seeking inpatient and outpatient services, and having an

Author/ Year	Country	Methods		Results
		Design	CHE calculation method	
				elderly member in the household led to increase in CHE prevalence ($p < 0.05$).
(Swetha et al., 2020)	India	longitudinal study	Total household income	Within a one-year period, fourteen percent of the households faced CHE. There was a statistically significant association between CHE and socioeconomic status. Around 42% of the households suffering with CHE had individuals with chronic illness.
(Njagi et al., 2018)	Sub- Saharan Africa	scoping review	10% of household income and 40% of capacity to pay	Individuals receiving treatment for HIV/ART, tuberculosis, malaria, and chronic diseases experienced significantly high levels of financial burden in West African countries. The risk of facing CHE is influenced by various factors, including the household economic situation, the characteristics of healthcare providers, the socio-demographic characteristics of household members, the specific type of illness, participation in social insurance programs, the geographical location, and the size and composition of the household.
(Ramirez-Agudelo & Pinilla-Roncancio, 2023)	Colombia	descriptive and analytical cross-sectional study	Capacity to pay, with a threshold of 20%.	The study showed variations in the incidence of CHE based on the province of residence. Nationally, 1.77% of households encountered CHE, and for the majority of these households, nearly half of their OOP expenses were attributed to expenditures on medications and medical consultations. The geographic location of a household was a pivotal factor in the examination of CHE in Colombia,

Author/ Year	Country	Methods		Results
		Design	CHE calculation method	
				with rural households exhibiting elevated levels of CHE.
(Sato, 2022)	Nigeria	Cross-sectional study	Capacity to pay	Health-seeking behaviors, including clinic visits for illness treatment and prevention, are constrained, particularly among impoverished households. Despite these limitations, the prevalence of households facing Catastrophic Health Expenditure (CHE) remains notably high in Nigeria.
(Bogale & Kassa, 2022)	Ethiopia	A cross-sectional study	total household expenditure	The study revealed a decrease in catastrophic health spending among homes with insurance coverage, whereas an increase was observed among households with children under the age of 5, people suffering from chronic illnesses, and those with poor health status. Hence, it is crucial to promote insurance and health promotion activities in order to enhance the overall health condition of the population.
(Araujo & Coelho, 2021)	Brazil	A cross-sectional study	total household expenditure	Households led by women and those with heads who have received a higher level of education are more likely to experience significant financial burden due to healthcare expenses. Annually, nearly 10 million Brazilians are driven into poverty as a result of out-of-pocket healthcare expenses.
				Conclusions: Despite the progress made in providing universal health care in Brazil, there are still obstacles to ensure financial protection for the

Author/ Year	Country	Methods		Results
		Design	CHE calculation method	
				public, particularly the impoverished. Enhancing the availability and cost-effectiveness of vital medications is crucial for enhancing financial security in the healthcare system of Brazil.

2.6.3 COVID 19 in Mongolia

Mongolia had early financial consequences from COVID-19 as a result of its strong interdependence with the Chinese economy, specifically in terms of commerce, tourism, and foreign investments. The country's economy contracted by 4.6% in 2020 and sluggish growth by 1.6% in 2021(ADB, 2023). Mongolia confirmed its first domestically transmitted case of COVID-19 in November 2020, despite sharing the longest border with neighboring China, where the outbreak initially emerged.

Early measures taken prior to the first confirmed domestic case

The Mongolian government took early preventive measures to prevent the inflow and outbreak of COVID-19 pandemic, beginning in late January 2020. The government initiated its first lockdown on January 26, 2020, and implemented essential and rigorous measures to contain the spread of COVID-19. These encompassed closing the borders with China and suspending international flights. Educational institutions at all levels remained closed from late January until September 2020, while people were still allowed to go to work. These actions had a substantial impact on households, causing considerable hardship as their regular sources of income were either disrupted or entirely halted (World Bank, 2020a).

The National Statistical Office (NSO) collaborated with the World Bank and performed a 5-stage phone survey to assess the impact of COVID-19's on households. According to

the survey, people faced significant reductions in their income, with some experiencing a complete loss of income altogether. Moreover, some individuals experienced significant financial setbacks, with certain individuals being forced to temporarily or permanently cease operations of their enterprises as a result of the financial impacts of the pandemic. Households were worried about food availability, with 75% of households experiencing adverse effects due to an increase in prices for essential food items (World Bank, 2020a).

Measures taken after the spread of COVID-19

Following the first domestic transmission of COVID-19 in November 2020, Mongolia implemented a second lockdown, which began on November 12, 2020, and included the closure of workplaces. While some restrictions were temporarily eased on December 14, 2020, many containment measures, such as school closures and bans on public gatherings, remained in effect. However, after a brief relaxation period, strict lockdown measures were reinstated on December 23, 2020, and they continue to be in effect as of January 6, 2021 ("Decree No.226," 2020). In addition to employment and income losses, rising prices of essential food items exacerbated food insecurity among the impoverished (World Bank, 2020a).

The fourth lockdown in Mongolia was enforced from February 11th to 23rd, 2021, to mitigate the transmission of COVID-19 and imposing mobility restrictions during the Lunar New Year holiday. Additionally, "One Door One Test" a mass testing campaign was introduced during this period. However, this campaign faced criticism for being inefficient and potentially providing people with a false sense of security (J. Dorjdagva et al., 2021).

On February 23, 2021, the vaccination program commenced and concurrently, the state of emergency was lifted. Individuals, enterprises, and institutions have resumed their regular routines and activities (UN, 2021). In April 2021, Mongolia faced a significant COVID-19 challenge, experiencing a four-fold increase in positive cases compared to the end of March. The capital city, Ulaanbaatar, became the epicenter of infections, with cases surging from 7,000 to 31,362 during this period (UNFPA, 2021). Following that

government imposed the 5th lockdown from April 10 to 25. During the lockdown, about 30 percent of government and private sector employees were permitted to work from their offices. However, several events took place during this time, including the presidential election campaign, which may have contributed to the increase in local transmission (Ganzon et al., 2023).

According to the World Bank phone survey, the government's single cash transfer program implemented before the April lockdown had a notable impact on reducing household food insecurity. In addition, households have commonly resorted to limiting food and non-food consumption as a way to cope. Poorer households were more likely to reduce their spending on non-food items and resort to detrimental coping strategies, such as accumulating debt or selling assets.. (World Bank, 2021).

In July, the restrictions on movement were progressively eased, leading to a rise in domestic tourism. It is worth noting that despite the significant increase in confirmed cases, the mortality rate remained low and declined by mid-November 2021, as a result of high vaccination coverage among the population (Ganzon et al., 2023).

Access to healthcare during COVID-19

During the second lockdown, households encountered obstacles in accessing medical services. Survey findings indicated that by the end of 2020, one in three individuals requiring medical treatment did not receive it, primarily due to concerns about contracting the virus and mobility restrictions (World Bank, 2020a). Access to healthcare services has shown a moderate improvement, particularly, there has been a significant recovery in rural areas between December and April 2020. However, with the surge in COVID-19 cases in Ulaanbaatar, the improvement in urban areas has been marginal. Although there was a slight increase in the accessibility of health services in urban areas by June, 20% of households that required medical treatment were unable to access it. The disparity in access to healthcare services between urban and rural areas has decreased since April, but still 19% of households that required medical treatment were unable to receive prompt care.

Measures taken to support the economy and burden on households

To mitigate the impact of COVID-19 on households and enterprises, the Mongolian government has put in place strategies to aid the financial stability of households, guarantee the welfare of children, secure employment within businesses, and protect against economic challenges.

