Household Happiness and Fuel Poverty: a Cross-Sectional Analysis on Turkey

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Abstract

In recent years, self-reported happiness and fuel poverty have both become hotly-debated topics in the literature. Since both of them affect people's quality of life, they are certainly worth serious consideration. Therefore, this paper aims to conduct a household-level analysis on the association between happiness and fuel poverty taking advantage of other housing characteristics. We used ordered logit model utilizing Turkish Statistical Institute (TURKSTAT)'s 2014–2018 Life Satisfaction Survey (LSS) data for the analysis. Our dependent variable is household happiness. The results show that household fuel poverty is negatively associated with household happiness in Turkey. A positive association exists between becoming home-owner and household happiness in the country; however, it becomes mostly negative after considering odds ratios. On the other hand, there is a positive association between climbing income ladder and household happiness in the country. Also, the presence of men in households is found to be negatively associated with household happiness in Turkey. Our results imply a U-shaped association between age groups in households and household happiness in the country. Finally, we found that the association between an increase in household size and household happiness varies across each category of the independent variable. This is also the case for the association between number of rooms and household happiness as well as for the association between dwelling area and household happiness in Turkey.

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Introduction

Happiness has been an important concept and also a major goal for humankind from past to present. Although the definition of the concept is not very clear, many people still expressed that they wanted to live a happy life in all periods in history(Frey 2018). Since the concept is very important for individuals, it is important to delve into the question that what makes them happy. Asking questions on the subject will provide a comprehensive understanding of it. However, in order to understand the concept thoroughly, it is necessary to measure it while taking advantage of different methods of measurement used by various disciplines from psychology and neuroscience to economics(Lane 2017). Although happiness has generally been examined at the individual level in the literature, we also found some studies that look at the determinants of (physical) well-being at the household level (Zereyesus et al. 2016; Gautam and Anderson 2016; Seitz 2019). Considering that the second most important social arrangement after an individual in a society is the concept of household (Sönmez 1998), it will be better understood the importance of doing household-level analysis in examining self-reported happiness.

Happiness studies in Turkey have proliferated in recent years as well as in the world. The concept is discussed in a wide range in the country from the fields of psychology (Gürgan and Ulubay 2020; Çankaya and Denizli 2020) and emergency medicine (Çelikel et al. 2020) to the field of economics (Eren and Aşıcı 2017; Uğur 2019; Kuzuoğlu et al. 2020; Mavruk et al. 2020).

While these studies improve our understanding of the concept of happiness, learning about the average happiness level in a country is especially important. World Happiness Report edited by Helliwell et al. (2020) announced that Turkey is ranked 93rd in the Ranking of Happiness (2017–2019) among 153 countries. Its score is 5.132. While the top three countries on the report are Finland (7.809), Denmark (7.646) and Switzerland (7.560), the last three countries on the report are Zimbabwe (3.299), South Sudan (2.817) and Afghanistan (2.567). From this information, it is understood that, even if Turkey was not ranked at the end of the list, there is still some way to go for the country to be in a higher happiness level. In addition to this statistical information, it is also important to look at the statistics of TURKSTAT that released 2019 LSS in February 2020. Figures 1 and 2 show Turkey's level of happiness in 2019 by gender and age groups.

While the former figure shows that females were happier than males in Turkey, the latter figure shows that the happiest age group was 65+ in the country. It also shows that happiness reached at its minimum between ages 55–64 in the country. As a comparison, while 49.6% of males were happy in 2018, the percentage of females who report that they are happy were the same as 2019. The least happy age group was 45–54 in 2018.

