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RESEARCH ARTICLE

Gendered Impacts of the COVID-19 in Mongolia: results from big data research

Otgontugs Banzragch[1], Manlaibaatar Zagdbazar[2], Uyanga Gankhuyag[3], Delgernaran Tumurtogoo[4], Amarbal Avirmed[5], Davaajargal Davaatseren[5], Undral Lkhagva[5], Ouyntsetseg Mashir[5], Ganbayar Javkhlan[6], Batbileg Tumur[7], Aruinbat Galbat[7]

1 *National University of Mongolia, Ulaanbaatar, 14200, Mongolia*
2 *Economic Research Institute of Mongolia, Ulaanbaatar, 14200, Mongolia*
3 *UNDP Asia and Pacific Regional Hub, Bangkok, 10200, Thailand*
4 *UNDP office in Mongolia, Ulaanbaatar, 14200, Mongolia*
5 *National Statistics Office of Mongolia, Ulaanbaatar, 14200, Mongolia*
6 *Ministry of Finance of Mongolia, Ulaanbaatar, 14200, Mongolia*
7 *Information and Technology Center of Custom, Taxation and Finance, Ulaanbaatar, 14200, Mongolia*

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Abstract

Based on the big data sample, we found that during the first year of COVID-19, although per month, per person expenditures of female-headed households were higher, on average, compared with male-headed households in Mongolia, but it is not because of the gender of the household head, but because these heads of households on average have more education, smaller household sizes, and living more in urban areas. They also register their expenditures in the VAT e-receipts system more consistently, which means that male-headed households' expenditures are underestimated. Overall, expenditure of both male- and female-headed households has increased in 2020 compared with 2019, while poverty slightly declined. The major reasons for expenditure increase and poverty decline in 2020 a rapid rollout of a fiscal stimulus with a sizable social protection component.

Keywords

COVID-19, gendered impacts, male headed households, female headed households, poverty, Mongolia

JEL codes: C55, E21, O53

Section 1. Introduction

Various studies of the COVID-19 pandemic have explained various reasons why the pandemic is expected to have gender-differentiated impacts on employment, unpaid job, care work, income (Rivera et al. 2020; Kabeer et al. 2021; Alon et al. 2020, Madgavkar et al. 2020); on paid and unpaid work (Seck et al. 2021; Czymara et al. 2021); on changing labor duty division within families (Seiz 2021); on gendered labor market outcomes (Ham 2021, Desai et al. 2021), difference between men and women heads of states' policies (Abras et al. 2021).

However, most research dealing with the impacts of COVID-19 in various countries have reported particularly negative effects on women's employment. Globally, more women than men are employed in the sectors hardest hit by the pandemic, and women from lower-income households bore the brunt of the COVID-19 crisis (Kabeer et al. 2021). This is because the participation of women is higher than that of men in the service-related sectors and in social services in particular, which makes it more difficult for them to perform these jobs remotely (Kabeer et al. 2021).

Chetty, Friedman, Hendren, Stepner, and the Opportunity Insights Team (Chetty et al. 2020) estimated spending of the US households and found that the initial impacts of COVID-19 on economic activity were largely driven by a reduction in spending by higher-income individuals due to health concerns, which in turn affected businesses that cater to the rich and ultimately reduced the incomes and expenditure levels of low-wage employees of those businesses. Gombodorj and Petö (Gombodorj, Petö 2022) cited that in the United States and the United Kingdom, the least educated women are those who suffer most from the consequences of the pandemic.

Lustig, Pabon, Sanz and Younger (2020) analyzed the impact of the pandemic on poverty in Argentina, Brazil, Colombia and Mexico and found that in all countries the increase in poverty induced by the lockdown is similar for male headed (MHHs) and female-headed households (FHHs). However, the offsetting effect of expanded social assistance is greater for female-headed households. A recent study of Ethiopia showed that FHHs have fairly equal access to food consumption compared to MHHs but inequal access to medical services (Ebrahim et al. 2020). However, there is a gap in investigating how the pandemic has been affecting consumption and expenditure of households. Female-headed households are defined as those who are missing a principal adult male, and are usually single-earner households. Male-headed households are households headed by a principal adult male, usually double-earner households.

Escalante and Maisonnave (2022) provided a case study for Bolivia showing that FHHs, in general, and those headed by unskilled women, in particular, were the most affected by pandemics as they experienced significant reductions in employment and the largest increases in household burdens. In addition, they found that a decline in final consumption was more pronounced in FHHs than MHHs.

Gombodorj and Petö (2022) have assessed the impact of Covid-19 by type of households in Mongolia and concluded that rural households, herders' families were less affected by COVID-19 than households in the capital city and other urban areas in terms of changes in their income and expenditure. But in their research gender of households was not fully specified.

Moreover, the Ministry of Labor and Social Welfare of Mongolia (MLSW) and UNICEF office in the country as well as L.Carraro and A.Tserennadmid (2020) have assessed the impacts of the emergency expansion of two major social assistance programs in the country namely, the Child Money Program (CMP), a near-universal child grant, and the Food Stamp Program (FSP), a poverty-targeted voucher program using qualitative and quantitative data collection, mainly from beneficiary households, but also including non-beneficiary households (UNICEF, 2021). They found that there are pronounced differences between the two programs in terms of gender; while women were the decision-makers on spending in over 80% of households for CMP, only 42% of women were decision-makers on the FSP related expenditure and savings. The report revealed that gender of the person with the most control over CMP decision-making, the gender of the household head, and the gender of the child did not affect the likelihood of top-up of social assistances being saved. However, older and better educated household heads, households with more working members, and households in countryside saved more (UNICEF, 2021). Thus, there is a need to investigated gendered impacts of Covid-19 in Mongolia.

Understanding which populations are most harmed by this pandemic is important for formulating an evidence-based, gender-sensitive and targeted policy response in any country. Thus, we aimed to learn the gendered impacts of the pandemic for Mongolian households in consumption. We asked:

1. ***Is the level of expenditure in female- and male-headed households different?***
2. ***How did expenditures change for female- and male-headed households during the COVID-19 period?***
3. ***How did poverty rate change for female- and male-headed households during the COVID-19 period?***

Based on the big data sample, we found that expenditures of female-based households (FHHs) were higher, on average, compared with male-headed households (MHHs). The validating household survey of 2018 shows that incomes of FHHs are slightly higher on average, while expenditures are only slightly lower than that of MHHs. Further analysis showed that FHHs in Mongolia have higher expenditures not because of the gender of the household head, but because these heads of households on average are more educated, have smaller household sizes, and mainly live in urban areas. Finally, FHHs more consistently register their expenditures in the VAT e-receipts system, which means that MHHs' expenditures are underestimated.