Moreover, for three months starting from April 1, 2020, employees who paid social insurance contributions from enterprises that had suspended operations due to government decisions but retained their jobs received MNT 200,000 (approximately $71, 1$ = MNT 2813.53). The government covered social insurance premiums for self-employed and voluntary insured individuals for six months, calculated based on the minimum wage. Social insurance premiums for private sector enterprises and citizens were waived for six months. Additionally, enterprises with annual sales income of up to MNT

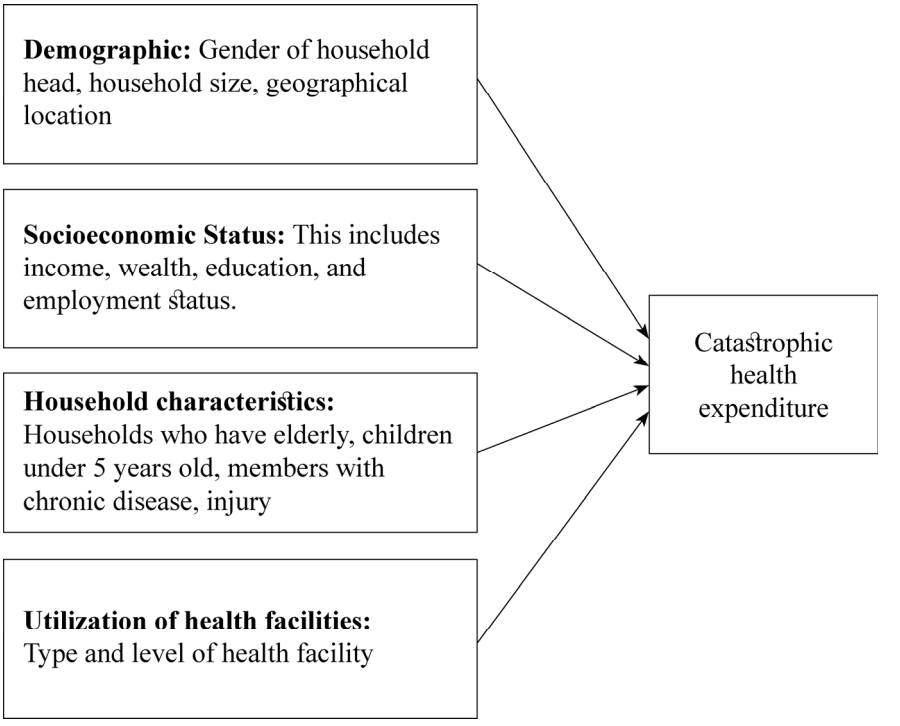
1.5 billion ($533’000) were granted a six-month income tax exemption, and no fees or penalties were imposed for late reports ("Government Resolution No.167," 2020).

Furthermore, from December, 2020, to the end of 2021, the government provided support by covering the costs of water, electricity, heat, and garbage for households and businesses. However, starting from January 1 to May 31, 2022, the government decided to continue offering a discount only on household electricity consumption. Additionally, the government distributed MNT 300,000 (approximately $106) to each individual in April 2021.

The objective was to mitigate the economic consequences of the COVID-19 pandemic, protect the welfare of households, maintain employment, and ensure the financial stability of individuals and enterprises in Mongolia.

III. CONCEPTUAL FRAMEWORK

The conceptual framework was used to map out and explore different variables and their correlation/association to CHE. The framework included various factors such as demographic (age, gender, household size, geographical location), socioeconomic (income, wealth, education and employment), household characteristics (households who have elderly, children under 5 years old, members with chronic disease, injury, disability) and utilization of healthcare facilities (type and level of health facilities). These factors were identified through an existing literature review which provided basis for the study assessment.



IV. METHODOLOGY

4.1 Design

This is a retrospective cross-sectional study analyzing the factors associated with CHE and impoverishment in Mongolia in 2021.

4.2 Study setting

The study was carried out in Seoul, Republic of Korea using secondary data from Household Socio-Economic Survey (HSES) conducted by the NSO of Mongolia.

4.3 Data collection

HSES is a nationally representative survey, that has the full set of variables for the analysis.

4.3.1 Household Socio-Economic Survey

The primary goal of the HSES is to assess the standards of living and poverty level of the population, while also measuring household income and spending. Additionally, it provides to update the items and their respective importance in the consumer price index, and provides data for calculating the GDP. The survey is stratified into three levels. Ulaanbaatar is the capital city of Mongolia. Mongolia is divided into provinces, districts, soums, and khoroo/baghs (NSO, 2021b).

The HSES collects data on a range of aspects, including household income, expenditure, consumption of both food and nonfood items, dwelling conditions, heating and electricity usage, education, employment, and health. The health part of the survey has detailed information on total household OOP health expenditures, such as the amount spent on outpatient services in the last month, expenditures on inpatient care over the past

12 months, and costs related to medications not prescribed by a doctor; other expenses like transportation, accommodation, food, travel costs, and gifts to medical staff etc. It also includes data related to the health status, and healthcare utilization of household members: whether each member of the household experienced illness during the past 30 days and, if so, whether they sought outpatient medical services, the reasons for seeking healthcare, the type of hospital or healthcare facility and the referral level of the hospital visited.

4.3.2 HSES Survey sample size

In 2021, a total of 11,199 households (comprising 40,129 individuals) were enrolled across the nation using three-stage stratified random sampling.

4.3.3 Exclusion criteria

Household members who have been absent from home for the last 11 months (including household head, spouse, children, and students) and other household members absent for the last 6 months will be excluded from the study.

4.3.4 Data management

Measuring the socio-economic status of household

Household economic status can be measured through income, expenditure and consumption. Measurement through consumption is more advantageous than measuring income, particularly in developing countries. This is because formal work is less prevalent, households often have several and frequently changing sources of income, and home production is prevalent in developing countries (O'Donnell & Doorslaer, 2007). Thus, we estimated the incidence of CHE using total household consumption.

Construction of key variables

Based on the raw data, the following variables were generated to measure CHE and impoverishment (details in Appendix I):

1. OOP health expenditure per capita/ monthly; per household/annually

2. Total household consumption per household annually

To calculate total household consumption: food consumption, nonfood consumption, durable goods, imputed rental value and energy consumption were aggregated.

3. Total household food consumption per household, annually

4. Total household non-food consumption per household annually

4.5 Measuring Catastrophic health expenditure

4.5.1 Methods to calculate CHE

In this study, two different approaches were employed to calculate the incidence of CHE:

- Budget share approach: OOP payments exceeding 10% of total household consumption (Wagstaff & van Doorslaer, 2003).
- Capacity to pay approach: OOP payments exceeding 40% of household's nonfood expenditure (Ke Xu et al., 2003).

The budget share approach

The budget share approach compares the OOP health payments to the total household expenditure or income. By the definition of SDG indicator 3.8.2, the threshold is 10% and 25%. This approach is simple to apply, and supposes that the household budget is consistently accessible for healthcare expenditures. Therefore, it presupposes that when healthcare expenditure reaches a significant level, the household will inevitably allocate fewer funds to other essential expenses, such as food, housing, and education (Nguyen et al., 2023). The limitations of this approach are 🕮 it doesn't consider variations in purchasing power among different income groups (Grépin et al., 2020) and it may underestimate CHE for poor households and overestimate CHE for rich households (Rahman et al., 2022).

The estimate of CHE would be

$$\frac{OOP}{Total\ expenditure\ or\ income} > \text{threshold} \quad \text{or} \quad \frac{T}{X} > z$$

where *T*, representing OOP health payments, *x*, representing total household budget, and *z*, representing the threshold.

The capacity-to-pay approach

This method compares the OOP health payments to the household's non- discretionary spending, which is the amount left after deducting a standard amount for basic needs from the total household budget. The threshold is usually set at 40% of the non- discretionary spending (Xu, 2005), and complies with the WHO's definition of CHE. The advantages of this approach are that it takes into account the basic needs of the household, such as food, adjusts for different levels of income or consumption and can capture the long-term effect of health spending on household's standards of living and well-being (Nguyen et al., 2023) As well as, it can account for the variation in health needs across different groups of people, such as age, gender, and chronic conditions. (Quintal, 2019) In the contrast, the CTP approach might not be able to calculate the short-term effect of OOP payments on the household's liquidity and ability to manage short term challenges, such as asset sales and loan taking.

The estimate of CHE would be

$$\frac{OOP}{Total\ expenditure - basicneeds} > Threshold \text{ or } \frac{T}{nf(x)} > z$$

If *x* represents the overall household expenditure, *nf(x)* denotes the household's ability to pay, *T* stands for OOP expenditures for healthcare, and *z* represents a predetermined threshold, then household experiences CHE if the ratio of *T* to *x*, or *T* to *nf(x)*, surpasses threshold *z* (O'Donnell & Doorslaer, 2007).