Fuel poverty is another conspicuous topic in the literature since the 1980s. Although the first recognition of the problem can be traced back to 1970s (Healy and Clinch 2002; Creutzfeldt et al. 2018), Lewis (1982) defined this issue first in his book as the "difficulty for households to afford adequate warmth in their homes". Then, Boardman (1991) created a 10% indicator for measuring fuel poverty in her seminal book, which shows that households are fuel poor when they need to spend more than 10% of their income on fuel so as to maintain a satisfactory indoor temperature. However, the
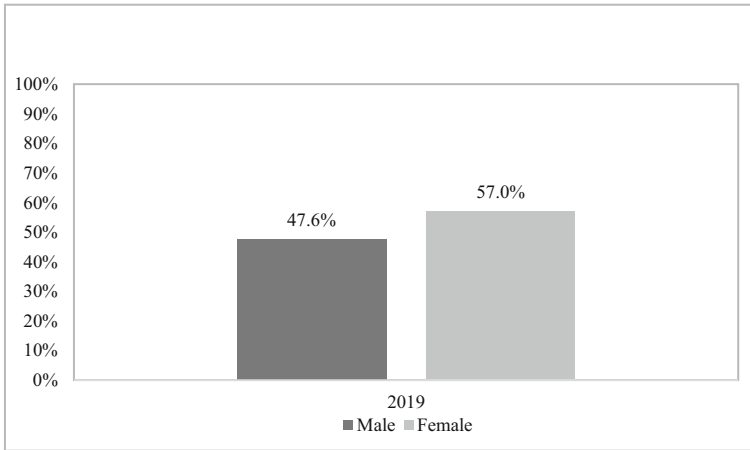
Fig. 1 Turkey's level of happiness by gender. Source: TURKSTAT LSS

United Kingdom replaced 10% indicator with Low Income High Cost(LIHC) indicator in order to measure fuel poverty more accurately (Hills 2011). There are also subjective(self-report) methods such as interviews and questionnaires for measuring fuel poverty. Although the concept is generally measured at an individual level (as is the measurement of happiness) in relevant literature, it may also have *broader repercussions for households*. Therefore, it is also important to look at the concept at the household level and thereby understand its effects on *quality of life* and *psychological well-being* of households (Grey et al. 2017). Although Grey et al. (2017) argue that there is also a need for qualitative research on fuel poverty, this paper attempts to partially fill the gap in the literature by examining the relationship between happiness and fuel poverty as well as other housing characteristics in Turkey *at the household level* due to the limited literature available on this relationship especially in developing countries.

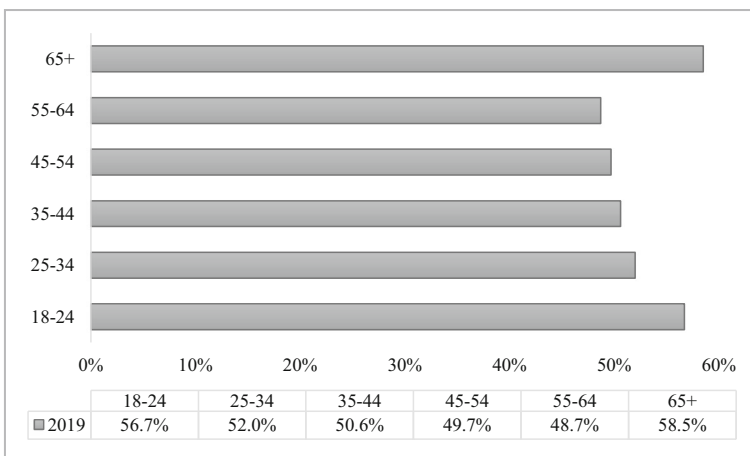|	18-24	25-34	35-44	45-54	55-64	65+
2019	56.7%	52.0%	50.6%	49.7%	48.7%	58.5%

Fig. 2 Turkey's level of happiness by age groups. Source: TURKSTAT LSS

The concepts of *energy poverty*, *fuel poverty*, *energy deprivation*, *energy vulnerability*, *energy precariousness*, and *consumer vulnerability* can be used as interchangeably in world literature (Longo et al. 2020). Although there are various energy studies in Turkey (Özcan et al. 2013; Kaygusuz et al. 2015; Öztürk and Yüksel 2016), the concept of energy poverty is still relatively new in the literature (Kaygusuz 2011; Emeç et al. 2015; Köktaş and Selçuk 2018; Selçuk et al. 2019; Köse 2019). As a result of this, the empirical studies on fuel poverty are quite limited in the country. To the best of our knowledge, there is no empirical study which directly focuses on the presence of the heating problem in houses as independent variable in the country. An exception worth noting is that Köse (2019) examined the relationship between fuel poverty and individual health with different dataset and question type than those currently used in this study.

Turkey's 2017 statistics on the heating problem faced by households due to the lack of isolation in the building and to the problem of leaky roof, damp wall, rotten window frames in houses can be seen in Fig. 3 below:

According to Fig. 3, while 36.6% of households have the problem of leaky roof, damp wall, rotten window frames in their houses, 40.8% of them have heating issues due to the lack of isolation in their buildings.