With regard to changes in expenditures during 2020, we found that expenditures of both male- and female-headed households moved generally in tandem, having declined (year-on-year) in the first quarter of 2020, as well as in November-December 2020 – the periods of the strictest lockdowns, especially in urban areas. Overall, expenditure of both male- and female-headed households has increased in 2020 compared with 2019, while poverty slightly declined. However, there was a large volatility of expenditures month-by-month. Poverty decline was also slower than in the previous year, 2019. The major reasons for expenditure increase and poverty decline in 2020 was a rapid roll out of a fiscal stimulus with a sizable social protection component.

This paper makes several contributions. First, it estimate changes in household expenditures and poverty during the COVID-19 period using a sample of big data (value-added tax data) for the first time ever in the country and in the Asia and Pacific region, which allows to some extent to circumvent challenges related to implementation of traditional surveys. Second, we estimate changes in expenditure and poverty on a much more frequent basis than what was possible until now, with the poverty rate becoming no longer a slow-moving indicator, which allows policy makers to see more rapidly the effect of policies on poverty. Third, it sheds light on the pandemic's gendered impacts in Mongolia.

The paper is organized as follows. Section 2 explains the country's situation during COVID-19. Section 3 describes the data and the methodologies for data processing and analysis. Section 4 shows descriptive statistics of the sample and examines the changes in expenditure, and poverty and inequality in expenditure during the pandemic period, 2020. Section 5 concludes. Supplementary descriptive statistics and estimations results are provided in the Appendix.

Section 2. Pandemic conditions in Mongolia

Compared with most other countries globally and in the Asia Pacific region, the spread of the pandemic in Mongolia has been much lower until February, 2021. However, starting from March, 2021, the spread of COVID-19 has rapidly accelerated in the country (Worldometer COVID-19). The economic impact of the pandemic for Mongolia is colossal. According to the National Statistics Office of Mongolia (NSO), GDP fell by 5.3 percent in 2020 (NSO 2021). Considering that the average growth rate of GDP in the preceding decade 2010-2019 was 7.8 percent, this is a massive (around 13 percentage points) decline from a trend growth rate.

So far, the government of Mongolia instituted 4 periods of strict lockdowns covering the whole country (National Emergency… 2021). The first lockdown was enforced from 27 January until end of May 2020. Strict measures were put in place, such as mandatory use of masks, social distancing, bans on public gatherings and spaces, limited public transportation, closure of all educational institutions, and bans on travel between cities and provinces. Borders were closed and international travel was strictly controlled, with people arriving by land and chartered flights being placed in institutional quarantine facilities for 21 days. The second lockdown was enforced on 11th November 2020 and ended on 11th January 2021. The third lockdown started on 12th February 2021 on the eve of the Lunar New Year and continued till 23rd February 2021. The fourth lockdown started on 10th April, 2021 and continued until 7th May, 2021. However, our study uses only the data for 2020, so the third and fourth lockdowns are outside the scope of our analysis.

To deal with the economic fallout of COVID-19, the government of Mongolia took a series of measures (Government of Mongolia 2021b). On 11th March 2020, the Bank of Mongolia (BOM) reduced the policy rate from 11 to 10 percent, and reduced the MNT reserve requirement of banks to 8.5 percent, and narrowed the policy rate corridor to ±1 percent. The lower reserve requirement released MNT 324 billion (0.8 percent of GDP) of additional liquidity in the banking system. On March 18, the BOM and the Financial Regulatory Commission implemented temporary financial forbearance measures on prudential requirements, loan classifications, and restructuring standards. On 27th March 2020, the State Emergency Commission began to implement a comprehensive set of fiscal measures to protect vulnerable households and businesses and to support the economy with 5.1 trillion MNT (1.79 billion USD at the current exchange rate[1]) such as tax exemptions on several imported food and medical items, types of equipment, an increase in monthly child allowance, unemployment benefits, and food stamps, tax exemptions on income tax as well as corporate income tax, plus social security contributions until the end of September 2020.[2]

1 1USD=2850MNT (Mongolian Tugrugs)

2 Moreover, before the spread of COVID-19 (in November 2019) the Government made a decision to increase public employees' wages starting in January 2020.

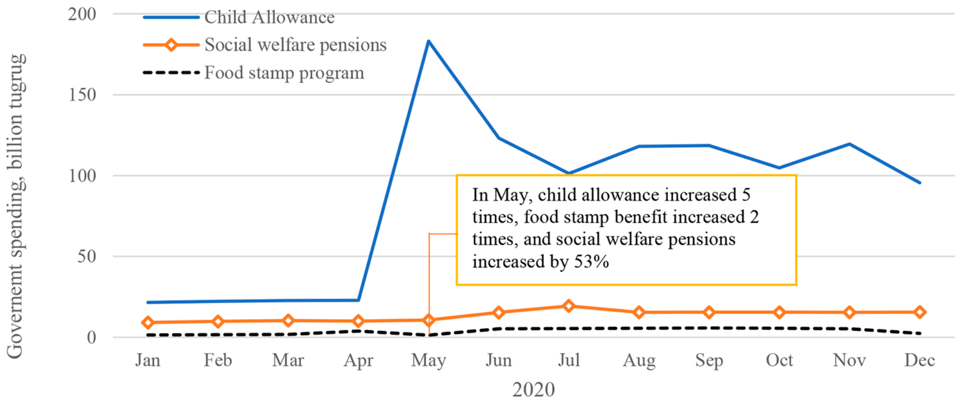

Figure 1. Government spending on social assistance during COVID-19. Source: NSO, Monthly bulletin January-December, 2020. *Note*: The jump in government spending on social benefits in May is due to the following: Following the increase in child allowance from 30,000 MNT to 100,000 MNT in May 2020, households with children retroactively received the increment of child allowance for April (70,000 = 100,000 – 30,000). Thus, the budget spending on child allowance in May reflects both 100,000 MNT per child for May plus 70,000 MNT per child retroactive for April. After May 2020, the spending on child benefits has stabilized.

The stimulus packages reached households and companies in April 2020. These measures, while providing a much-needed injection into the economy, have further pushed Mongolia's debt into unsustainability. Looking at Mongolia, one can find that the country has quickly acted by having stringent lockdowns thus avoiding local transmission of the virus for most of 2020, and by issuing a fiscal stimulus with a large component of social assistance.