4.5.2 Measuring incidence and intensity of CHE

The incidence of CHE can be express by headcount, and can be obtained from a proportion of households that incurred catastrophic payments (O'Donnell & Doorslaer, 2007).

First of all, we will estimate CHE headcount (incidence) by the following:

$$\text{Headcount} = \frac{1}{N}\sum_{i=1}^{N} E_i \qquad (2.1)$$

If the ratio of *Ti* to *xi* is greater than *z*, Ei takes on the value 1, and 0 otherwise. However, it does not accurately represent the extent to which households surpass the threshold.

Additionally, the catastrophic gap/overshoot was calculated, which measures the average percentage increase in payments above the threshold z in relation to total expenditure. The estimation is as stated: (2.2)

$$O_i = E_i\left(\left(\frac{T_i}{x_i}\right) - z\right) \qquad (2.2)$$

Furthermore, it is important tp evaluate how catastrophic payments were distributed in respect to wealth. Since it may be challenging to determine the differential impact of CHE on individuals of lower socioeconomic status compared to those who are more affluent. The concentration indices (*Ei* and *Oi,* referred to as C_E and C_O) were used to determine the level of income-related inequality in catastrophic payments. This term refers to the quantity that's equivalent to two times the difference in area between the concentration curve and the line of equality (van Doorslaer & Koolman, 2004). The concentration index lies -1 to 1 range. To compute the weighted head count and overshoot measures, the following calculation is employed:

$$\text{Hw} = \text{H}\ (1\text{-CE}) \qquad (2.4)$$

$$\text{Ow} = \text{O}\ (1\text{-Co}) \qquad (2.5)$$

A positive concentration index (CE) indicates that persons with higher income have a greater likelihood of surpassing the threshold for catastrophic healthcare expenses. This indicates that the burden of such spending is disproportionally borne by high-income groups. Conversely, a negative CE value would imply the opposite relationship. Similarly, a positive/negative value of C_O implies that the extent of overshoot is more among the wealthies /poorest households (Wagstaff & Van Doorslaer, 2000).

In the preceding equations, the CHE at the threshold of 40% of nonfood consumption was calculated by replacing the total household consumption, *xi*, with the capacity to pay, *nf(xi)*.

4.6 Measuring impoverishment:

Excessive OOP health costs can potentially result poverty. Conventional poverty metrics fail to account for those who are driven into poverty as a result of significant direct OOP payments. An individual is regarded as fallen into poverty if their income/consumption, which was previously is above the poverty line, falls below it following the payment of healthcare expenses. If the consumption before OOP spending was already below the poverty line, it can also face impoverishing health expenses, which further worsens its financial situation.

The impoverishing effect of OOP payments for healthcare can be measured by comparing the poverty level before and after deducting OOP payments.

First, the poverty rate before paying for health will be calculated (HP_{gross}). This indicates the percentage of the population living below the poverty line before accounting for healthcare-related expenses (O'Donnell & Doorslaer, 2007).

$$H^{gross} = \frac{\sum_{i=1}^{N} s_i p_i^{gross}}{\sum_{i=1}^{N} s_i} \qquad (3.1)$$

p^{gross} equals 1 if xi <PL and is 0 otherwise, *s* is the household size, and N is the number of households in the sample.

Individual-level poverty gap as a result of health payments will be as follows:

$$g_i^{gross} = p_i^{gross}(PL - y_i) \qquad (3.2)$$

where PL is the poverty line, based on the equation 3.2 the mean poverty gap will be:

$$G^{gross} = \frac{\sum_{i=1}^{N} s_i g_i^{gross}}{\sum_{i=1}^{N} s_i} \qquad (3.3)$$

Subtraction of health expenses is calculated by replacing p_i^{gross} with p_i^{net} in the equation 3.1. When the average household expenditure/consumption per person falls below the poverty line p_i^{net} equals 1 and the net of the healthcare payments poverty gap is estimated as the replacement of g_i^{gross} by g_i^{net} the equation 3.3 with

$$g_i^{net} = p_i^{net}\ (PL - y_i) \qquad (3.4)$$

4.6.1 Poverty line

The national poverty line provided by the NSO was used for the poverty measurement. The national poverty line equals to MNT184,747, ($65.6) per month (NSO, 2020), which is approximately 2.1$ per day.

4.7 Measuring determinants of CHE

In this study, multivariate logistic regression models were used, considering that CHE is a binary variable with a value of 0, when the household did not have catastrophic payments or 1, when the household had CHE. Socio-economic characteristics, such as household size (continuous variable), location (categorical variable), household economic status(categorical variable), household head gender (categorical variable), marital status (categorical variable), education level (categorical variable), employment status (categorical variable); presence of chronic illness (binary variable), cancer utilization (categorical variable), hospitalization of a household member (binary variable) were independent variables based on the previous

literature (Dugee et al., 2019; Eze et al., 2022).

4.8 Data analysis

A total of 11,199 households and 40,129 individuals participated in the HSES 2021. From that, 839 individuals who were absent from home for the last 11 months (including household head, spouse, children, and students) and other household members absent for the last 6 months were also excluded from the study. In total 11199 households and 39290 individuals were enrolled in the study.

The chi-square test was used to compare households that experienced CHE to those that did not, and percentages were used to describe categorical variables. The study used multivariate logistic regression analysis to assess the impact of various determinants on the probability of experiencing CHE. The results provide odds ratios (OR) together with their associated 95% Confidence Intervals (CI). A p-value of 0.05 was considered to have statistical significance. All statistical analyses were conducted using Stata.

Table 2. Description of Variables

Characteristics	Classifications	Definitions/remarks
DEPENDENT VARIABLES		
Catastrophic health expenditure	1. 10% of household consumption expenditure 2. 40% of a household's capacity to pay	1. OOP payments exceeding 10% of household total consumption expenditure 2. OOP payments exceeding 40% of a household's nonfood expenditure
INDEPENDENT VARIABLES		
Household characteristics		
Household size	1. ≤ 5 2. ≥ 5	1. ≤ 5 refers to household size with less than five members 2. ≥ 5 refers to household size with more than five members
Location	1. Urban	1. Urban refers to households located in

Characteristics	Classifications	Definitions/remarks
	2. Rural	an urban area or province center 2. Rural household refers to households situated in a rural area or countryside (soum/countryside).
Household expenditure quintile	1. Poorest 2. Second 3. Third 4. Fourth 5. Richest	1. Poorest: This quintile represents households with the lowest levels of expenditure or consumption. These households often struggle to meet basic needs. 2. Second: The second quintile represents households with slightly higher expenditures than the poorest quintile but still face economic challenges. 3. Third: This quintile includes households with moderate levels of expenditure, indicating a relatively stable economic situation. 4. Fourth: The fourth quintile comprises households with above-average expenditures, indicating a relatively comfortable economic position. 5. Richest: The richest quintile represents households with the highest levels of expenditure.
Household head characteristics		
Gender of household head	1. Male 2. Female	Gender of the household head
Marital status	1. Single 2. Married 3. Others	1. Single household heads who are single 2. Married refers to the household head, whether they have legal documentation of marriage or not, with their spouse or wife. 3. Others refer to household head who are widowed or divorced
Household head/spouse's educational status	1. No education 2. Primary 3. Secondary 4. Vocational/technical 5. Higher education	1. No education: The household head has not received any formal education. 2. Primary: The household head has completed primary education. 3. Secondary: The household head has

Characteristics	Classifications	Definitions/remarks
		completed secondary education, which generally includes high school or an equivalent level of education. 4. Vocational/technical: The household head has received training in technical or mid-professional fields. 5. Higher education: The household head holds a diploma or a higher level of education, indicating various levels of post-secondary education, bachelor's degrees and higher degrees.
Household head/spouse employment status	1. Employed 2. Unemployed 3. Inactive	1. Employed: Household head who was engaged in economic activities, whether paid or self-employed, for at least one hour during the reference week. 2. Unemployed: Household head who was not engaged in economic activities, whether paid or self-employed, for at least one hour during the reference week. Inactive: refers to household heads who are either a retiree, disabled, have injuries or illness
Household members		
Members with chronic disease	1. Yes 2. No	1. Yes: If there's a member in the household who sought outpatient care with a reason of cardiovascular, respiratory, gastrointestinal, urinary, and nervous system diseases, excluding cancer. 2. No: if there is no member in the household who sought outpatient (last month) services in the last month.
Member with injuries		Member utilized
Utilization of services	1. Member utilized outpatient care 2. Member utilized inpatient	1. Member utilized outpatient care refers to households' members that utilized only outpatient services for the last

