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Multidimensional poverty index: a multilevel analysis of deprivation among Iranian older adults

Seyed Hossein Mohaqeqi Kamal^{1,2} , Mehdi Basakha^{1,3*}  and Sabina Alkire⁴ 

¹Social Welfare Management Department, School of Education Sciences and Social Welfare, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran, ²Social Welfare Management Research Center, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran, ³Social Determinants of Health Research Center, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran and ⁴The Oxford Poverty and Human Development Initiative (OPHI), Oxford Department of International Development, University of Oxford, Oxford, UK

*Corresponding author. Email: Me.basakha@uswr.ac.ir

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Abstract

Although the older adult population faces a higher risk of poverty compared to others, there is no clear picture of their poverty in Iran. The aim of this study was to measure multidimensional poverty and its related factors among Iranian older adults. This cross-sectional study was conducted from July to November 2019 and collected data by interviewing 1,280 participants in Tehran, Iran. To compute multidimensional poverty, four dimensions were used: health (disabilities), education, housing and standard of living. Single and multidimensional poverty and the joint distribution of deprivation were calculated. Multilevel logistic regression models were used to determine the relationship between predictor variables and outcome (multidimensional poverty). Multidimensional poverty among Tehran's older people was 59.0 per cent. The prevalence of health, housing, education and standard of living deprivations were 15.4, 25.3, 29.5 and 29.9 per cent, respectively. Furthermore, multivariate analysis shows that living with a spouse, being employed, and having health and social insurance coverage were protective factors, while being female was a risk factor for multidimensional poverty. Approximately 21 per cent of multidimensional poverty variance was attributed to the district level and the remaining was assigned to individual-level factors. This study showed that the older adults living in different areas of Tehran experience different aspects of poverty. So paying attention to the dimensions of multidimensional poverty can play an important role in customising the policies of each district. Also, the findings of this study on risk and protective factors of multidimensional poverty can be effective in designing and implementing interventions to mitigate poverty among the older adults.

Keywords: poverty; older adults; deprivation; multidimensional approach; multilevel analysis; Iran

Introduction

Older adults are among the most vulnerable population sub-groups, especially in developing countries (Berthoud *et al.*, 2009; Gasparini *et al.*, 2010; United Nations, 2019). Poverty among older adults is likely to grow among countries faced with a rapidly ageing population, and will become a larger problem in the coming decades (Smeeding, 2001; Ku and Kim, 2020).

By 2050, about a quarter of Iran's population is expected to be aged 60 and above (Soltani *et al.*, 2018). Data on the speed of population ageing show that Iran is the second fastest ageing country in the world in terms of the percentage point increase in the population age 60 and over between 2015 and 2050 (Mehri *et al.*, 2020).

Since the 1950s, various researchers have noted that older people are one of the largest groups living in poverty in Iran (Raghfar and Mohammadifard, 2013). The older population faces a higher risk of poverty compared to other age groups and they are also much less likely to escape poverty. Poverty among older adults is associated with poor health, spending a high proportion of income on out-of-pocket health-care services, higher levels of functional impairment and institutionalisation (Chou and Lee, 2018).

In the last few decades, the literature on multidimensional deprivation has been at the frontier of poverty research (Dhongde, 2017). In the late 1970s, Sen took the first steps towards alternative measurements of poverty by providing a capability approach (Sen, 2004, 2018). Today, this approach is widely accepted among international organisations, so that the Human Development Index and the Multidimensional Poverty Index (MPI), which are published annually by the United Nations, are measured using multidimensional poverty (Alkire, 2005; Alkire and Foster, 2011; Alkire and Santos, 2014). The wellbeing of an older person is not determined by his or her income alone, nor is deprivation limited to income deprivation, but deprivation of health, housing, education, dignity, political and social deprivation are among the various forms of deprivation (Tsui, 2002; McKay, 2008; Raghfar and Mohammadifard, 2013; Dhongde, 2017; Yun and Ko, 2018).

People are multidimensional beings and may feel poverty in different aspects of socio-economic life, not just in terms of income. Thus, poverty becomes a comprehensive concept that encompasses the entire spectrum of human life. Therefore, income as an indicator of welfare is not a proportionate indicator and must be complemented by other factors such as housing, literacy, health, access to public goods and others. The need for such a multidimensional approach to measuring welfare inequality has recently come to the attention of economists including Bourguignon and Chakravarty (2019), Tsui (2002), and Maasoumi and Lugo (2008).

Multidimensional indicators have been widely used in the literature on poverty and even later-life poverty. Dhongde (2017) estimated multidimensional poverty using the four dimensions of health (disability), education, housing and living standards among older adults, over the age of 65, in the United States of America (USA). She found that 38 per cent of the US older adults were poor in at least one dimension. Joint distribution of poverty among older adults showed that 12 per cent of the older adults in two dimensions, 3 per cent in more than two

dimensions and 0.4 per cent in all four dimensions were below the poverty thresholds. Yun and Ko (2018) designed a multidimensional poverty index for Korean seniors. Their index was composed of the three dimensions of income, assets and housing. They found that 5.5 per cent of South Korea's general population suffers from multidimensional poverty compared with 14.3 per cent for the older population. In addition, multidimensional poverty was higher among female seniors than male seniors (70% compared to 30%). Chen and Leu (2022) assessed the dynamics of multidimensional poverty and inequality among middle-aged and older adults in Taiwan. They found older seniors confronted more multidimensional poverty. In addition, the most prominent factors of inequality among those in poverty were gender and education. Contrary to the international literature, empirical studies in Iran on older adults' poverty have been very lacklustre. This paper attempts to fill this research gap by using a multidimensional deprivation approach in regard to the circumstances of older people in Iran.

Profile of Iranian older adults

According to the last census of the Statistics Centre of Iran (2016a), people aged 60 and over constitute more than 9.28 per cent of Iran's population and 12.75 per cent for Tehran (Statistical Centre of Iran, 2016a). In terms of population growth, Iran will be the second fastest ageing country in the world by 2050, after South Korea, as people aged more than 60 will represent about 31 per cent (almost 29 million people) of Iran's population. In the same path, the share of population aged over 65 is projected to be 22 per cent of the total population in 2050 (Mohaqqei Kamal *et al.*, 2019b).