Social protection measures were an important part of the fiscal stimulus. To put the size of social benefits into perspective, multiplied by 9 months from April to December 2020, total government spending to meet the announced commitments on social benefits would run up to an estimated 1.3 trillion MNT (US$456 million), or about 26 percent of the announced fiscal stimulus (Government of Mongolia 2021a). The largest of these social benefits was the increase in universal child allowance,[1] which accounted for nearly 80 percent of the social benefit part of the COVID-19 fiscal stimulus. In April 2020, the monthly child cash transfer was increased from 20,000 MNT per child to 30,000 MNT (US$10.5) and then in May, it was further increased to 100,000 MNT (US$35). The government also increased food stamps from 18,000 MNT (US$6) per poor household to 36,000 MNT (US$13) (Government of Mongolia 2020). Figure 1 illustrates total budgetary spending on social assistance in 2020.

According to the NSO, in 4th quarter of 2019, average household income was 1,261,395 MNT (USD 442.5) from which income from wages was 685,874 MNT (USD240) or about 54.3 percent.[2] Thus, the increase in child benefits has increased the income of a household with a single earner who earns the minimum wage, which is 420,000 MNT by 23.8 percent, etc.

1 Prior to COVID-19 fiscal measures, Mongolia had a universal child allowance, but of a much smaller amount (20,000 MNT per month, equivalent to US$7 per month). Child allowance is given to children under 18 years old.

2 https://www2.1212.mn/BookLibraryDownload.ashx?url=HSES_tan_2019_3q.pdf&ln=Mn (in Mongolian)

Section 3. Data and methodology

3.1 The background of the data

In recent years, there has been an increasing interest in using non-publicly available data, including big data, in economics research (Einav and Levin 2014). In Mongolia, there are several sets of big data, one of which is the VAT data, which allows estimation of expenditure. However, there are challenges that other researchers have encountered in using the VAT data in the country due to the regulation.

The VAT in Mongolia is assessed on goods and services at 10 percent. It is the biggest source of tax revenues in the country, accounting for 23 percent in 2019. In 2015, the Parliament of Mongolia adopted amendments to the VAT tax law to incentivize consumers – payers of VAT by giving 20 percent of VAT that they pay as a rebate, along with a lottery scheme. The government created a unified system called the E-receipts system, to which all POS machines in the country are connected and which is accessible to consumers by a mobile phone application and the web. Once a POS registers a sale, the E-receipts system sends to this machine a unique QR code at the end of each receipt. Consumers are encouraged to download an app on their cell phones and computers through which they can scan receipts with the QR codes to register their purchase. Today, every minute, consumers scan their E-receipts into the system. In 2020 alone, 931 million E-receipts were printed in total. At the beginning of every quarter, the 20 percent refund is sent directly to individuals' registered bank accounts (UNDP 2021).

Despite the growing number of individuals who insert E-receipts, as we expected, not all individuals in the HSES-2018 sample use the app. In 2016, when the E-receipts system was introduced, more MHHs (45.2 percent) than FHHs (39.3 percent) from HSES-2018 sample ownloaded the E-receipts app and inserted their expenditure data into the system. Similarly, in 2020, more MHHs (73.7 percent) than FHHs (64 percent) used the E-receipts app (See Table 1 in Appendix).

VAT data is confidential and is not available for public use. However, government agencies can have access to it as part of fulfilling their official duties. Therefore, researchers from the National Statistics Office (NSO), UNDP Offices in Mongolia and the Bangkok Regional Hub, the National University of Mongolia (NUM), and data scientists from the Custom, Taxation and Finance Information Technology Center (here and after referred to as the Tax Data Center) formed a research team to access and use a sample of this emerging big data for the analysis of consumption, inequality and poverty during the pandemic. Within the research team, only the authorized government officials from NSO and the Tax Data Center had access to full data, while the rest of the researchers were given access to depersonalized set of data. The team was permitted to use only the customers' data, but not the retailers' side of the data.

3.2 Methodology for processing big data

The research team linked two data sets using a methodology similar to that used by Chetty et al. (2020). The first data set is our big data sample – a sample of individuals along with their expenditures drawn from the VAT electronic filing in 2018, 2019 and 2020 and housed at the Tax Data Center. The second data set is microdata of the Household Socio-Economic Survey conducted in 2018 by NSO (here and after referred to as the HSES-2018), which is available publicly (National Statistics…). At the time of writing this paper, the HSES-2018

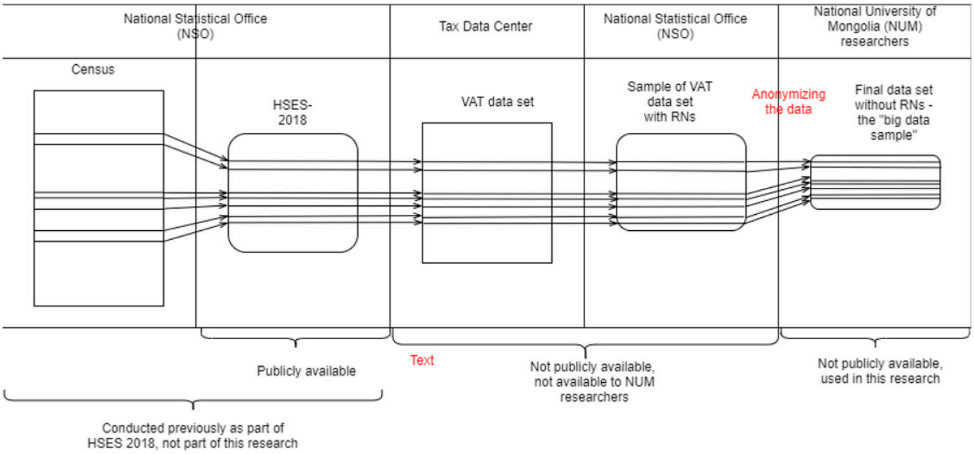

Figure 2. First-stage processing of the big data for this research. *Source*: Authors depiction

was the latest household living standards survey, designed to be representative of the entire population through stratified random sampling, and covering 16,454 households, or 1.8 percent of the total households in the country.

The two data sets were linked for the following reasons.

First, to enable estimation of poverty, expenditure by individuals generated by the VAT data set needed to be aggregated by household, using the HSES-2018 data.

Second, the VAT data lacked information on characteristics of households and individuals. Thus, it needed to be combined with the HSES-2018 data to identify characteristics such as household size, gender of the household head, his or her education, marital, employment status, etc.

Third, the HSES-2018 data set was used as the underlying, validating set to enable adjustment of weights of individuals in the big data set, so as inferences can be made from the big data set.