In order to understand the association between household happiness and household fuel poverty as well as other housing characteristics from a pooled cross-sectional perspective, first, we will review the literature on the relationship between happiness and fuel poverty. Then, we will review the literature on the relationship between happiness and housing characteristics. Next, we will review the literature on the relationship between happiness and individual characteristics, namely, income, gender and age. Second, we will explain research methodology and data. Third, we will report the findings of the econometric analysis. Fourth, we will touch on the advantages and disadvantages of the study. Finally, we will conclude the paper.

Basic research process followed is illustrated in Fig. 4 in order to help explain the conceptual model of the study:
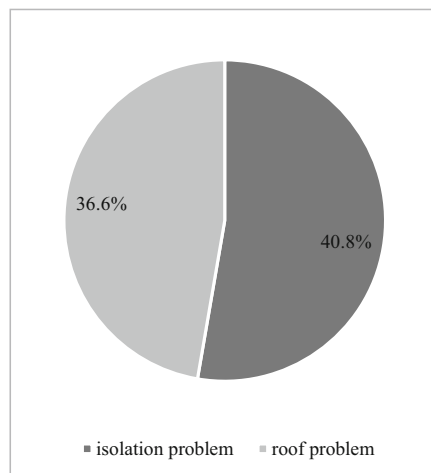

Fig. 3 Percentage of households who faced isolation and roof issues, 2017. Source: TURKSTAT Statistics on Family, 2018
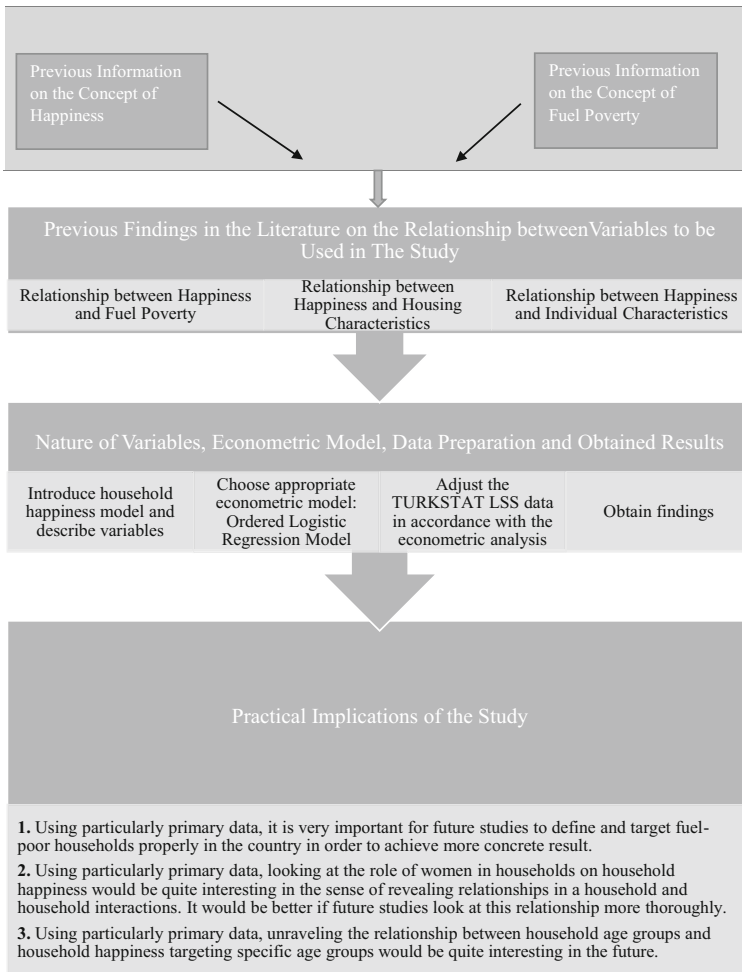
Fig. 4 Basic research process in the study. *Note*: While building our conceptual model, we were inspired by the definition of the conceptual model provided by Elangovan and Rajendran (2015)

Literature Review

On the Relationship between Happiness and Fuel Poverty

In the literature, there have been few studies on the relationship between subjective wellbeing/life satisfaction/individual happiness and the problem of fuel/energy poverty, which is generally understood as a lack of energy affordability.