Characteristics	Classifications	Definitions/remarks
	care 3. Both 4. Not utilized	month. 2. Member utilized inpatient care refers to households' members that utilized only inpatient services for the last 12 months. 3. Both refer to household members that utilized both inpatient and outpatient healthcare services. 4. Not utilized refers to household members who did not seek any type of care.
Member with cancer	1. Outpatient only 2. Inpatient only 3. Both 4. Not utilized	1. Cancer outpatient: if a member sought outpatient care for the last month specifically for cancer-related reasons. Those households were excluded if their hospital visits were more than one for reasons other than cancer. 2. Cancer inpatient: if a member sought inpatient care for the last month specifically for cancer-related reasons. Those households were excluded if their hospital visits were more than one for reasons other than cancer. 3. Both: if a member utilized inpatient and outpatient care specifically for cancer reasons. 4. Not utilized: Households whose members did not seek care for cancer reasons.
Children less than 5 years in the household	1. Yes 2. No	1. Yes: If there's a child under 5 years old in the household 2. No: if there are no children in the household under the age of 5
Household members who are elderly	1. Yes 2. No	1. Yes: If there's a member above 65 years old 2. No: If there is no member above 65 years old
Utilization of health care		
Outpatient care of health facility	1. primary 2. secondary	1. Primary: At least one member in the household sought care in primary-level

Characteristics	Classifications	Definitions/remarks
	3. tertiary 4. private 5. other 6. Not utilized	health facilities for the last month 2. Secondary: At least one member in the household sought care in secondary level health facilities for the last month 3. Tertiary: At least one member in the household sought care in tertiary level health facilities for the last month 4. Private: At least one member in the household sought care in private health facilities for the last month 5. Other: At least one member in the household sought care in other types of health facilities for the last month 6. Not utilized: Household members who did not utilize outpatient care in the last month If household members sought outpatient care more than once then the higher level of health facilities were considered.
Utilization of service	1. primary 2. secondary 3. tertiary 4. private 5. other 6. Not utilized	1. Primary: At least one member in the household sought care in primary level health facilities for the last 12 months 2. Secondary: At least one member in the household sought care in secondary level health facilities for the last 12 months 3. Tertiary: At least one member in the household sought care in tertiary level health facilities for the last 12 months 4. Private: At least one member in the household sought care in private health facilities for the last 12 months 5. Other: At least one member in the household sought care in other types of health facilities for the last month Not utilized: Household members who did not utilize inpatient care in the last month If household members sought inpatient care more than once then the higher level of health facilities were considered.

V. RESULTS

5.1 General characteristics of participants

The study aimed to determine the incidence of catastrophic health expenditure and impoverishment in Mongolia in 2021, and the factors associated with it. There were 11199 households that were equally distributed between urban and rural areas of Mongolia and household size ranged from 1 to 13, with an average of 4 members in the household. Notably, almost 76% of household heads were male, the majority were married (69.4%), almost half (46.7%) had secondary level of education and 60% were employed. Only 14.1% of households had an elderly member, 30.5% had children under the age of five, 9.5% had a member with chronic disease and 0.5% had member with cancer. About 32% of households had at least one member who sought any type of care, where 6.6% sought outpatient care in the past 30 days and 17.5% sought inpatient care in the last 12 months, and 7.6% requiring both. Household members seeking outpatient care predominantly utilized primary level hospitals (6.5%), while those requiring inpatient care mainly sought services from tertiary care facilities (6.2%). (Table 1).

Table 3. Descriptive statistics for sample households in Mongolia, 2021

Characteristics	N=11199
Household size	[1, 13]
Location	
Urban	55.4%
Rural	44.6%
Household economic status and median OOP	
Poorest	180,000
Second	220,000
Third	286,500
Fourth	300,000

Characteristics	N=11199
Richest	350,000
Household head characteristics	
Gender of the head of the household	
Male	75.9%
Female	24.1%
Marital status	
Single	7.3%
Married	69.4%
Other	23.2%
Educational attainment	
None	6.5%
Primary	8.3%
Secondary	46.7%
Vocational/technical	15.8%
Higher level education	22.7%
Economic activity	
Employed	60.6%
Unemployed	13.2%
Inactive	26.2%
Household member characteristics	
Presence of an elderly person	
yes	14.1%
Presence of children under 5 years old	
yes	30.5%
Member with chronic disease (excl. cancer)	
yes	9.5%
Member with injury	
yes	1.2%
Member with cancer	
Yes	0.5%

Characteristics	N=11199
Outpatient (only)	0.1%
Inpatient (only)	0.3%
Both	0.1%
No	99.5%
Healthcare utilization	
Member utilized outpatient care	6.6%
Member utilized inpatient care	17.5%
Both	7.6%
Not utilized	68.3%
Outpatient care utilization by health facility	
At least one member utilized primary care	6.5%
At least one member utilized secondary care	4.1%
At least one member utilized tertiary care	2.0%
At least one member utilized private care/abroad	1.6%
Other	0.1%
Not utilized	85.8%
Inpatient care utilization by health facility	
Member utilized primary care	3.9%
Member utilized secondary care	9.0%
Member utilized tertiary care	6.2%
Member utilized private care/abroad	5.6%
Other	0.3%
Not utilized	74.9%

Notes: [Min, Max]

Figure 1 displays the usage of outpatient services and the level (primary, secondary, and tertiary) and type of health facilities (public and private) accessed across different consumption groups. The usage of primary care and tertiary care remains consistent among members of households seeking outpatient care, regardless of their household

income level. The utilization of secondary care in the poorest households are is 34.9%, while for private care it is 14.3%. In contrast, the utilization rates rate of secondary care in the richest households are is 23.6%, and for private hospitals, it is 31.5%.

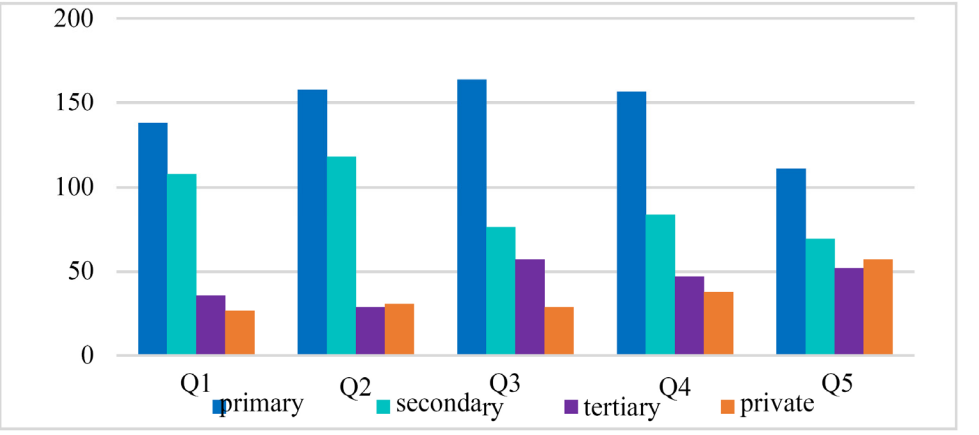


Figure 1. Outpatient utilization by health facility and consumption levels in Mongolia, in 2021

Figure 2 illustrates the usage of outpatient services categorized by level and type of health facilities accessed across different consumption levels. Households in the poorest quintiles sought inpatient care predominantly at secondary level facilities 40.9%, around 26.2% sought care in tertiary level facilities and only 14.3% sought care in private facilities. On the other hand, among the households in the wealthiest quintiles (Q5) who sought inpatient care utilization of secondary level health facilities are 29.1%, tertiary and private care is 25.2%, and 31.5% relatively of those seeking inpatient care.