The two datasets were linked using a unique identifier called the Registration Number (RN) assigned by the General Authority for State Registration to every newborn citizen of the country. The RNs are strictly confidential and are housed at the Population and Household Database (PHDB) of the NSO. Within this research team, only the officials of the NSO and the Tax Data Centre, who already had access to RNs and other identifying information as part of their official duties, had access to this information, performed primary-level data processing, and released depersonalized data to the rest of researchers in our research team.

The HSES-2018 sample included data on 59,820 individuals, but not their RNs. Thus, the RHDB of NSO conducted a matching exercise and identified 42,991 individuals' RNs out of the HSES-2018 sample (for some individuals, RNs could not be found due to reasons such as name misspelling) (See Figure 2). This data, along with RNs, was sent to the Tax Data Center. The Tax Data center's data scientists matched RNs of these individuals with those who are registered with the VAT E-receipts system and identified 23,600 individuals. The data on these individuals, along with their monthly expenditure based on the E-receipts system, were provided to the rest of the research team.

We matched them with household data in the HSES-2018 full sample, aggregating individuals with the VAT-based expenditures into 9,826 household units and attributing household and individual characteristics to them from the HSES-2018 survey.

Because not all households were consistently registering their receipts (purchases) into the VAT E-receipts system, we further filtered out such households. The final criterion was to retain only those households whose members registered their purchases in the VAT E-receipts app at least once a month in 2018-2020, which returned 4,463 households. All analysis in this paper is conducted using this final, depersonalized panel dataset of 4,463 households (See Figure 2).

3.3 Second-stage data processing

First, outliers with unusually high or low expenditure within the big data sample were identified using a univariate outlier detecting method in which data values were transformed by the robust Box-Cox transformation (Filzmoser et al. 2016)[1] and imputed.

Second, reweighting of the big data sample was performed to correct for biases, particularly because rural households are less representative.

The big data sample, which is a subset of the HSES sample, underwent the process of elimination of individuals (and households) at several stages: 1) individuals whose Registration Numbers could not be located (losing 28% of individuals in the HSES sample); 2) individuals who were not registered in the VAT E-receipts system (losing 45% of the "matched" sample); 3) even when individuals were registered, many were not consistently using the E-receipts system (losing 25% of individuals registered in the VAT E-receipts system). The resulting big data sample constituted 27.2 percent of individuals in the HSES sample, or 29.4 percent of households. Therefore, the resulting big data sample was reweighted by each of the four types of locations (Ulaanbaatar, aimag, soum and countryside levels) and thus the sample allows to make inferences at the location level as well as at the national level, given that the underlying HSE survey is representative at the national, aimag and location levels. Table 2 in Appendix shows the shares of households by location with and without the weights. When weighted, the VAT sample is very similar to the HSES sample, although differences still exist for soum and countryside households (See Table 2 in Appendix for a more detailed description of weights of the big data sample).

Reweighting of the households in the big data sample could not be performed with further disaggregation, such as gender of household heads, their education level or employment status. Table 3 in Appendix shows further descriptive statistics that are the proportions of households by gender, age, education level and employment status in both the HSES and the VAT big data samples. The full HSES sample and the big data sample are very similar in terms of the household head's age, but differ somewhat with respect to other characteristics such as household heads' gender, education, and employment status. This means that people registering their transactions in the E-receipts system are slightly more likely to belong to male-headed households, as well as to households headed by people that are employed and better-educated than heads of households in the general population represented by the HSES-2018 sample (See Table 3 in Appendix). Further descriptive statistics of unweighted and weighted data sets show that weighting also significantly improves the representativeness of the VAT big data sample in terms of female- versus male-headed households' distributions across the four types of location – Ulaanbaatar, aimag, soum and countryside (See Table 4 In Appendix). The rest of the paper uses weighted measures of the big data sample.

1 We used the rule "median plus/minus 3 times interquartile range

Third, we reproduced the methodology used by statistics offices to estimate consumption. Roughly speaking, consumption is estimated in the HSES as follows:

*Consumption = Monetary expenditure + Consumption of self-produced and owned goods –
– Expenditure on durable goods + Depreciation of durable goods per year +
+ Imputed consumption of self-owned housing*

Not all consumption will be registered in the VAT E-receipts system. Consumption of self-produced and owned goods, such as self-produced food, or self-owned housing is not registered in the VAT system, since there are no market transactions associated with them. In 2018, the value of consumption of self-produced food was 1 percent for households in Ulaanbaatar, 4 percent for households residing in aimag centres, 17 percent for soum centre households and 51 percent for countryside households (herders).

In addition, some services, such as health and education, are not subject to VAT and thus consumers do not have incentives to register spending on these goods and services. Finally, some economic activities remain informal and small-scale, with vendors not being able to afford to invest in POS machines; or consumers not registering their receipts fully in the VAT E-receipts system.

Nevertheless, monetary expenditures on food, non-food goods, durable goods and many services are subject to VAT and are likely to be registered by households in the VAT E-receipts system. The VAT-based measure of consumption approximates the measure of monetary expenditure, including on durable goods, as per the HSES. Therefore, hereafter we refer to it as expenditure, and use it as the basis for estimating poverty and inequality, rather than consumption.

3.4 Methodology used in calculating expenditure and poverty

Individual expenditure from the VAT E-receipts system was aggregated into households and then divided by household size to calculate per-person expenditure.[1] In other words, when a father or a mother makes purchases, they do so on behalf of the whole household, but then, the total purchases made by the household need to be divided by the number of family members.

The resulting per-person expenditure for 2018-2020 was adjusted for inflation. We used monthly consumer price indexes (CPI) with the base of January 2018 to adjust monthly expenditure changes to measure real changes. Prices significantly differ by provinces; for instance, in the western provinces that are located farthest from Ulaanbaatar, prices tend to be higher compared with the central provinces due to high transportation costs. Therefore, we used both provincial and capital city's CPI in order to accurately assess living standards and expenditure values. The resulting values provide inflation-adjusted per-person monthly consumption.

Then, we re-estimated the poverty line. The poverty line of the HSES-2018 survey was used which was 166,580 MNT per person per month (National Statistics… 2020b). However, some categories of services are not subject to VAT and are therefore unlikely to be registered in the VAT E-receipts system, so we need to exclude them. Thus, our poverty line

1 The expenditure of 23,600 individuals was aggregated into 9,826 households. Then, from the linkage between the HSES-2018 data set and the big data sample, the total number of household members was found (not only adult household members who are registered in the E-receipts system), which was 37,382.

was adjusted to 78.2 percent of the official poverty line, by deducting health, education and rental services, which accounted for 21.8 percent at the national level in 2018; the resulting poverty line was 130,266 MNT per person per month (US$52.4). This poverty line was adjusted for inflation for 2019 and 2020, and the resulting poverty lines were 139,564 MNT and and 145,259 MNT, respectively.[1] The calculation of poverty indicators used individual (new) weights.