A careful look at the socio-demographic status of the older adults in Iran shows that 72.37 per cent of Iranian seniors lived in urban areas and about 22 per cent of them were employed. The employment rate of urban seniors was less than 16 per cent, compared to 37 per cent for rural seniors (Statistical Centre of Iran, 2016a). Based on the World Bank statistics, the old-age dependency ratio of Iran was 6.43 per cent in 1990 reaching 9.21 per cent in 2019, representing an increasing number of the older population compared to the active middle-aged population (World Bank, 2020).

Gender disparity is another challenge for the community of Iranian older adults. Women comprised only 17.5 per cent of the workforce in 2019 (Kiani *et al.*, 2010), whereas they constitute more than half of the total population in Iran (Statistical Centre of Iran, 2016b). Women retire five years earlier than men in Iran (Kiani *et al.*, 2010). As the life expectancy of women is three years more than that of men in Iran (World Bank, 2020), retired women may face more economic problems in later life (Kiani *et al.*, 2010). Inequality in education has exacerbated gender disparity among the older adults in Iran. The literacy rate of older adults in Iran has grown significantly over the past four decades, from 12.9 to 46.4 per cent. But, an important part of this improvement has been due to high literacy rates for men (59.2%) rather than women (33.9%) (Secretariat of the National Council of the Elderly, 2020). Besides, the divorce rate for Iranian older adults was considerably different in terms of gender. It is easier for men than women to remarry after a divorce or being widowed. Women face more social barriers to remarriage (Amini

et al., 2021). Thus, the proportion of single older women is higher than that of single older men and, consequently, older women are more at risk of poverty.

Despite the mentioned challenges, there is no comprehensive system of protection for Iranian older persons, as there is in developed countries, like state pensions in Europe or social security in the USA. However, in Iran there are a range of employment-related pension plans that are managed by social security organisations. The formal pension plans cover principally men given the male-dominated structure of formal employment in Iran, but women do inherit the pension of their deceased husbands. However, the majority of pensioners have struggled to cover their basic needs in recent years (Mehri *et al.*, 2020).

Considering the outlined challenges, awareness of the poverty situation among older people will be one of the most important prerequisites for social policy in Iran.

The basic approach in poverty studies in Iran is to focus on income poverty, but this approach cannot provide a holistic overview of poverty and can be misleading. Information on economic poverty in Iran is limited to research studies conducted in this field (Raghfar and Mohammadifard, 2013; Mahoozi, 2015; Mohaqeqi Kamal *et al.*, 2019b) and there are no official statistics on the extent and severity of poverty in Iran. To our best knowledge, very few studies have been conducted on the income status and poverty of older adults in Iran. According to Zanjari and Sadeghi (2020), 25 per cent of the Iranian older population live in poverty, while this rate is 13 per cent for young and middle-aged adults. So, older people are about twice as likely as others to be poor. Among the older population sub-groups, the poverty rate among older women (39.5%) was almost 20 per cent higher than among older men (19.2%). Their results also showed that increasing age for an older individual was more likely to be associated with poverty: 36.9 per cent of older adults (80 years and older) were below the poverty line compared to 18.7 per cent for adults aged 60–69 years. In another study, Moghadam (2016) estimated the poverty rate of Iranian older adults and its related factors. He found that 34.72 per cent of older adults live in poverty. Older women are more likely to be poor than men and seniors with a spouse are 16 per cent less likely to be in poverty.

In Iran, like many developing countries, there is no study on multidimensional poverty in older adults, but few studies have been conducted in the general population. For example, Ali-Maddadi (2008) presented for the first time an estimate of the multidimensional poverty index in Iran. In this study, the multidimensional poverty index in rural and urban areas has been compared between 2004 and 2006. This study considered income, housing, sustainable assets, health, social security, leisure and education as dimensions of the poverty index. It found that in 2004, 18.3 per cent of urban households and 19.6 per cent of rural households suffered from multidimensional poverty. The results of 2006 showed that the poverty rate decreased slightly to 18.1 per cent for urban households and 19.3 per cent for rural households. In another study, Raghfar and Mohammadifard (2013) measured the multidimensional poverty index for Tehran, consisting of income, housing, education and public health. According to their results, the highest and lowest multidimensional poverty rates were in districts 14 and the 1, respectively.

Given the complexity of poverty, it is essential to provide policy makers with a more comprehensive and clear picture of the multiple deprivations experienced by older adults. This paper attempts to calculate multidimensional poverty for the older population in all municipal districts of Tehran, Iran. Tehran is a metropolis with a large socio-economic gap between its different geographical areas. Previous studies have shown this gap in the general population (Mohaqqei Kamal *et al.*, 2019a), but the gap has not been bridged for the older population. The study of multidimensional poverty among the older adults will help to realise the spatial distribution of poverty and its dimensions. This approach facilitates the adoption of cost-effective and specific anti-poverty policies to bridge the gap.

The theoretical framework (the dimensions and the indicators) of the study have been selected based on previous empirical research, especially the MPI of the United Nations Development Programme. Of course, in applying this theoretical framework, we have faced data availability constraints for Iran. The MPI, developed in collaboration with the University of Oxford, includes the three dimensions of health, education and living standards that are most applicable to the general population (Alkire, 2007). The previous studies on older adults' multidimensional poverty added 'housing quality' as the fourth dimension. The rare empirical studies on multidimensional poverty (Dhongde, 2017; Yun and Ko, 2018) have addressed the issue based on the same four dimensions but with different indicators.

Method

Design

This cross-sectional study was conducted from July to November 2019. The required sample size was estimated to be 1,066 using Cochran's formula, taking into account the 95 per cent statistical confidence intervals, the population size ($N = 1,000,000$), 0.03 desired level of precision (d) and $p = q = 0.5$. Considering the type of sampling (clustered sampling), 20 per cent was added to the sample size because of the design effect and the final volume was increased to 1,280 people:

$$n = \frac{Nz^2 pq}{Nd^2 + zpq} = 1,066$$

The samples were selected by using a multi-stage probability-proportional-to-size sampling method to obtain a sample representative of the municipality. A total of 1,280 people aged 60 years and above were sampled from 22 municipal districts and 367 neighbourhoods in Tehran. The sampling occurred in the following four steps. Stage 1: 22 Districts of Tehran metropolitan were considered as the primary sampling units. Samples were selected from all 22 districts of Tehran metropolitan. Stage 2: For each district, the required sample size was determined in proportion to the number of older people in each region by considering the distribution of the older population in each region (based on the URBAN HEART study in Tehran. Asadi-Lari *et al.*, 2013). Two neighbourhoods were selected by chance and by lot from each region. Stage 3: The samples were then randomly selected within each neighbourhood. The first sample was the first house on the right