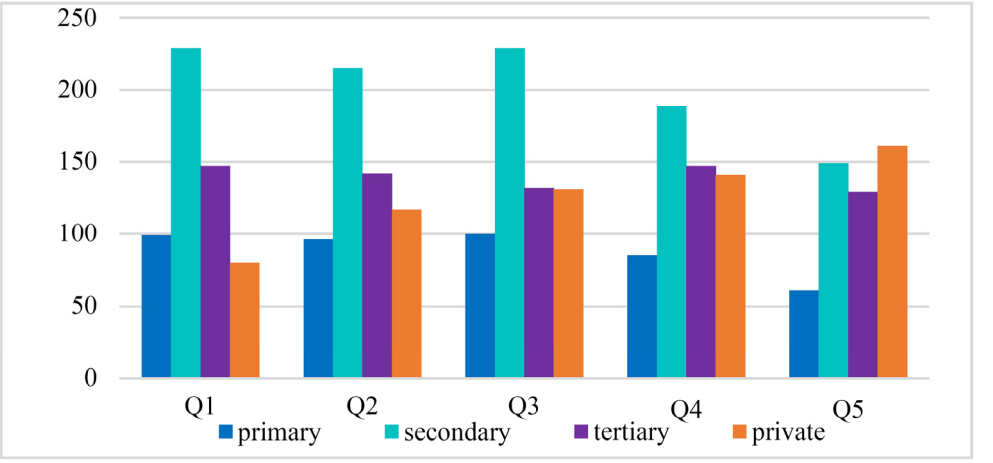


Figure 2. Inpatient utilization by health facility and income levels in Mongolia, in 2021

5.2 Catastrophic health expenditure and impoverishment in Mongolia in 2021

Table 4 displays the percentage of the population in Mongolia having catastrophic payments for health care. CHE was estimated in relation to total household consumption (THC) and non-food expenditure (capacity to pay), using different thresholds as suggested by the UN and WHO guidelines. When the threshold is 10% of the total household consumption, 13.8% of households experienced CHE. By increasing the threshold, the incidence rate decreases. For example, 9.5% of households used more than 25% of their total household consumption to healthcare. Similarly, increasing the threshold from 25% to 40% of the ability to pay results in a decrease in the incidence of catastrophic payments from 9.5% to 5.3%.

The "Concentration Index" measured the degree of inequality in relation to income. The presence of negative concentration index values, such as -0.31 at the 10% at the 10% of THC indicates that people with lower incomes are disproportionately impacted by CHE, particularly when the threshold rises.

Table 4. Households incurring catastrophic health expenditure in Mongolia, 2021

	OOP health spending as a share of THC			OOP health spending as a share of non-food consumption	
Threshold	10%	15%	25%	25%	40%
Catastrophic headcount	13.9%	8.9%	4.5%	9.5%	5.3%
Mean catastrophic overshoot	2.36%	1.8%	1.16%	3.71%	2.63
Concentration index	-0.31	-0.40	-0.49	-0.44	-0.51

Around 19.4% of the surveyed population is considered to be in poverty prior paying for health, but following the OOP health payments the poverty rate increases to 22.7%, approximately by 3%. The estimate of the poverty gap also rose from MNT 7173 to MNT 10269.4, by MNT 3095 (Table5).

Table 5. Measures of poverty based on gross and net of spending on health care in Mongolia, 2021

Poverty measures	Gross of health payment	Net of health payments	Percentage change
Poverty headcount	19.4	22.8	3.3
Poverty gap	7,193.5	10,304.7	3,111.4
Normalized poverty gap	3%	5%	1%

5.3 Association between catastrophic health expenditure and other factors

A chi-square analysis was conducted to examine the association between CHE and the determinants (Table 6).

Among households that experienced CHE at the 10% threshold of THC, 41.0% were situated in the poorest quintile (with this percentage increasing to 56.1% at the 40% CHE

threshold). Additionally, 22.3% were in the second poorest quintile, 15.4% in the third quintile, and 11.8% and 8.7% in the richer and richest quintiles incurred CHE at the threshold of 10% of THC, respectively (p value=0.0001).

Significant variations were also observed about the gender of the household head. For example, 63% led by males incurred CHE using 10% of their THC, in contrast to households led by females. Catastrophic payments were faced by 63.3% (74.8% at threshold 40% of CPT) of household heads who were retirees, had a disease, or had suffered an injury, students. Notable differences were seen between households that had elderly people, particularly 39.6% (50% of households at the threshold of 40% of nonfood expenditure), as well as variations between households that had children under the age of five and households that did not have children under the age of five (p-value = 0.0001). In addition, there were significant differences of incurring catastrophic payments at the threshold of 10% between households that had members with chronic disease (23%), members who had injuries (2.1 percent), members who had cancer (2.9%), and households that did not have any of these members (p-value = 0.0001).

Furthermore, there were differences between households that utilized inpatient care and those that utilized outpatient care at health facilities (p-value = 0.0001). Out of the households whose members used inpatient care, 35.9% experienced catastrophic payments. Similarly, among the households that used outpatient care, 10.5% had catastrophic payments at the threshold of 10% of THC. Interestingly, 12.4% of households that utilized outpatient care at primary level hospitals incurred catastrophic payments, as well as individuals who used inpatient care at tertiary level hospitals (20.3%) and private hospitals (15.9%) faced catastrophic payments (p value = 0.0001).

Table 6. Association between Catastrophic health expenditure and its determinants in Mongolia, 2021

Characteristics	Incidence of CHE 2021			
	10% excess of total household consumption		40% of nonfood consumption	
	no	yes	no	yes
	N=9691	N=1508	N=10595	N=604
Household size				
1- 2 **	29.2%	57.8%	31.1%	68%
3-4	30.9%	26.4%	39.1%	21%
≥5	30.9%	15.9%	29.9%	10.9%
Location				
Urban *	54.9%	59.0%	55.5%	54.1%
Rural	45.1%	41.1%	44.5%	45.9%
Household economic status				
Poorest **	16.6%	41.9%	17.9%	56.1%
Second	19.6%	22.3%	19.9%	22.5%
Third	20.7%	15.4%	20.5%	10.6%
Fourth	21.3%	11.8%	20.7%	7.1%
Richest	21.7%	8.7%	20.9%	3.6%
Household head characteristics				
Gender of the head of the household				
Male **	77.9%	63.0%	76.8%	59.9%
Female	22.0%	37.1%	23.2%	40.1%
Marital status				
Single **	7.6%	5.9%	7.4%	5.8%
Married	71.6%	55.6%	70.4%	52.2%
Divorced/widowed	20.9%	38.6%	22.2%	42.1%
Educational attainment				
None **	6.3%	7.8%	6.4%	9.1%
Primary	7.6%	12.9%	7.8%	17.1%
Secondary	47.5%	41.7%	47.0%	41.6%

Characteristics	Incidence of CHE 2021			
	10% excess of total household consumption		40% of nonfood consumption	
	no	yes	no	yes
	N=9691	N=1508	N=10595	N=604
Vocational/technical	15.2%	19.7%	15.6%	19.7%
Diploma and above	23.4%	18.0%	23.3%	12.6%
Economic activity				
Employed **	65.5%	28.8%	62.9%	19.5%
Unemployed	14.0%	8.0%	13.7%	5.5%
Inactive	20.5%	63.3%	23.4%	75%
Household member characteristics				
Presence of an elderly person				
yes **	10.1%	39.6%	12.0%	50.0%
Presence of children under 5 years old				
yes **	33.1%	13.9%	31.6%	10.6%
Member with chronic disease (excl. cancer)				
yes **	7.4%	23.0%	8.6%	25.3%
Member with injury				
yes **	1.0%	2.1%	1.1%	2.2%
Member with cancer				
**Yes **	0.2%	2.9%	0.3%	5.1%
Outpatient	0.1%	0.6%	0.1%	0.8%
Inpatient	0.1%	1.7%	0.2%	3.0%
Both	0.0%	0.6%	0.0%	1.3%
No	99.8%	97.1%	99.7%	94.9%
Health care utilization				
Member utilized outpatient care **	6.0%	10.5%	6.5%	9.3%
Member utilized inpatient care	14.6%	35.9%	16.3%	37.7%
Both	5.6%	20.8%	6.6%	24.8%
Not utilized	73.8%	32.9%	70.6%	28.1%