Section 4. Findings

4.1 Is the level of expenditure in female- and male-headed households different?

We observe that in the big data sample, female-headed households have higher expenditure on average compared with male-headed households, and this difference is statistically significant (Table 1). Median expenditures of female-headed households are also higher.

Table 1. Comparison of means of VAT-based monthly average expenditure in 2020, weighted, in MNT thousand

Group	Observations	Mean	Confidence interval	Median	Confidence Interval
FHHs	846	292.1	(266.7 , 317.4)	211.4	(192.3 , 230.5)
MHHs	3,617	241.0	(232.0 , 250.0)	178.1	(172.0 , 184.3)
	t = 3.855, p-value = 0.0001				

This difference holds for most of the months of 2019-2020, if we consider male- and female-headed households by whether they have children (below the age of 18) or not, by employment status and education level of the head of household, and by urban and rural location.

If FHHs are defined as those who are missing a principal adult male, then, by definition, they would more likely to be single-earner households, as opposed to most MHHs, which are double-earner households. The above finding means that factors such as the size of the household (which is 4.2 for FHHs and 4.7 for MHHs), age of the head of household (49 for FHHs versus 43 for MHHs) and urban location (a higher proportion of FHHs is in urban areas) that are positively associated with the level of expenditure outweigh the negative effect of marital status (in FHHs, the head of household is much less likely to be married).

The prevalent cultural norm is that households name the male as the head of households by default, so in most cases, households would be female-headed only if a single, divorced or widowed woman heads the household. A surprising finding was that there was a sizeable share of FHHs where the head of household is married (17.6 percent). This might indicate that a number of families live in split households due to migration. A common phenomenon in Mongolia is when the husband lives in the countryside, herding livestock, while the wife with children live in soum centres or in urban areas to pursue better quality of education for children. In these cases, even if married, a woman may call herself the head of the household.

Checking back with our underlying data from the HSES-2018, we find that for both the overall dataset of 16,545 households of the HSES-2018, and the subset of 4,463 households

1 The estimated poverty lines are predicted values.

who are part of the big data set, measures of income and expenditure of MHHs are higher than those of FHHs – with the exception of mean income, where it is higher for FHHs (See Table 4 in Appendix). However, the confidence interval of this measure is also wide, while the median income of FHHs is lower than that of MHHs, indicating that in the big data sample, there is a group of wealthier FHHs, alongside a larger group of poorer FHHs; and these effects were not fully corrected through reweighting.

Nevertheless, where the incomes and expenditures of FHHs are lower, they are not much lower – for median expenditure, they are lower by 5.8-10.9 percent, whereas for median income, they are lower by 2.0-2.2 percent for FHHs compared with male-headed ones. There are several factors that explain either higher income of FHHs, or the fact that male- and female-headed households' income and expenditure levels are not very far off from each other (See Table 4 in Appendix).

In our sample, women-heads of households are more likely to have college education, which reflects the fact that women in Mongolia – in general - are much more likely to have higher education compared with men (61.5 percent compared with 38.5 percent for men) (NSO, 2019). More generally, women in Mongolia tend to work in both lower-paid sectors such as health and education, and also in higher-paid sectors such as financial services and trade. In mining, for instance, one of the highest-paid sectors, women are more likely to have white-collar jobs, while men - blue-collar jobs. In addition, FHHs are more likely to be childless or have fewer members of the household (See Table 4 in Appendix).

To investigate further why male- and female-headed households' income and expenditure levels are not very far off from each other in 2018 (See Table 5 in Appendix), we regressed households' VAT expenditure[1] by variables such as the gender of the household head and other household characteristics. The regression shows that the size of households is negatively associated with the level of household expenditure per person while higher education of the head of the household is positively associated with expenditure. The location of households away from the capital city – either in aimag centres, soum centres or the countryside is also negatively associated with expenditure. The age of the head of household, as well as whether the head of household is married has no association with expenditure.

When these characteristics of households and heads of households are held constant, the gender of the head of the household does not have any statistically significant relationship with the expenditure level of the household. Thus, when controlling for various characteristics of household heads and households, the difference between female-and male-headed households expenditure disappears – becomes statistically insignificant. This means that while female-headed households, on average, have higher level of expenditure per person, this may be due to factors that women-heads of households have higher education and smaller households.

A similar regression was performed using the data on consumption from the 2018 HSES as the dependent variable, which showed different results (See Table 6 in Appendix). Consumption of MHH is almost 10 percent higher than that of FHH. An important caveat that needs to be made here is that, despite the reweighting to enhance representativeness of the big data sample, as well as adjustment to exclude households that do not systematically register their expenditures in the VAT e-receipts system, there still remains the issue of the coverage of the VAT-based expenditure – the extent to which households register their VAT-able expenditures.

1 Average monthly expenditure in 2019-2020, adjusted for inflation.

Again, the underlying HSES-2018 data set allows to check this coverage. We found that FHHs more fully register their expenditure in the VAT E-receipts system – with the ratio of VAT-based expenditure of 2018 to HSES-based consumption of 2018 being 96.2 percent for FHHs on average and only 64.6 percent for MHHs. This means that FHHs are more diligent about registering their expenditures in the VAT E-receipts system, or that they are more likely to buy goods and services sold via formal markets. Therefore, from the VAT database, FHHs' expenditures will appear higher. We found no feasible way of adjusting for such discrepancy in the coverage of expenditure, given the current data that we have access to.

Overall, even considering a nationally representative household survey conducted in 2018, we found that incomes and expenditures of FHHs are only slightly lower, whereas using the big data sample, we found that their incomes and expenditures are somewhat higher compared to those of MHHs. This is a highly unusual situation compared to most other countries. This phenomenon is explained by various advantages enjoyed by women in Mongolia – some of which are heads of households – such as higher education, smaller households, and residence in urban areas with access to more job opportunities. In the absence of these advantages, the small positive gaps in income/ expenditure between female- and male-headed households would disappear, while the small negative gaps would widen. Considering that the levels of expenditure based on VAT data set for male- and female-headed households are not easily comparable, the rest of this section will examine changes in expenditure, as well as changes in poverty of male- and female-headed households.

4.2 How did expenditures change for female- and male-headed households during the COVID-19 period?

Overall, in the big data set (i) per person expenditure of both MHHs and FHHs is higher in 2020 compared to 2019; (ii) the direction of change in expenditure is largely the same for both male- and female-headed households in pre and post-pandemic period.