side, when entering the alley. If the selected household did not have any eligible respondents, 'the next house' was chosen and the houses one by one surveyed to find older adults 60 years and older in each neighbourhood, until we had a large enough sample. Stage 4: Individuals were chosen to participate in the study from a list of all eligible persons residing in the selected households. One eligible participant was surveyed from each household. If more than one eligible participant was present in the household, the eldest participant was interviewed. In order to obtain maximum diversity in the samples, the distribution of the samples was considered based on gender (male, female), employment (employed and unemployed, housewife), level of education and housing status (owner and tenant). Finally, individuals who consented to participate were interviewed face-to-face at home by trained staff via computer-assisted personal interviewing.

The inclusion criteria were: (a) Iranian citizenship, (b) being aged 60 and over, and (c) ability to speak and understand the Persian language. The exclusion criterion also included seniors who lived in nursing homes or were unable to understand the questions.

Data

Data were collected using a closed-ended questionnaire which included three sections: demographic characteristics, economic status and health status.

The demographic section included questions about age, gender, education, marital status and life arrangements. The economic section included questions about family income, personal income, employment status, house-ownership status, residential unit area, and health, social and supplementary insurance. Finally, the health section included questions about self-reported health status, diseases diagnosed by a physician, taking medication, use of assistive devices such as glasses and hearing aids, glasses number, ability to walk for 15 minutes, ability to take a bath and wear clothes, and ability to go shopping and visit a doctor.

Independent variables in the regression model were age (continuous), gender (male, female), marital status (married, divorced, widowed, never married), employment status (working, retired, not employed, housewife), possessing health, social and supplementary insurance (no, yes), living arrangement (living together with spouse, living with children, living with another person, living alone), smoking in the past month (yes, no) and substance use in the past month (yes, no).

The survey was carried out through face-to-face interview with participants in their homes. The face validity of this questionnaire was approved by five experts in the fields of ageing, health and social welfare. A pilot study was conducted among 20 older people and, based on their responses, the questionnaire was revised and necessary adjustments were made before administration of the main survey.

Measurement

Adapted from Dhongde's (2017) theoretical and analytical framework, the four dimensions of health (disabilities), education, housing and standard of living were considered to compute the older adults' multidimensional poverty.

Due to the different needs, indicators of each dimension should be chosen based on the older adults' situation and their needs. For instance, getting a high-school diploma is widely used as a criteria for educational attainment (Alkire and Foster, 2011; Dhongde, 2017). But in the past, there was no proper educational infrastructure for Iranian older adults to complete their education at a young age. Hence, this study considered a senior as deprived in education if he or she has not been able to complete the eighth grade successfully.

Health may also be a different concept for older adults. So, disability metrics have been used to measure the health deprivation of them. There are six known areas of disability: vision, hearing, cognition, ambulation, self-care and independent living (Dhongde, 2017). Due to the fact that the study was conducted as a self-report survey of seniors, the cognition dimension was excluded to prevent bias. In this study, any older person experiencing two or more disabilities is considered as deprived in the health sub-dimension.

In this study, standard of living is measured by comparing an individual's total family income in the last 12 months with the poverty threshold. A person is deprived in this dimension if her or his income is less than the poverty threshold.

Floor area per person is one of the key housing indicators approved by the Commission on Human Settlements. Floor area per person is defined as the median floor area (in square metres (m^2)) of the housing unit divided by the average household size. The average floor area per person varies among countries; but for many countries, *e.g.* Italy, the United Kingdom, Japan, Spain, Sweden, France and Greece, it is between 30 and 45 m^2 (Mesthrige Jayantha and Lau, 2008). Based on the criteria and standards of residential space of the Ministry of Roads and Urban Development of Iran, here a person was considered deprived in this dimension if her or his house was smaller than 39 m^2 (Department of Housing and Urban Development, 2021). Table 1 shows the dimensions, indicators and poverty thresholds for the older adults.

A multidimensional measure of poverty can incorporate a range of indicators to capture the complexity of this phenomenon. Depending on the context and the purpose of measurement, different dimensions and indicators can be chosen to create a multidimensional poverty index. On the other hand, people describe their situation differently according to what they have in mind. For instance, empirical studies show that poor people describe ill-being to include poor health, nutrition, lack of adequate sanitation and clean water, social exclusion, violence and much more (Oxford Poverty and Human Development Initiative, 2020). Generally, using composite indicators can summarise complex, multidimensional realities to support decision makers. They also reduce the visible size of a set of indicators without dropping the underlying information. Another advantage of multidimensional indicators over single indicators is their appropriate capacity for facilitated communication with the general public (*i.e.* citizens, media, *etc.*) and enabling them to compare complex concepts effectively (Nardo *et al.*, 2008).

Statistical methods

First, the uncensored deprivation headcount ratios in health, housing, education and standard of living were calculated using poverty thresholds and the share of

Table 1. Dimensions, indicators and thresholds of older adult poverty

Dimension	Indicator	Poverty threshold
Standard of living	Comparing household income over the past 12 months with the poverty line	The income of the family being less than US \$1 (250,000 Iranian rials) per day/per member
Education	Years of education	Having less than 8 years of education
Disabilities ¹	Vision problems	Having glasses or lens equal or more than 3 dioptries
	Hearing problems	Using hearing aids
	Physical-motor problems	Unable to walk for 15 minutes without fatigue
	Self-care	Unable to dress or bathe alone
	Independent living	Unable to go shopping or visit a doctor alone
Housing	Per capita residential area	If a person has a per capita living area of less than 39 square metres, he or she is considered poor

Note: 1. Presence of two or more disabilities was regarded as the threshold for having health poverty. People with mental disability were excluded because they may not understand the questions correctly or give the incorrect answers.

poor older adults in the population was determined. Presuming equal weights and a union identification approach, the average multidimensional poverty intensity (A) or average percentage of simultaneous deprivations suffered by the poor older adults was calculated using Alkire and Foster's (2011) methodology, expressed as $A = c(k)/q(d)$, where $c(k)$ is the share of deprivations experienced by all poor people in dimension k , q is the number of multidimensionally poor people and d is the maximum number of deprivation dimensions. The final step was calculating the multidimensional headcount ratio (incidence) ($H = q/Population\ size$) and the adjusted headcount ratio ($M_0 = H \times A$), which accounts for both the incidence of poverty among the older adults and the intensity of their multidimensional poverty.