Characteristics	Incidence of CHE 2021			
	10% excess of total household consumption		40% of nonfood consumption	
	no	yes	no	yes
	N=9691	N=1508	N=10595	N=604
Outpatient care utilization by health facility				
Member utilized primary care**	5.6%	12.4%	6.2%	12.3%
Member utilized secondary care	3.4%	8.2%	3.8%	8.6%
Member utilized tertiary care	1.2%	6.9%	1.6%	9.1%
Member utilized private care/abroad	1.3%	3.5%	1.5%	4.0%
Other	0.1%	0.2%	0.1%	0.2%
Not utilized	88.4%	68.9%	86.9%	65.9%
Inpatient care utilization by health facility				
Member utilized primary care**	3.6%	6.3%	3.8%	6.0%
Member utilized secondary care	8.3%	13.7%	8.8%	12.7%
Member utilized tertiary care	4.0%	20.3%	5.1%	26.5%
Member utilized private care/abroad	4.0%	15.9%	5.0%	17.4%
Other	0.3%	0.4%	0.3%	0.0%
Not utilized	79.8%	43.4%	77.0%	37.4%

*Note: *p<0.05, **p<0.01*

5.4 Determinants of catastrophic health expenditure in Mongolia in 2021

A multivariate regression analysis was conducted to assess the likelihood of incurring CHE with the determinants of CHE. In relation to household size, no substantial variations were discovered. However, at the threshold of 10% of THC, rural households have less risk of incurring CHE by 0.83 times [95% CI: 0.72-0.96] than those living in urban areas, but no significant difference was observed when the threshold was set at 40% of capacity to pay. The wealthiest households experienced 80% less catastrophic payments [95% CI:0.15-0.26] compared to the poorest households, the likelihood of having CHE was 92% less [95% CI: 0.05-0.13] when the threshold of catastrophic payments was at 40% of

capacity to pay.

Gender did not have a statistically significant association with the probability of experiencing catastrophic payments in terms of household head characteristics. However, marital status differed significantly, where married households compared to households with a single household head had 1.4 times [95% CI: 1.10-1.94] more likely to incur CHE (at the threshold of 10 of THC).

Interestingly, household heads who have secondary education have less likelihood of incurring CHE by 0.83 [95%, CI: 0.68-0.99], but when at 40% of capacity to pay it does not have significant effect. Household heads who are inactive meaning who are either a retiree, has injuries or disease or a student have higher risk by 2.8 [2.39-3.31] times of facing catastrophic payments (threshold 10% of THC) compared to household heads who are employed, and the odds of having CHE increased to 3.1 [95% CI: 2.45-4.13] times at the threshold of 40% of nonfood expenditure.

Households who have elderly members had higher risk of incurring CHE by 2.1 [95% CI: 1.78-2.46] times and 2.28 [95% ci: 1.83-2.85] times at the threshold of 10% of THC and the 40% of capacity to pay, relatively, compared to households without elderly members. Households with a child under five years old have less likelihood of having CHE (10%) by 0.59 times [95% CI: 0.48-0.72], and no effect in CHE when the threshold is 40% of nonfood consumption. Households with a member who has a chronic disease (excluding cancer) or injuries, and those without have no significant effect on the likelihood of incurring CHE.

Households without cancer patient member are less likely to incur CHE by 0.27 [95% CI: 0.19-0.36] times compared to households with cancer patient members who utilized inpatient care.

Members of the household who sought outpatient care were 3.1 [95% CI: 1.9-5.1] times more likely to incur CHE at the threshold of 10% of THC and 40% of nonfood spending, respectively, and 3.7 [95% CI: 2.7-5.1] more likely than those who did not utilize care. Further, a household member who sought inpatient care was six times [95%

CI: 5.28-7.19] more likely to experience CHE at the 10% THC threshold and 5.4 times [95% CI: 4.36-6.8] more likely to experience CHE at 40% of capacity to pay compared to a household member who did not seek any kind of care.

Table 7. Determinants of catastrophic health expenditure in Mongolia in 2021

Characteristics	CHE 10% of total household consumption				CHE 40% of nonfood consumption			
	aOR	CI 95%		p value	aOR	CI 95%		p value
Household characteristics								
Household size								
1--2	1.25	0.99	1.59	0.06	1.29	0.86	1.92	0.20
3—4	0.97	0.80	1.20	0.83	1.01	0.71	1.44	0.94
≥5	1.00				1.00			
Location								
Rural **	0.83	0.72	0.96	0.01	1.00	0.81	1.23	0.99
Urban	1.00							
Household economic status								
Poorest	1.00				1.00			
Second **	0.56	0.46	0.67	0.0001	0.42	0.33	0.54	0.0001
Third **	0.40	0.32	0.49	0.0001	0.22	0.15	0.30	0.0001
Fourth **	0.29	0.23	0.37	0.0001	0.14	0.10	0.22	0.0001
Richest **	0.20	0.15	0.26	0.0001	0.08	0.05	0.13	0.0001
Household head characteristics								
Gender of the head of the household								
Male	0.82	0.67	1.01	0.05	0.86	0.64	1.16	0.32
Female	1.00				1.00			
Marital status								
Single	1.00				1.00			
Married/living together **	1.46	1.10	1.94	0.01	1.60	1.04	2.45	0.03
Widowed/separated	0.91	0.68	1.20	0.49	0.77	0.50	1.17	0.22
Educational attainment								

Characteristics	CHE 10% of total household consumption				CHE 40% of nonfood consumption			
	aOR	CI 95%		p value	aOR	CI 95%		p value
None	0.85	0.63	1.15	0.29	1.09	0.71	1.68	0.70
Primary	0.90	0.69	1.18	0.44	1.21	0.83	1.78	0.32
Secondary *	0.83	0.68	0.99	0.04	1.01	0.74	1.38	0.95
Vocational/technical	0.98	0.79	1.21	0.85	1.16	0.82	1.63	0.40
Higher degree education	1.00				1.00			
Economic activity								
Employed	1.00				1.00			
Unemployed	1.12	0.89	1.40	0.34	1.03	0.68	1.54	0.90
Inactive **	2.81	2.39	3.31	0.0001	3.18	2.45	4.13	0.0001
Household member characteristics								
Presence of an elderly person								
yes **	2.10	1.78	2.46	0.0001	2.28	1.83	2.85	0.0001
no	1.00							
Presence of children under 5 years old								
yes **	0.59	0.48	0.72	0.0001	0.80	0.56	1.13	0.20
no	1.00							
Member with chronic disease								
yes	1.16	0.86	1.56	0.32	1.07	0.69	1.66	0.76
no	1.00							
Member with injury								
yes	0.86	0.52	1.42	0.56	0.91	0.44	1.89	0.80
no	1.00							
Member with cancer								
Yes								
Inpatient	1.00				1.00			
outpatient	0.95	0.22	4.03	0.94	1.11	0.25	5.01	0.89
Both	1.80	0.27	11.93	0.54	3.39	0.59	19.58	0.17
No**	0.18	0.07	0.43	0.0001	0.13	0.06	0.30	0.0001

Characteristics	CHE 10% of total household consumption				CHE 40% of nonfood consumption			
	aOR	CI 95%		p value	aOR	CI 95%		p value
Health care utilization								
Member utilized outpatient care	3.70	2.70	5.10	0.0001	3.16	1.94	5.10	0.00
Member utilized inpatient care**	6.10	5.28	7.19	0.0001	5.40	4.36	6.80	0.00
Both**	8.70	6.40	11.82	0.0001	8.56	5.43	13.40	0.00
Not utilized**	1.00				1.00			

*Note: *p<0.05, **p<0.01, aOR -adjusted odds ratio*

VI. DISCUSSION

6.1 Characteristics

The measurement of CHE is an important metric to measure a country's financial protection in health that has to be measured consistently, as it is one of the core indicators to achieve UHC. This study aimed to discover proportion of population facing catastrophic payments when paying for the health services in Mongolia and the extent of impoverishment due to paying for health. The incidence of CHE was calculated using two different approaches, i.e 10% of total household consumption and 40% of nonfood consumption. The study revealed several interesting policy points.