How did the stimulus payments made to households in mid-April 2020 affect the said households? We presumed that lockdowns cause sharp reduction in economic activity, decline in employment and income, consequently households would spend less throughout 2020, compared with 2019.

Because of a strongly pronounced seasonal pattern of consumption in Mongolia, we use year-on-year changes in this section, unless specified otherwise. The decline in expenditure[1] happened for all households, regardless of their heads' gender, only in the beginning and the end of 2020 - the periods of strict lockdownd in urban areas (January and March, November-December).[2] When the social benefits, and especially child money, were ramped up, spending recovered from April 2020 and grew in May-October 2020. However, during the second lockdown of November-December 2020, all households' expenditures declined. While in these winter months, the distribution of social benefits was still continuing, it was not enough to prevent the decline in expenditure.

1 Both mean and median.

2 Increase in spending in February 2020 was a special case, related to the Lunar New Year. Whereas the Lunar New Year in 2019 was in early February (5-7 February), in 2020, it was at the end of February (24-26 February). Usually, the preparatory spending for the Lunar New Year takes place in about two to four weeks before the holiday. Therefore, in 2019, the bulk of the Lunar New Year-related spending was in January, whereas in 2020 it was in February.

Changes in expenditure throughout 2020 followed largely the same pattern for male- and female-headed households (Figure 3, panel a). However, there are substantial differences between households with and without children. For instance, while all households with children recovered spending in May-October, it has been more pronounced for female-headed households and more gradual for male-headed households, which is probably a reflection that the sample size of male-headed households is larger and thus changes are more stable. However, for households without children below the age of 18 (Figure 3, panel b), surprisingly, male-headed households' expenditure recovered earlier – starting in February, and did not decline that much; whereas female-headed households' expenditure had been declining for most of the year and only recovered in August and September 2020.

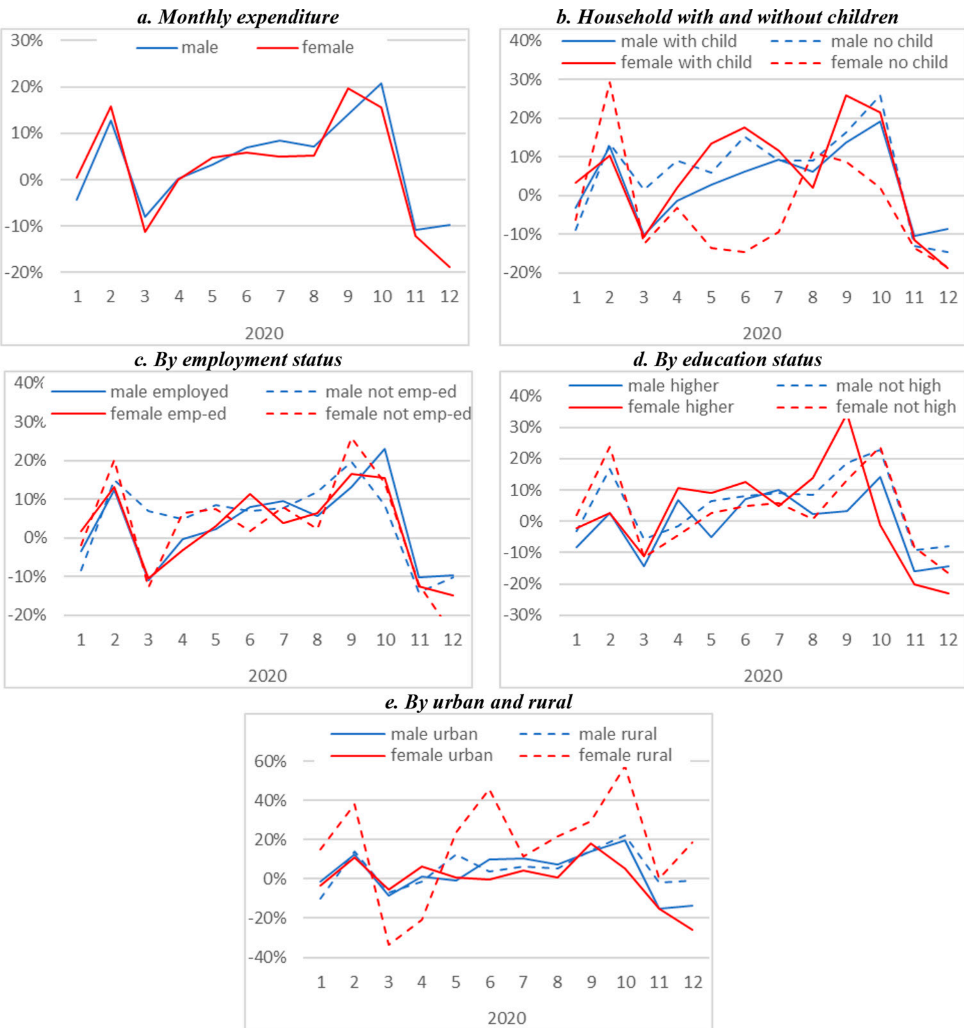

Figure 3. Year-on-year change in MHH and FHH's monthly expenditure, by socio-economic status.
Source: authors' estimates

The changes in expenditure were similar for those whose head is employed, but somewhat diverged for households with unemployed head of the household (Figure 3, panel c). More generally, for households whose heads are not employed, their spending started recovering already in April, while for those with employed heads, it only started recovering in May. With regard to differences by education level of the head of the household, both male- and female-headed households with heads without higher education had very similar patterns of changes. This included a large increase in February, indicating an uptick in the Lunar New Year spending. But their spending recovery during the middle months of the year was lower compared with more "educated" households. For households with heads with higher education, female-headed households' spending recovered more than that of male-headed households.

Finally, in rural households, female-headed households' expenditure had much higher volatility compared to that of male-headed households, probably also reflecting the small sample size. In urban households, the volatility was lower, and the differences between spending of male- and female-headed households were less.

UNICEF (2021) reports that "there are pronounced differences between the two programs in terms of gender; while women were the decision-makers on spending in over 80% of households for CMP/CMP top-up, only 42% of women were decision-makers on the FSP/FSP top-up. The majority of CMP households (68%) did not save any of the top-up, 26% saved all of it, and a small minority saved some and spent some. This pattern was the same across all three periods[1] (Table 1 in the report), even August/ September. Households in rural areas were more likely to save the CMP (30% in countryside soums, 25% in aimag centre soums, 22% in Ulaanbaatar). The gender of the person with the most control over CMP decision making, the gender of the household, and the gender of the child did not affect the likelihood of top-up being saved. However, older and better educated household heads, households with more working members, and households in countryside soums saved more".