The joint distribution of deprivations was then estimated and illustrated in a Venn diagram. Multilevel logistic regression models were used to determine the relationship between predictor variables and multidimensional poverty. All predictor variables was aggregated from individual-level data at the district level. Independent variables were selected for inclusion in the model based on their significance as determined by the χ^2 test. A value of $p < 0.05$ was considered statistically significant. All tests were run using SPSS version 21 and Stata version 14.

Ethical consideration

Each older person was approached and interviewed separately and was told he or she could refuse to participate. They were informed that information would be anonymous and confidential and he or she could stop talking at any time without penalty. Sampling was performed on all older individuals who were verbally consenting to participate in the study. In addition, written informed consent was

obtained from all participants. The study was approved by the Research Ethics Committee of the University of Social Welfare and Rehabilitation Sciences, Tehran.

Results

Participants' profile

The age of the participants ranged between 60 and 95 years with an average of 70.9 (standard deviation (SD) = 8.06). Almost, 50 per cent of older adults lived with their spouses and 13.4 per cent were illiterate. In terms of employment status, the majority were retired (40.3%) or housewives (34.5%). The household income level of 20–30 million Iranian rials was the most frequent response. The profile of the participants in terms of socio-demographic variables is reported in [Table 2](#).

Multidimensional poverty and joint distribution of deprivations

According to the deprivation cutoffs mentioned in [Table 1](#), the highest percentage of deprivation was related to the standard of living poverty (54.1%). Slightly more than half of the older adults (50.7%) did not complete education beyond the eighth grade; and 50.2 per cent of the sample experienced housing poverty. Also, 29 per cent of older adults had two or more disabilities; and about one in three of them had multiple disabilities.

As there were four dimensions, equally weighted, it is convenient to use Venn diagrams to depict some of the overlaps, although all overlaps cannot be visual. The Venn diagram in [Figure 1](#) presents the share of poor older adults found in each dimension in addition to the overlaps among these dimensions. It shows that 16.3 per cent of the older adults with income poverty experienced disabilities and 38.7 per cent were deprived of a high-school education. Among the older population with housing poverty, 16.3 per cent were disabled and 29.4 per cent were deprived of a high-school education. Obviously, there are other overlaps between dimensions (*e.g.* disabilities and education joint poverty (19.5%) and standard of living and housing joint poverty (30.8%)) that cannot be shown in the Venn diagram. [Figure 1](#) also shows the percentage of the population that experience deprivation in more than two dimensions. For example, 13.8 per cent of the older adults were deprived in the three dimensions of disabilities, standard of living and education. Among older adults, 9.1 per cent were deprived in all four dimensions.

The next step is to identify who is poor according to different poverty cutoffs (k). Any specific choice for the k value is somewhat arbitrary and should be subject to robustness tests, *e.g.* by evaluating poverty levels for a grid of nearby cutoffs (Alkire and Foster, 2011). Considering that, the study reports multidimensional poverty according to the different k values. [Table 3](#) shows the percentage of older adults who were deprived at least in k dimensions. Here we have defined four different dimensions of poverty. Due to the use of questionnaire data, poverty coefficients are reported with 95 per cent confidence intervals (95% CI). It should be noted that equal weights are assumed for the four dimensions of poverty. [Table 3](#) presents poverty levels for different values of k and shows that 84 per cent of the sample were

Table 2. Socio-demographic characteristics of the participants

Variables	Variable dimensions	Frequency	%
Gender	Male	641	50.1
	Female	639	49.4
Age category	60–74	898	70.1
	75–90	362	28.3
	>90	20	1.6
Mean age (SD)		70.90 (8.07)	
Marital status	Married, living with a spouse	899	70.2
	Widowed	335	26.2
	Divorced	28	2.2
	Never married	18	1.4
Educational status	Illiterate	171	13.4
	Elementary to middle	478	37.4
	Secondary	384	30
	University	247	19.3
Employment status	Employed	252	19.7
	Unemployed	71	5.5
	Retired	515	40.3
	Housewife	442	34.5
Income level (million Iranian rials)	<10	54	4.2
	10 to <20	272	21.3
	20 to <30	366	28.6
	30 to <50	362	28.3
	≥50	226	17.7
Smoking	Yes	205	16
	No	1,075	84
Drug use	Yes	144	11.3
	No	1,136	88.7
Health insurance	Covered	701	54.8
	Not covered	579	45.2
Social insurance	Covered	843	65.9
	Not covered	437	34.1
Supplementary insurance	Covered	756	59.1
	Not covered	524	40.9
Life arrangement	Only with spouse	459	35.9

(Continued)

Table 2. (Continued.)

Variables	Variable dimensions	Frequency	%
	With spouse and single children	410	32
	Single	159	12.4
	No spouse with married children	93	7.3
	No spouse with single children	80	6.3
	With spouse and children	62	4.8
	With relatives	10	0.8
	Others	7	0.5