First of all, our analysis found that the incidence of CHE, defined as the proportion of the population spending 10% of their household consumption on health was 13.9% and at the threshold of 40% of capacity to pay it was 5.3% in 2021 in Mongolia. Unfortunately, there was an increase in the incidence of CHE at both thresholds in comparison with previous studies. In a study conducted in 2012, it was found that 5.5% of households in Mongolia spent 10% of their household expenditure on health (Dorjdagva et al., 2016), while another study conducted in the same year revealed that the incidence of catastrophic payments at the 10% threshold of total household consumption was 10.5% and 3.3% at the 40% of nonfood expenditure (Dugee et al., 2019). The WHO report revealed that the incidence of CHE exceeding 10% of total household budget in 2018 was 7.2% (WHO, 2022).

The primary goal of social health insurance in Mongolia is to protect its citizens from financial hardship and share the costs of catastrophic medical expenses. Health insurance is mandatory for all Mongolian nationals, with a relatively high coverage rate. For the last decade, the Mongolian government continuously tried to increase financial protection among people, expanding the benefit package, exempting vulnerable people from co-payments, removing the annual reimbursement threshold, and pooling the separate

funding sources that created fragmentations (Jigjidsuren, 2022). However, the incidence of incidence of catastrophic spending in Mongolia is increasing steeply as reported in the Tracking UHC, Global Monitoring Report (WHO, 2021b). It is worth noting that there are methodological differences in measuring living standards through income, expenditure, and consumption.

Second, the distribution of catastrophic payments was more among the poorest households, whereas earlier research conducted in 2012 (Dorjdagva et al., 2016) found that the CHE was more among the wealthiest households. These findings suggest weak implementation of reduction of poverty strategies and raising concerns about the efficacy of the health system, emphasizing the need for comprehensive interventions to address the financial burdens experienced by households across different socioeconomic groups.

Thirdly, our study revealed that prior to paying healthcare expenses, the poverty rate was determined to be 19.4%, but it rose to 22.8%, indicating that 3.3% of the population were pushed to poverty as a direct result of OOP payments. The poverty headcount, prior paying for health expenditures, was calculated to be 19.4% in 2021, an estimate that is lower than the NSO's estimated poverty rate of 27% in 2020. This is also due to the methodological differences when measuring living standards, i.e constructing consumption aggregates (further details are in Appendix I). This study employed the national poverty levels provided by the NSO of Mongolia, which is MNT184,747 ($65.6) per month (NSO, 2020), equivalent to around $2.1 per day. While healthcare expenditures drove about 20,000 people into poverty in 2012, our findings indicate that 110,000 individuals are pushed into poverty. Mongolian government made significant progress in alleviating poverty between 2010 and 2014, however, the pace of poverty reduction decelerated following the economic downturn in 2016 and the emergence of the COVID-19 pandemic in 2020 (Uochi & Kim, 2022). Evidently, reducing poverty can have a positive impact on the incidence of CHE (Jung & Lee, 2022).

Furthermore, our study used the latest available data from 2021, which corresponds to the onset of the initial domestic COVID-19 outbreak in November 2020 in Mongolia,

followed by a sequence of lockdown measures in late 2020 and throughout 2021. Although this study did not directly examine the impact of COVID-19, the observed rise in the incidence of CHE, could be partially attributed to the potential impact of COVID-19. Previous research has already demonstrated that COVID-19 has adverse effects on household economic activity, such as a substantial decrease in income and consumption of households (World Bank, 2021). According to the survey, during COVID-19 pandemic poorer households were more likely to reduce their spending on non-food items and resort to detrimental coping strategies, such as accumulating debt or selling assets (World Bank, 2021). As well as, in a multi-country research that the incidence of CHE increased above the predicted rate due to the pandemic (Haakenstad et al., 2023).

Fourth of all, in terms of determinants of CHE households where having a member who is elderly, households' economically inactive (most of them who are retirees) experienced more CHE. Following the introduction of the social health insurance scheme, the government has placed a high importance on addressing the needs of the most disadvantaged sections of the population by subsidizing insurance contributions for retirees and other groups (students, children, mothers who have children under the age of two, and low-income individuals eligible for social assistance programs). Our findings are consistent with those of earlier studies, showing that families with older members experience higher rates of CHE than homes without such people (Liu et al., 2019).In many countries elderly individuals often experience higher rates of catastrophic health expenditures as a result of their worsening health and increasing use on pharmaceutical products (Sanwald & Theurl, 2017).

However, the government completely waived co-payments when accessing health services for vulnerable groups, including children, the elderly, and individuals with disabilities in 2021 (Jigjidsuren, 2022). A study conducted in Uganda, indicated that the elimination of user fees resulted in an escalation in OOP expenses, which was explained by the to the poor quality of free public services, leading individuals to seek costly healthcare at higher levels. But it is important to note that health system framework is

different depending on the context.

Furthermore, household members who utilized inpatient and outpatient care were more likely to incur CHE, compared to the households whose members did not utilize care at both thresholds. In another study conducted in Mongolia, patients who utilized inpatient care were more prone to cause financial difficulties among their homes (Dorjdagva et al., 2021). This is not a desired result because the national health insurance completely covers both inpatient and outpatient care according to the revision to the health insurance law (NHIL, 2015). Also the studies done in China, suggest that the households whose members utilized inpatient and outpatient care and households who had elderly members were the determinants of CHE (Liu et al., 2021).

The health insurance related legislation, actions, and regulations have undergone frequent and recent changes, making the law and regulations unsustainable. When a government implements sustainable policies and measures to protect the people from financial difficulties, CHE and impoverishment decreases, as can be seen in other countries. In China, for example, from 2010 to 2018, the incidence of CHE showed a decreasing trend, falling from 14.7 to 8.7 % for total households, as well as intensity of catastrophic payments (Liu et al., 2021). As well as in Indonesia, during the period where national health insurance scheme reached coverage rate exceeding 80% between 2018-2019 the incidence of CHE and impoverishment decreased from 7.9% to 4.4% at the threshold of 10% of THC (Fattah et al., 2023). Furthermore, the findings of the country-level study show that population coverage, carefully planned co-payment policies, targeted interventions, and a comprehensive benefit package are required to ensure access to essential healthcare services and protect individuals from financial hardships.

Research suggests that having high coverage rates of health insurance does not guarantee protection against financial hardship. However, increasing the portion of total health expenditure through compulsory contributions, has proven to be effective (Adam Wagstaff et al., 2018). Although social health insurance coverage in Mongolia is

mandatory for all citizens, the government subsidizes the contributions for those who are vulnerable and has made various attempts to reduce OOP health expenses, it continues to fall short in providing adequate financial protection and reaching the UHC.

6.2 Limitations

First and foremost, this research has a number of limitations that are comparable to those of previous studies. These limitations are primarily connected to the recall periods of the participants, since it is possible that some individuals may not fully recall health-related episodes and the specifics of the expenditures that are associated with them.

Second of all, the cross-sectional design of the study constrains the capacity to establish a causal relationship between variables, allowing for the assessment of only an associative relationship.

Third of all, the study did not address the structure of catastrophic payments, as well as did not analyze the incidence of CHE between different disease groups.

VII. CONCLUSION

This study aimed to identify the percentage of the population experiencing catastrophic health expenditures as a result of healthcare expenses, as well as to determine the degree of impoverishment in Mongolia in 2021. Although Mongolia has a national health insurance system, 13.9% of households faced catastrophic health expenses, and 3.3% of the population, around 110,000 people were pushed into poverty due to paying for health. Despite the mandated status of national health insurance in Mongolia and the government's efforts to protect citizens from financial hardship during the last decade, it still falls short in terms of providing adequate financial protection and achieving universal health care. The government needs to implement consistent policies in protecting the population from financial burden.

7.1 Suggestion

The government should establish consistent policies to protect individuals from financial difficulties. This involves decreasing OOP health payments, minimizing indirect expenses, and expanding services that fall outside of social health insurance coverage. Additionally, efforts should be directed towards enhancing the quality of healthcare services.