As to other countries, for instance, single mothers in the United States are the most severely affected, with little potential for accessing other sources of childcare under social isolation orders, and little possibility to continue working during the crisis, thus it has been advised that supporting these women and their children during the crisis is among the most immediate and important policy challenges (Alon et al. 2020).

Overall, in 2020, households' expenditures increased in real terms compared with 2019, despite it being the pandemic year. This increase masks substantial volatility throughout the year – decline at the beginning and the end of the year when strict lockdowns were introduced, but also increase during most of the year. The increase in spending is observed for both male- and female-headed households especially from May 2020, when social benefits were increased – particularly universal child benefits.

Our big data sample does not provide information on savings and loans. However, the balance sheet of the banking system shows that in 2020, the balance of loans by individuals was reduced by 969.7 billion MNT ($344 million using the average 2020 exchange rate), non-performing loans increased by 234.9 billion MNT ($83.4 million), while the balance of savings increased by 3.56 trillion MNT ($1,263.1 million) (Mongolbank 2020). Thus, households increased savings and repaid loans, which indicates that for the economy as a whole, household incomes have potentially increased more than expenditure. At the same time, the amount of poor-quality loans also increased in 2020, indicating financial distress, which is likely to affect households in poorer or less wealthier quintiles.

1 June-July, 2020, August-September, 2020 and October-November 2020

4.3 How did poverty rate change for female- and male-headed households during the COVID-19 period?

Our next research question was to estimate poverty for MHHs and FHHs over the COVID-19 period. As noted in Section 2.4, we used an adjusted poverty line to estimate the poverty headcount rate; and used expenditure, rather than consumption.

Table 2. Poverty headcount rate, by gender of the household head, based on VAT-based expenditure data

	Sample size	2018	2019	2020
Poverty headcount rate, %				
All HHs	4,463	45.1%	36.3%	32.0%
MHHs	3,317	46.4%	37.1%	32.9%
FHHs	846	38.0%	31.6%	27.2%
Change in poverty headcount rate, percentage points				
All HHs			-8.8	-4.3
MHHs			-9.3	-4.2
FHHs			-6.4	-4.4

Source: authors' estimates.

The poverty rate is higher compared to the official poverty rate. But this is inevitable, given that the VAT-based expenditures do not fully capture all types of consumption – or even expenditure. Therefore, changes in poverty are more meaningful.

Our findings show that during the pandemic year 2020, the poverty rate declined compared with 2019, and this happened for both male- and female-based households. However, the reduction in poverty decelerated compared with 2019. Such a reduction in poverty was largely due to ability of the government to prevent penetration of COVID-19 infection to the country altogether for most of 2020, as well as an economic stimulus which included a universal child benefit. The universality of the social benefits protected both male- and female-headed households (with children), despite the large impacts of the pandemic on the overall economy.

Section 5. Conclusions

Overall, we found that incomes and expenditures of FHHs are only slightly lower and some measures (such as mean income) are somewhat higher compared to those of MHHs. This phenomenon is explained by various advantages enjoyed by women in Mongolia – some of whom are heads of households – such as higher education, smaller households, and residence in urban areas with access to more job opportunities. Without these advantages, the small positive gaps in income/ expenditure between female- and male-headed households would disappear, while the small negative gaps would widen.

FHHs are found to be more likely to register their spending in the VAT E-receipts system – more fully. This points to differences in behavior and attitudes between men and women, as well as differences in buying patterns of male- and female-headed households.

Monthly expenditures show that expenditures of both male- and female-headed households increased during most of 2020 compared with the same month of 2019, with the exception of periods of strict lockdowns in early 2020 and late 2020. There were no significant differences in changes in expenditure, when comparing male- and female-headed households.

Correspondingly, poverty somewhat declined in 2020 compared with 2019, although the decline in poverty decelerated compared with the previous year. Changes in poverty of both male- and female-headed households were similar. Overall, the VAT data open the possibility to monitor expenditures and poverty on a monthly basis, enabling to analyze how these variables respond to shocks and policies. This makes the poverty rate – one of the Sustainable Development Goal indicators – no longer a slow-moving indicator.

This approach of using tax data through robust methods (such as linking with the latest official household surveys) of analysis opens doors for further research using big data and open data. While such data does not replace official household surveys, it can complement them, particularly in the contexts where, faced by the need to contain the COVID-19 pandemic, face-to-face surveys become highly risk-bearing in terms of human health and lives. It also illustrates ways of designing and adopting protocols to ensure confidentiality and privacy of data, while at the same time, the possibility of opening government administrative data for research to better inform decision-making.

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Appendix

1. Sampling weight gives us the number of households represented by our th household in the estimation sample. This is calculated to be equal to the inverse of its probability of th household is being selected. The sampling weight was calculated using the following formula by K.Himelein (Himelein 2014):

$$p_{hi} = \frac{n_h \times M_{hi}}{M_h} \times \frac{m_{hi}}{M'_{hi}},$$

where:

p_{hi} = probability of th household's primary sampling unit (PSU) to be selected from the group

n_h = number of PSU selected from group

M_{hi} = number of households identified in PSU sampling frame based on household that is selected from group

M_h = number of households identified in total PSUs sampling frame that belong to group

m_{hi} = number of households identified in PSU based on household that is selected from group[1]

M'_{hi} = number of households that are included in the list of PSU based on household that is selected from the group ($M'_{hi} = M_{hi}$ is possible).

Table 1. Distribution of households in the big data sample by location, before and after weighting

	Unweighted		Weighted	
	HSES	VAT	HSES	VAT
Ulaanbaatar	21.7%	29.7%	45.8%	44.4%
Aimag	32.8%	43.3%	20.5%	20.3%
Soum	25.4%	20.8%	18.1%	24.3%
Countryside	20.1%	6.1%	15.6%	11.0%
	100%	100%	100%	100%

Source: Authors estimates.