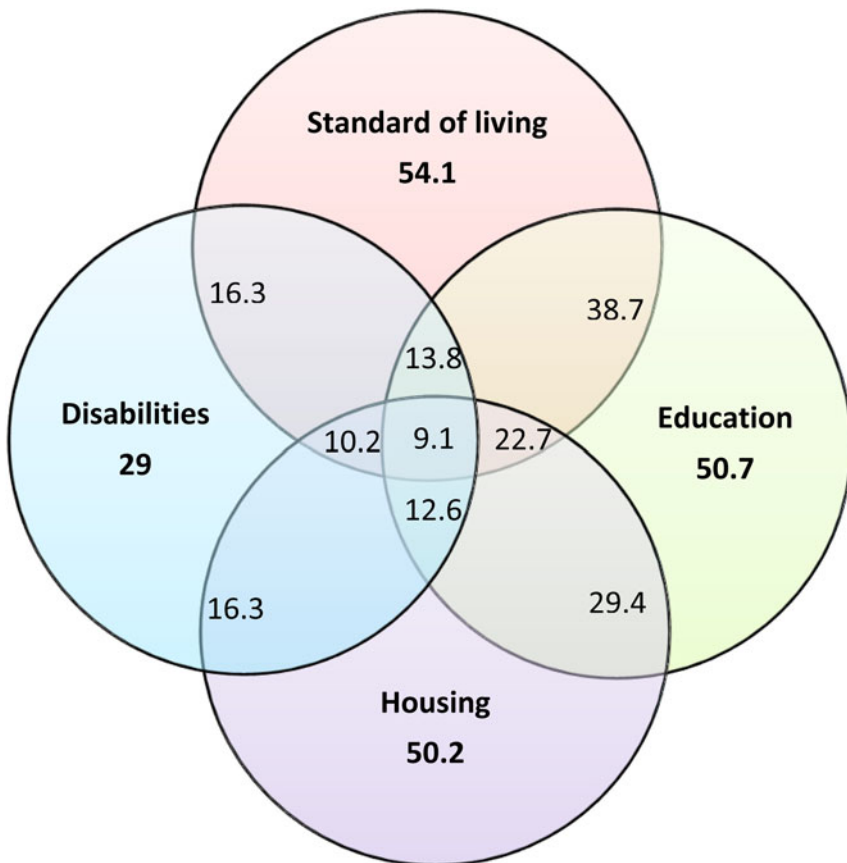


Figure 1. Venn diagram of joint distribution of deprivations in the multidimensional framework.

Table 3. Headcount (H) and intensity-adjusted multidimensional poverty (M_0) for at least n -dimensions

Deprivation cutoff	Index	Coefficient	Standard error	95% confidence interval	
				Lower bound	Upper bound
At least in one dimension	H	84.0	1.0	82.0	86.0
	M_0	46.0	0.8	44.3	47.6
At least in two dimensions	H	59.0	1.4	56.3	61.7
	M_0	39.7	1.0	37.7	41.7
At least in three dimensions	H	31.7	1.3	29.1	34.2
	M_0	26.1	1.1	23.9	28.2
At least in four dimensions	H	9.1	0.8	7.5	10.7
	M_0	9.1	0.8	7.5	10.7

deprived in at least one dimension. As the deprivation criteria increases to at least two and three dimensions, the poor older adults' headcount ratio changes to 59 and 31.7 per cent of the population, respectively. Results show that only about 9.1 per cent of the older population were deprived in all four dimensions. The study chose to consider multidimensional poverty as being poor in at least two dimensions ($k = 2$). Hence, the poverty headcount ratio is 59.0 per cent ($SD = 1.4$), and the value of adjusted multidimensional poverty (M_0) is 39.7 per cent ($SD = 1.0$).

Contribution of dimensions in multidimensional poverty

Table 4 presents multidimensional poverty across Tehran municipal districts. As mentioned earlier, the older people who were deprived in at least two dimensions were considered as a people with multidimensional poverty. According to Table 4, the lowest and highest multidimensional poverty headcount ratios were in districts 6 (30.8%) and 18 (97.1%), respectively. Taking the intensity of poverty into account and calculating adjusted multidimensional poverty, the situation in different regions changes significantly. For instance, in district 5, where the headcount multidimensional poverty rate is 72.9 per cent, the M_0 was calculated at 44.1. In other words, the poor older adults in this area experience 44 per cent of the deprivations that would be experienced if everyone was poor and deprived in all dimensions. Therefore, despite the high rate in headcount poverty, the severity of poverty in this district has not been very high. The situation is completely different for district 20. The headcount multidimensional poverty rate for this region is 78 per cent, which is slightly different from district 5. The intensity of poverty shows that 72 per cent of these people have been deprived in exactly two dimensions. This figure, compared to the 44 per cent ratio in district 5, indicates that the intensity of poverty among the older population in this district was much higher than in district 5. Results show that the incidence of multidimensional poverty is disproportionately high for older people in the southern districts.

Table 4. Multidimensional poverty and contribution of its dimensions in Tehran

District	H	M_0	Percentage contribution of each dimension to M_0			
			Health	Housing	Education	Standard of living
1	43.1	27.1	28.2	26.9	30.8	14.1
2	31.6	20.4	24.2	21.0	25.8	29.0
3	37.0	22.8	27.4	20.2	33.3	19.0
4	51.7	32.3	21.3	32.0	25.3	21.3
5	72.9	44.1	9.6	18.3	31.7	40.0
6	30.8	20.6	34.7	17.3	28.0	20.0
7	71.2	45.1	5.9	19.3	35.3	39.5
8	73.7	46.7	4.9	26.8	31.7	36.6
9	56.5	39.3	27.1	35.4	21.9	15.6
10	86.0	55.7	2.4	25.2	33.9	38.6
11	83.6	54.5	3.8	28.6	30.8	36.8
12	71.2	50.5	24.8	31.4	20.0	23.8
13	50.0	31.5	8.6	20.7	37.9	32.8
14	46.7	30.0	8.3	29.2	36.1	26.4
15	63.2	44.7	25.0	32.4	22.1	20.6
16	81.5	59.4	19.8	26.2	26.2	27.8
17	42.2	26.1	8.5	23.4	38.3	29.8
18	97.1	75.7	13.6	23.3	31.1	32.0
19	89.2	72.3	20.6	27.1	23.4	29.0
20	78.0	72.3	18.0	24.8	27.1	30.1
21	61.4	36.9	6.2	20.0	32.3	41.5
22	37.0	23.6	11.8	19.6	31.4	37.3
Total	59.0	39.7	15.4	25.3	29.5	29.9

In Table 4, we break the poverty levels down by its dimension. In fact, we have calculated the percentage contribution of each dimension to the multidimensional poverty. The sum of the share of these dimensions is equal to 1 and shows in each district which dimension has played a more important role in its multidimensional poverty. In 2019, health poverty, housing poverty, education poverty and poverty in living standards have contributed 15.4, 25.3, 29.5 and 29.9 per cent to Tehran's multidimensional poverty, respectively. Health poverty in districts 10 and 11 has the least and in districts 6 and 1 has the most impact on multidimensional poverty. It is quite obvious that housing poverty in districts 9 and 15, education poverty in districts 17 and 13, and poverty in living standards in districts 21 and 5 have had the largest contribution to their multidimensional poverty.