To achieve meaningful healthcare reform, it is crucial to conduct further research. This research should evaluate the effectiveness of existing policies and also analyze the incidence of CHE among different disease groups. This detailed examination will provide insights into the specific healthcare challenges faced by diverse populations, enabling policymakers to tailor interventions to address unique needs associated with various health conditions.

In summary, adopting evidence-based policies is essential to reduce financial burdens on individuals and improve the overall quality and inclusivity of the healthcare system.

Continuous research and evaluation will play a pivotal role in refining these policies, ensuring their effectiveness in safeguarding the population from financial hardships and promoting equitable access to high-quality healthcare services.

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APPENDICES

APPENDIX I. Constructing consumption aggregates

In total household's consumption expenditure, we will use both monetary and in- kind payments on all goods and services, as well as consumption on homemade products in monetary value. Consumption aggregate consists of 5 main components: food consumption, non-food consumption, housing, durables and energy.

Table 2. Components of consumption

#	Components	Definition	Variables
			2021
1.	Food consumption	Households provide information on the food they consume, as well as the source of that food, whether it was purchased, self-produced, or received as a transfer.	13 categories (127 items) *Recall period:* 1 week
2.	Non-food consumption	Non-food consumption refers to household expenditures on goods and services other than food items.	28 categories (278 items)
3.	Durable goods	A durable good is a type of consumer good that is capable of providing beneficial services to a consumer over a long period of time through repeated use. (Diewert, 2009)	5 categories (53 item) *Recall period:* Last 12 months
4.	Housing	The flow of services households derive from their dwellings over a period of time (Ceriani et al., 2023).	Structural and neighborhood characteristics of dwellings such as type of construction, number of rooms, age of the building, etc.
5.	Energy consumption	Energy includes consumption expenditures on heating and electricity.	Energy consumed as well as received for free or produced on their own. *Recall period:* Last 12 months

1. Food consumption

Food plays a crucial role in various essential aspects of well-being, including food security, nutrition, and health. In low-income countries, it constitutes the majority of total household spending, making up around 50 percent of the typical household budget. Consequently, it plays a crucial role in the analysis of consumption patterns and poverty. (FAO, 2018).

To calculate the total food consumption, the consumption of all types of food products will be aggregated into a single time period 1 year.

There are few principles to calculate this variable:

- Inclusion criteria: All potential sources of food consumption are considered. This includes food purchased from markets, dining out (meals taken outside the home), food items produced by the household, and given as gifts or remittances from others. When calculating the expenses of food items produced and/or received for free, the median price for each item was calculated at the household level. If a particular household did not consume a particular food item, the median price for that item was then calculated at the cluster level, consequently higher sampling units were included in the computation.
- Actual Consumption: Only food items that were actually consumed by the household members during the survey period are taken into account, not all products that were purchased.
- Monetary Valuation: For food items that were not purchased, received as a gift or remittances, their value is calculated in monetary terms. The survey specifically gathers information on the price and quantity of food purchases made by the household. This price data is then used to determine the value of food items that were not directly purchased.

2. Non-food consumption

- Non-food consumption aggregates include clothing, footwear, cosmetics, recreational

expenses, miscellaneous personal care items, household textiles, health and education expenditures etc. It also encompasses non-food products that were domestically produced, received as a gift or remittance, or provided by others without cost. Only products that directly contribute to consumption were included in the inclusion criterion.

- For exclusion criteria, taxes, levies, finance capital transactions, repayments of debt and interest payments will not be included. Lump expenditures such as weddings, dowries, celebrations and funerals are excluded from the consumption aggregate. To prevent duplication remittances given are only included on the receiving party (as income), thus excluded (Deaton & Grosh, 1997). The recall period for a consumption product was based on data from the previous year. If a household did not provide any information for the previous year, data from the latest month was utilized instead.

3. Durable goods

A durable goods include home appliances, electronics, furniture, home improvement items, vehicles etc.

Durable goods measurement requires cautious consideration. The purchasing market price of a durable good reflects its value throughout its entire economic existence. However, our objective is to determine the value of durable goods for a shorter period of time, specifically one year (the reference period). Consequently, these values cannot be calculated directly. Consequently, the value of the product utilized for a duration of one year (service/consumption flow) must be approximated and incorporated into the expenditure on household consumption. However, it is not possible to directly observe the value of utilizing a durable that improves the standard of living of a household during the reference period. According to prior research, the estimation of the consumption flow (CF) of durable goods, which quantifies the advantage that households derive from owning such goods, is restricted to the analysis period of reference.

$$CF_t = s_t\, p_t\, (\, i_t - \pi_t + \sigma_t) = s_t\, p_t\, (r_t + \sigma_t) \qquad (1.1)$$

where t is survey year, s_t p_t current market value of a good, i_t - π_t the real rate of interest, and σ the re rate of depreciation for the durable good. Real interest rate was taken as 1.3867% in 2021.

The depreciation rate for each category of durable is determined using the following formula:

$$\delta - \pi = 1 - \left(\frac{p_t}{p_{t-T}} \right)^{1/T} \qquad (1.2)$$

Before computing depreciation rates, the current value of each durable item was calculated. Subsequently, to minimize the influence of any irregularities in the dataset, the median depreciation rate was assigned to each item for which data were gathered. This means that household-specific depreciation rates calculated from the data were not used.

4. Housing/ imputed rental value

Housing refers to the value of the flow of services that the household receives from occupying its dwelling, and is one of the important components of household consumption. Dwellings can either be rented or owned. In the case of a rented dwelling, assuming rental markets are functioning efficiently, the value is represented by the actual rent paid. However, households living in their own dwellings or benefiting from subsidized rent do not incur actual rental expenses. An additional complication in the country would be that almost half of the population lives in gers (traditional tents), for which establishing a rental value appears to be even more difficult.

The majority of rent-imputation methodologies adhere to the hedonic theory of consumption, which posits that the rent of a household is determined by various factors associated with its dwelling, such as neighborhood characteristics, location, and structural attributes (e.g., number of rooms, age of the building, and type of construction) (Balcázar et al., 2017).

The HSES asks how much it would cost them if they had to sell the dwelling in the present moment. Thus, the NSO of Mongolia also uses hedonic housing regressions with

the “imputed value of the dwelling or selling price” as the dependent variable. The regression model is predicated on the concept that property values are influenced by a certain mixture of structural and the neighborhood factors. Thus, set of independent variables included characteristics of the dwelling such as main type of roof, floors, construction material of walls, number of rooms, access to water, electricity, heating, location, etc. The parameter estimates obtained from this model are then used to calculate rents for that segment of the population for which data on rents are missing. This exercise is conducted separately for gers, houses and apartments.

Furthermore, either the depreciation rate or the remaining useful life of the dwelling is required as an additional assumption in order to calculate the flow of services received from dwelling ownership using estimated property values. The lifespan of residences and apartments is projected to be 33 years, while that of gers is anticipated to be 17 years. In the final analysis, the estimated imputed rents obtained from self-reported or imputed property values were utilized to calculate the flow of services from housing in the consumption aggregate, unless actual rents were accessible.

5. Energy consumption

Energy includes consumption expenditures on heating and electricity. Mongolia has severe weather conditions, with temperatures dropping as low as -30°C. As a result, heating and electricity are crucial need for household usage.

Energy consumption in this context includes the expenditures on electricity, as well as the costs associated with wood, coal, and dung used for both heating and lighting purposes. For households that don't buy these energy sources but produce them themselves, their energy consumption will also be estimated. It is important to note that nomadic households often produce and utilize their own resources for energy, including dung, dirt, wood, and firewood, without incurring external costs or purchases.

The HSES uses the median price per unit of energy sources purchased and consumed by households within their specific sampling unit. If a particular item isn't purchased

within the sampling unit, the median price from a higher-level unit, such as a district or province, where the purchase was made will be used instead. The total amount of energy consumed by the household is then multiplied by the median price for that specific energy item, thereby incorporating fuel into the calculation of energy consumption. In the last step, similar to non-food consumption, both fuel and energy consumption figures are adjusted to a monthly basis and aggregated at the household consumption expenditure (NSO, 2020).