Table 2. Distribution of female- and male-headed households by location in the HSES and VAT samples, before and after weighing

	Unweighted				Weighted			
	HSES		VAT		HSES		VAT	
	Female-headed	Male-headed	Female-headed	Male-headed	Female-headed	Male-headed	Female-headed	Male-headed
Ulaanbaatar	24.8%	20.8%	35.1%	28.4%	53.0%	44.1%	55.5%	42.4%
Province center	37.0%	31.5%	45.3%	42.9%	23.1%	19.9%	21.5%	20.1%
District center	25.6%	25.3%	15.8%	22.0%	16.1%	18.6%	15.4%	25.9%
Countryside	12.6%	22.4%	3.8%	6.7%	7.9%	17.4%	7.6%	11.6%
	100%	100%	100%	100%	100%	100%	100%	100%

Source: Authors' estimates

1 Usually, it is 10 households in an urban area (Capital city and provincial centers) and 8 households in a rural area.

Table 3. Descriptive statistics of households in the HSES-2018 and the big data sample

	HSES-2018 sample (n = 16454)	VAT big data sample (n = 4463)
Male-headed households	75.5%	81.5%
Female-headed households	24.5%	18.5%
Average age of HH head	46.6 years	44.5 years
Education level of HH head:		
no education	3.6%	1.0%
primary	8.2%	2.8%
Incomplete secondary	14.3%	10.5%
Complete secondary	24.7%	26.8%
technical and vocational	24.5%	27.5%
non-bachelor diploma	7.4%	9.1%
bachelor	14.9%	19.3%
master and doctor	2.3%	3.1%
Employment status of HH head		
Employed	67.0%	76.5%
Unemployed	6.0%	5.2%
Studying	0.4%	0.2%
Elder	19.7%	12.2%
Disabled	3.3%	2.2%
Not working because of housework and taking care of others	2.1%	2.0%
Not working for other reasons	1.4%	1.6%

Source: Authors' estimates.

Table 4. Household and household heads' characteristics for the HSES-2018 and big data samples, using the HSES-2018 data

	HSES 2018 (n = 16454)		Big data sample (n = 4463), 2018	
	Male-headed	Female-headed	Male-headed	Female-headed
Obs.	12,561 (76.3%)	3,893 (23.6%)	3,617 (81%)	846 (19%)
Mean monthly income per person, weighted (MNT thous.)*	331.1 (325.5, 336.6)	330.2 (318.0, 342.5)	377.0 (365.3, 388.8)	389.4 (355.1, 423.7)
Median monthly income per person, weighted (MNT thous.)	265.6	260.0	301.7	295.7
Mean monthly monetary expenditure per person, weighted (MNT thous.)*	321.9 (316,8, 326.9)	311,9 (301. 9, 321.9)	384.9 (374.5, 395.3)	375.1 (349.5, 400.7)
Median monthly monetary expenditure per person, weighted (MNT thous.)	260.1	245.8	296.6	267.5
Household size, weighted mean, number of persons	4.5	3.9	4.7	4.2
Employed	74.2%	45.1%	80.1%	60.8%

	HSES 2018 (n = 16454)		Big data sample (n = 4463), 2018	
	Male-headed	Female-headed	Male-headed	Female-headed
Unemployed	25.8%	54.9%	19.9%	39.2%
With children	67.82%	50.29%	78.21%	64.8%
Without children	32.17%	49.70%	21.78%	35.2%
With college and above education	17.5%	16.7%	21.0%	28.3%
Without college education	82.5%	83.7%	79.0%	71.7%

Note: Confidence interval is in parenthesis.
Source: Authors' estimates.

Table 5. Linear regression of VAT expenditure in 2018

Dependent variable: log (VAT expenditure)	OLS estimation results
Household head is male	- 0.023
	(0.092)
Location (Capital city = 0)	-
Province center	- 0.396***
	(0.050)
District center	- 0.668***
	(0.060)
Countryside	- 0.650***
	(0.093)
Household head is married	0.024
	(0.097)
Household head's age	0.001
	(0.002)
Household head's education is higher than the secondary level	0.468***
	(0.057)
Household size	- 0.199***
	(0.020)
Constant	12.658
	(0.154)
R-sq	0.190
Observation	4,463

Note: Standard errors are in parenthesis. *** denotes significant at 1%.
Source: Authors' estimates

Table 6. Linear regression of HSES consumption in 2018

Dependent variable: log (HSES consumption)	OLS estimation results
Household head is male	0.099**
	(0.041)
Location (Capital city = 0)	-
Province center	- 0.104***
	(0.019)
District center	- 0.119***
	(0.022)
Countryside	0.008
	(0.039)
Household head is married	0.103**
	(0.042)
Household head's age	0.008***
	(0.001)
Household head's education is higher than the secondary level	0.318***
	(0.022)
Household size	- 0.166***
	(0.013)
Constant	12.705
	(0.060)
R-sq	0.303
Observation	4,463

Note: Standard errors are in parenthesis. *** and ** denoted significant at 1% and 5%.
Source: Authors' estimates

Information about the authors

- Otgontugs Banzragch – professor in economics, National University of Mongolia, Ulaanbaatar, 14200, Mongolia. Email: otgontugs@num.edu.mn
- Manlaibaatar Zagdbazar – PhD student in economics, National University of Mongolia, Ulaanbaatar, 14200, Mongolia; senior researcher at the Economic Research Institute of Mongolia, Ulaanbaatar, 14200, Mongolia. Email: manlaibaatar@eri.mn
- Uyanga Gankhuayg – regional economist, UNDP Bangkok Regional Hub in Thailand, Bangkok, 10200, Thailand. Email: uyanga.gankhuyag@undp.org
- Delgernaran Tumurtogoo – economist, UNDP office in Mongolia, Ulaanbaatar, 14200, Mongolia, Email: delgernaran.tumurtogoo@undp.org
- Amarbal Avirmed – director, Population and Social Statistics Department at National Statistics Office of Mongolia, Ulaanbaatar, 14200, Mongolia. Email: amarbal@nso.mn
- Davaajargal Davaatsersen – statistician, Population and Social Statistics Department at National Statistics Office of Mongolia, Ulaanbaatar, 14200, Mongolia. Email: davaajargal@nso.mn

- Undral Lkhagva – statistician, Population and Social Statistics Department at NSO of Mongolia, Ulaanbaatar, 14200, Mongolia. Email: undral@nso.mn
- Ouyntsetseg Mashir – statistician, Population and Social Statistics Department at National Statistics Office of Mongolia, Ulaanbaatar, 14200, Mongolia. Email: oyuntsetseg@nso.mn
- Ganbayar Javkhlan – senior specialist of the Macro-Economic Policy Division, Economic Policy Department, MOF, Ulaanbaatar, 14200, Mongolia. Email: ganbayar_j@mof.gov.mn
- Batbileg Tumur – director, Information and Technology Center of Custom, Taxation and Finance, Ulaanbaatar, 14200, Mongolia. Email: ariunbat@gmail.com
- Aruinbat Galbat – data scientist, Information and Technology Center of Custom, Taxation and Finance, Ulaanbaatar, 14200, Mongolia. Email:batbileg@itc.gov.mn