Table 5. Bivariate analyses of variables associated with multidimensional poverty

Variables	Dimension of variables	Multidimensional poverty		<i>p</i>
		Yes (N = 756)	No (N = 524)	
Sex	Male	329	312	0.00
	Female	427	212	
Marital status	Never married	3	15	0.00
	Married, living with a spouse	467	432	
	Widowed	271	64	
	Divorced	15	13	
Employment status	Employed	49	79	0.00
	Unemployed	23	11	
	Retired	327	349	
	Housewife	357	85	
Smoking	Yes	114	91	0.02
	No	642	433	
Drug use	Yes	97	47	0.07
	No	659	447	
Health insurance	Covered	356	345	0.00
	Not covered	400	179	
Social insurance	Covered	462	381	0.00
	Not covered	294	143	
Supplemental insurance	Covered	361	395	0.00
	Not covered	395	129	
Life arrangement	Only with spouse	173	286	0.00
	With spouse and single children	268	142	
	With spouse and married children	51	11	
	No spouse with single children	61	19	
	No spouse with married children	90	3	
	Single	101	58	
	With relatives	7	3	
	Others	5	2	

Factors predicting multidimensional poverty

One of the questions that poverty-related studies have always sought to answer has been to identify the factors associated with multidimensional poverty. A significant part of this study also sought to identify the related and influential factors on multidimensional poverty of the older adults in Tehran. In the first step, the correlation between the multidimensional poverty index and each of its dimensions was appraised. Spearman's correlation tests show that multidimensional poverty had the highest significant correlations with education poverty (74.3%) and poverty in living standards (66.2%). This finding emphasises the role of education in various aspects of the older adults' lives.

After a simple correlation test, bivariate analyses were conducted to assess the relationship between potential independent variables and multidimensional poverty (Table 5). According to regression results, all significant variables were entered into the multilevel logistic regression models (except for drug use).

The determinants of multidimensional poverty at the district level are presented in Table 6. All studied variables were measured at the individual level and then aggregated at the level of 22 districts. Based on intra-class correlation coefficient (ICC), the model satisfies the conditions for multilevel analysis (Peugh, 2010; Sajjadi *et al.*, 2020) justifies that 21.2 per cent of the variance of multidimensional poverty explained through the district-level differences (ICC = 0.212, 95% CI = 0.118–0.352). The multilevel logistic regression results indicated that gender, health insurance coverage, social insurance coverage, marital status and employment status were significant factors in explaining the multidimensional poverty. That is, health insurance coverage (OR = 0.69, 95% CI = 0.50–0.93), social insurance coverage (OR = 0.56, 95% CI = 0.37–0.80), living with a spouse (OR = 0.67, 95% CI = 0.48–0.91) and being employed (OR = 0.95, 95% CI = 0.88–1.02)

Table 6. Descriptive statistics of variables at the district level

Determinants	N	Minimum	Maximum	Mean	SD
Women (%)	22	44.40	55.60	49.92	2.49
Mean age	22	67.00	74.11	70.90	2.03
Never married (%)	22	0.00	6.50	1.41	2.00
Married, living with a spouse (%)	22	54.20	81.60	70.23	7.72
Widowed (%)	22	14.50	36.10	26.17	6.71
Divorced (%)	22	0.00	8.30	2.19	2.15
Employed (%)	22	0.00	33.30	10.00	7.33
Unemployed (%)	22	0.00	13.00	2.66	3.16
Retired (%)	22	0.00	19.40	9.69	5.32
Housewife (%)	22	19.40	50.00	34.53	7.20
Health insurance coverage (%)	22	0.00	91.20	45.23	24.53
Social insurance coverage (%)	22	2.20	68.40	34.14	16.12

Note: SD: standard deviation.

Table 7. Determinants of multidimensional poverty at the district level

Determinants	AOR	SE	<i>p</i>	95% confidence interval for AOR	
				Upper bound	Lower bound
Female	1.23	0.07	0.001	1.10	1.37
Mean age	1.00	0.04	0.09	0.91	1.10
Never married	1.62	0.19	0.51	0.48	0.91
Married, living with a spouse	0.67	0.12	0.01	0.48	0.91
Widowed	1.66	0.13	0.11	1.42	1.94
Divorced	1 (omitted)	–	–	–	–
Employed	0.95	0.03	0.001	0.88	1.02
Unemployed	1.08	0.01	0.22	1.04	1.12
Retired	1.01	0.01	0.53	0.97	1.05
Housewife	1.00	0.01	0.99	0.96	1.03
Health insurance coverage	0.69	0.01	0.001	0.50	0.93
Social insurance coverage	0.56	0.01	0.003	0.37	0.80
Supplemental insurance coverage	0.97	0.01	0.95	0.90	1.04

Notes: AOR: adjusted odds ratio. SE: standard error.

were protective factors, while being a female (OR = 1.23, 95% CI = 1.10–1.37) was the risk factor of multidimensional poverty among older adults in Tehran (Table 7).

Conclusion and discussion

This study was designed to measure multidimensional poverty and its related factors among the Iranian older population. The results of the present study revealed that the prevalence of multidimensional poverty (deprived in at least two dimensions) was 59.0 per cent. Also, the prevalence of health, housing, education and standard of living deprivations were 15.5, 25.3, 29.5 and 29.9 per cent, respectively. So, it is clear that educational poverty and difficulty meeting the basic needs of life have been the most important causes of multidimensional poverty among Iranian older people.

Evidence showed that the older population faces a higher risk of poverty compared to other age groups. On the other hand, the Iranian older population experience higher multidimensional poverty than in developed countries such as the USA and South Korea. For example, Dhongde (2017) reported that around 38 per cent of US older adults were deprived in at least one dimension and 12 per cent in at least

two dimensions. In another study, Yun and Ko (2018) revealed that 21.1 per cent of South Korea seniors are multidimensionality poor.

Furthermore, living with a spouse, being employed, and having health and social insurances were protective factors for multidimensional poverty among older adults. Household composition and their socio-demographic characteristics are associated with poverty risk in old age (Tai and Treas, 2009). Women who are not currently married and widows are more likely to be poor than women who are married with a spouse present (Chan and Chou, 2018; Agarwal *et al.*, 2020). According to the human capital theory, the poverty status of older adults depends on their human capital characteristics, such as educational level (Becker, 2007), skills and eventually employment status. Also, the older workers who were still working have labour market protection. Furthermore, insurance status captures many aspects of health-related disadvantage that we want to capture. Lacking insurance exposes people to greater health and financial risks in the event of illness. Research also suggests that the uncertainty associated with not having insurance creates ongoing psychological stress for people (Reeves *et al.*, 2016; Frey, 2018).

On the other hand, being female was the risk factor of multidimensional poverty among older adults; this is in line with previous studies (Kakwani and Subbarao, 2007; Gasparini *et al.*, 2010; Yun and Ko, 2018). Women were expected to leave paid employment after marrying or – at least – for the period of child care. Therefore, women's situation was affected by their lower pension contributions and eventually resulted in lower income in old age. In addition, the poverty risk gender gap in older cohorts is far greater than that in the working-age population (Antczak and Zaidi, 2016).

Generally, headcount multidimensional poverty of the municipal districts of Tehran was divided into five main categories: (a) very high (district 18); (b) high (districts 10, 11, 16, 19 and 20); (c) medium (districts 5, 7, 8, 12, 15 and 21); (d) low (districts 1, 4, 9, 13, 14 and 17); and (e) very low (districts 2, 3, 6 and 22). Overall, the percentage of multidimensional poverty at the south of the city was higher than in the northern districts. Previous evidence suggests that there is a large gap in socio-economic variables between the northern and southern parts of the city (Harouni *et al.*, 2017; Mohaqeqi Kamal *et al.*, 2019a). Thus, some policies such as investing in a diverse range of affordable housing and insurance options can help to close this gap.

The policy implications of the study can be noted as follows. First, to design effective anti-poverty policies, it is crucial to provide policy makers with a big picture of the multiple deprivations experienced by older adults. Second, in line with the activity theory and the findings of this study, policy makers should focus on different aspects of returning to work and integrating older people into society. Planning for voluntary employment in accordance with the abilities of the older adults can help them to maintain their physical and mental health to have an independent lifestyle. Given the high importance of education, the policy of facilitating formal and informal education can empower older population for this goal. Ageing policies and programmes should support the lifelong learning of the older people. Creating community-based educational opportunities for the older adults is a pillar of any active ageing strategy. Third, in line with the protective role of insurance on poverty, policy makers should expand affordable insurance options in the older

population. Fourth, according to the high poverty rate, policy makers should improve economic security by further enhancing direct and indirect support for low-income older adults.

As with many other studies, this study has its limitations. First, given that there is no official poverty line in Iran, we used the conventional poverty line based on previous studies. In addition, due to the lack of official statistics and reports on poverty in Iran, especially for older adults, the present study was conducted using a survey method and with limited samples; therefore, although the number of samples in the whole population has been representative of the older population, the disaggregation of multidimensional poverty in districts of Tehran was certainly for illustrative purposes. Further, due to the lack of data transparency in severe housing burden, the per capita standard of living space was used instead; and because poverty data are based on older adults' self-report, the results may be prone to social desirability bias.

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Ethical standards. All procedures performed in studies involving human participants were in accordance with the ethical standards of the Committee of Ethics in Research of the University of Social Welfare and Rehabilitation Sciences, Tehran (ethical code IR.USWR.REC.1398.068).

References

- Agarwal A, Lubet A, Mitgang E, Mohanty S and Bloom DE (2020) Population aging in India: facts, issues, and options. In Poot J and Roskrug M (eds), *Population Change and Impacts in Asia and the Pacific*. Singapor: Springer, pp. 289–311.
- Ali-Maddadi MS (2008) *Measuring Multidimensional Indicators of Poverty in Iran in 2004 and 2006* (MSc thesis). Sharif University of Technology, Tehran.
- Alkire S (2005) Why the capability approach? *Journal of Human Development* **6**, 115–135.
- Alkire S (2007) The missing dimensions of poverty data: introduction to the special issue. *Oxford Development Studies* **35**, 347–359.
- Alkire S and Foster J (2011) Counting and multidimensional poverty measurement. *Journal of Public Economics* **95**, 476–487.
- Alkire S and Santos ME (2014) Measuring acute poverty in the developing world: robustness and scope of the multidimensional poverty index. *World Development* **59**, 251–274.
- Amini R, Chee KH, Keya S and Ingman SR (2021) Elder care in Iran: a case with a unique demographic profile. *Journal of Aging & Social Policy* **33**, 611–625.
- Antczak R and Zaidi A (2016) Risk of poverty among older people in EU countries. *CESifo DICE Report* **14**, 37–46.
- Asadi-Lari M, Vaez-Mahdavi MR, Faghihzadeh S, Chergian B, Esteghamati A, Farshad AA, Golmakani M, Haeri-Mehrzi AA, Hesari H, Kalantari N, Kamali M, Kordi R, Malek-Afzali H, Montazeri A, Moradi-Lakeh M, Motevallian A, Noorbala A, Raghfar H and Razzaghi E (2013) Response-oriented measuring inequalities in Tehran: second round of UrbanHealth Equity Assessment and Response Tool (Urban HEART-2), concepts and framework. *Medical journal of the Islamic Republic of Iran* **27**, 236–248.
- Becker GS (2007) Health as human capital: synthesis and extensions. *Oxford Economic Papers* **59**, 379–410.

- Berthoud R, Blekesaune M and Hancock R** (2009) Ageing, income and living standards: evidence from the British Household Panel Survey. *Ageing & Society* **29**, 1105–1122.
- Bourguignon F and Chakravarty SR** (2019) The measurement of multidimensional poverty. In Chakravarty S (ed.), *Poverty, Social Exclusion and Stochastic Dominance*. Singapore: Springer, pp. 83–107.
- Chan LS and Chou KL** (2018) Poverty in old age: evidence from Hong Kong. *Ageing & Society* **38**, 37–55.
- Chen KM and Leu CH** (2022) Multidimensional perspective of the poverty and dynamics of middle-aged and older adults in Taiwan. *International Social Work* **65**, 139–156.
- Chou KL and Lee SY** (2018) Superimpose material deprivation study on poverty old age people in Hong Kong study. *Social Indicators Research* **139**, 1015–1036.
- Department of Housing and Urban Development** (2021) *Criteria and Standards of Residential Spaces*. Available at <https://shahrhayejadid.com/blogs/ZezmobNE/>.
- Dhonge S** (2017) Assessing multidimensional deprivation among the elderly in the USA. In White R (ed.), *Measuring Multidimensional Poverty and Deprivation*. London: Palgrave Macmillan, pp. 255–270.
- Frey WH** (2018) *Diversity Explosion: How New Racial Demographics Are Remaking America*. Washington, DC: Brookings Institution Press.
- Gasparini L, Alejo J, Haimovich F, Olivieri S and Tornarolli L** (2010) Poverty among older people in Latin America and the Caribbean. *Journal of International Development* **22**, 176–207.
- Harouni GG, Sajjadi H, Rafiey H, Mirabzadeh A, Vaez-Mahdavi M and Kamal SHM** (2017) Current status of health index in Tehran: a multidimensional approach. *Medical Journal of the Islamic Republic of Iran* **31**, 29.
- Kakwani N and Subbarao K** (2007) Poverty among the elderly in Sub-Saharan Africa and the role of social pensions. *Journal of Development Studies* **43**, 987–1008.
- Kiani S, Bayanzadeh M, Tavalaei M and Hogg RS** (2010) The Iranian population is graying: are we ready?. *Archives of Iranian Medicine* **13**, 333–339.
- Ku I and Kim C** (2020) Decomposition analyses of the trend in poverty among older adults: the case of South Korea. *Journals of Gerontology: Series B* **75**, 684–693.
- Maasoumi E and Lugo MA** (2008) The information basis of multivariate poverty assessments. In Kakwani N and Silber J (eds), *Quantitative Approaches to Multidimensional Poverty Measurement*. London: Palgrave Macmillan, pp. 1–29.
- Mahoozi H** (2015) Gender and Spatial Disparity of Multidimensional Poverty in Iran. Oxford Poverty & Human Development Initiative, Working Paper No. 95. Available at: <https://www.ophi.org.uk/wp-content/uploads/OPHIWP095.pdf>
- McKay S and Leu CH** (2008) Multidimensional perspective of the poverty and dynamics of middle-aged and older adults in Taiwan. *International Social Work* **65**, 139–156.
- Mehri N, Messkoub M and Kunkel S** (2020) Trends, determinants and the implications of population aging in Iran. *Ageing International* **45**, 327–343.
- Mesthrige Jayantha W and Lau SSY** (2008) Floor space per person and housing development: an urban growth approach to estimate housing supply in Hong Kong. *Urban Policy and Research* **26**, 177–195.
- Moghadam N** (2016) *Study of the Dimensions of Poverty of the Elderly and the Factors Affecting It in Iran in 2016* (MSc thesis). University of Tehran, Tehran.
- Mohaheqi Kamal SH, Harouni GG and Basakha M** (2019a) Spatial pattern of well-being in Tehran: the north–south gap. *Medical Journal of the Islamic Republic of Iran* **33**, 112.
- Mohaheqi Kamal SH, Harouni GG, Basakha M and Makki Alamdari S** (2019b) Multidimensional child poverty index in Iran: distribution of deprivation across provinces. *Journal of Poverty* **23**, 353–364.
- Nardo M, Saisana M, Saltelli A, Tarantola S, Hoffmann A and Giovannini E** (2008) *Handbook on Constructing Composite Indicators: Methodology and User Guide*. Available at <http://www.olis.oecd.org/olis/2005doc.nsf/>.
- Oxford Poverty and Human Development Initiative** (2020) *What is Multidimensional Poverty?* Available at <https://ophi.org.uk/policy/multidimensional-poverty-index/>.
- Peugh JL** (2010) A practical guide to multilevel modeling. *Journal of School Psychology* **48**, 85–112.
- Ragfar H and Mohammadifard Z** (2013) The measurement of multidimensional poverty in Tehran. *The Economic Research* **13**, 1–16.
- Reeves R, Rodrigue E and Kneebone E** (2016) Five evils: multidimensional poverty and race in America. Center on Children and Families at Brookings. ED568952. Available at https://www.brookings.edu/wp-content/uploads/2016/06/reeveskneebonerodrigue_multidimensionalpoverty_fullpaper.pdf

- Sajjadi H, Harouni GG, Rafiey H, Vaez-Mahdavi M, Vameghi M and Kamal SHM** (2020) Contextual and individual determinants of mental health: a cross-sectional multilevel study in Tehran, Iran. *Journal of Preventive Medicine and Public Health* **53**, 189–197.
- Secretariat of the National Council of the Elderly** (2020) *National Document of the Country's Elderly*. Tehran: Secretariat of the National Council of the Elderly.
- Sen A** (2004) Elements of a theory of human rights. *Philosophy & Public Affairs* **32**, 315–356.
- Sen A** (2018) *Collective Choice and Social Welfare*. Cambridge, MA: Harvard University Press.
- Smeeding TM** (2001) Income Maintenance in Old Age: What Can Be Learned from Cross-national Comparisons. Center for Retirement Research at Boston College. Working Paper No. 263. Available at https://crr.bc.edu/wp-content/uploads/2001/05/wp_2001-11.pdf
- Soltani A, Pojani D, Askari S and Masoumi HE** (2018) Socio-demographic and built environment determinants of car use among older adults in Iran. *Journal of Transport Geography* **68**, 109–117.
- Statistical Centre of Iran** (2016a) *Population and Housing Census*. Tehran: Statistical Centre of Iran.
- Statistical Centre of Iran** (2016b) *The Statistical Yearbook of Iran 2016*. Available at <https://www.amar.org.ir/english/Iran-Statistical-Yearbook>.
- Tai T and Treas J** (2009) Does household composition explain welfare regime poverty risks for older adults and other household members? *Journals of Gerontology: Series B* **64**, 777–787.
- Tsui K-y** (2002) Multidimensional poverty indices. *Social Choice and Welfare* **19**, 69–93.
- United Nations** (2019) *World Population Ageing 2019*. New York, NY: United Nations.
- World Bank** (2020) *Age Dependency Ratio (% of Working-age Population)*. *World Development Indicators*. Available at <https://data.worldbank.org/indicator/SP.POP.DPND>
- Yun S and Ko K** (2018) Multidimensional Elderly Poverty Index. Korea institute for Health and Social Affairs. Policy Report 2018-06. Available at <http://repository.kihasa.re.kr/bitstream/201002/30989/1/Multidimensional%20Elderly%20Poverty%20Index.pdf>
- Zanjari N and Sadeghi R** (2020) *Iran's AgeWatch Index in 2016*. Tehran: Saba Pension Strategies Institute.

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