Research on the relationship between fuel poverty and subjective wellbeing can be traced back to Biermann's seminal paper (2016). According to the study, fuel poverty has a significant, negative impact on subjective well-being. They also found that income-deprivation effect is not the only factor that determines this relationship. The similar finding has been found by Churchill et al. (2020) for Australia. Their results showed that being fuel poor decreases the level of subjective wellbeing. In addition,

this relationship has been shown to be robust, in the sense that alternative ways of measuring fuel poverty did not change the negative impact of fuel poverty on subjective well-being. While Llorca et al. (2020) mention the negative impact of fuel poverty on individual well-being, Welsch and Biermann (2017) also point out that energy prices have an increasing effect on wellbeing in case of greater fuel poverty. Taking into account consumer preferences through a frontier model, Rodriguez-Alvarez et al. (2019) found that fuel poor individuals may have a similar or even higher level of well-being with/than better-off individuals for these individuals may have different preferences from each other. Finally, Liddell and Morris (2010) touch on the negative impact of fuel poverty on mental health and wellbeing and highlight the importance of examining the broader *social and emotional impacts of fuel poverty* in future studies.

Energy poverty may also have a negative impact on physical health, wellbeing, and ability to prosper in a region, which is characterized by low electricity access and reliance on traditional cooking fuels. Being energy-poor is quite likely to lead to low standard of living, low calorific intake, low life expectancy, and low literacy levels (Njiru and Letema 2018). Kahouli (2020) partly supports this finding in her article in the sense that she found a significant causal relationship between fuel poverty and self-assessed health status. Another research suggests that it is more likely that the energy-poor people report poor health and subjective wellbeing compared to the non-energy poor people in European countries (Thomson et al. 2017). The research is especially important in the sense that its dataset also includes Turkey. According to this, Turkey had the highest overall prevalence rate of poor wellbeing along with Central and Eastern European countries and this rate was higher within energy-poor population in the country.

It is notable that unequal access to electricity may lead to dissatisfaction among households if their homes are close to a power line because this reminds them about being deprived of lighting at their homes. At the same time, they may also feel hopeful for they believe there will be a solution for this problem. This belief supports the relative deprivation hypothesis in the literature (Dugoua and Urpelainen 2014).

While examining the relationship between energy poverty and life satisfaction in some of the Central and Eastern European countries, Druică et al. (2019) use health status and one's satisfaction with his/her own socioeconomic status as the distinct mechanisms through which energy poverty is linked to life satisfaction. The results of their analysis suggest that both health status and socioeconomic status are relevant mediators. They also found that gender data can be used to moderate the relationship between health status and life satisfaction. In addition to these results, the level of people's health may not be greatly improved by the interventions on energy poverty, however, people may be more satisfied with their lives due to these interventions.

The contribution of income and energy availability on individual's happiness is examined by Tasik (2019). The results showed that energy expenditure has a higher positive impact on individual happiness than that of income received. Therefore, energy policies, which increase energy consumption, could be more important than the other policies that increase income of people, especially who live in rural areas.

On the Relationship between Happiness and Housing Characteristics

Ability to meet basic needs is one of the important determinants of individual happiness. Better housing can also be considered as one of the basic needs in human life

(Diener 2020). Therefore, it is important to examine the relationship between housing characteristics and individual wellbeing/life satisfaction/happiness. Although there are several studies that examine the relationship between housing and mental health, the literature written about the relationship between well-being and housing is limited (Clapham et al. 2018). In this literature, research studies examined the impacts of homeownership, household/dwelling size, number of rooms, etc. on subjective well-being and on physical/mental health of individuals. It has been proposed that health, happiness and social involvement improve through homeownership. For instance, since the purchase of a property can be seen as an achievement in one's life, it increases individual self-esteem and this may lead to an increase in general well-being of an individual (Elsinga and Hoekstra 2005). In urban China, the positive impact on household life satisfaction of home ownership may apply, in particular, to native residents, extended households, younger households, married households, and highly-educated people (Zheng et al. 2020).

Becky Tunstall (2012) who is the director of the center for housing policy and Joseph Rowntree professor of housing policy at the University of York also reports that home ownership has been accepted as an element of the good life for years, but the relevant research is limited and it suggests that the home ownership does not have to lead to pure happiness (Azizi et al. 2017). The relationship between homeownership and happiness is also examined in urban China for local residents and migrants. According to this, there is an association between homeownership and higher level of happiness for local residents and rural migrants. This relationship is stronger for local residents. Yet their final result is that people's happiness level is independent of residing in their own property; the happiness level increases as long as people own a place (Fong et al. 2020). In another study, it was found that homeownership affects life satisfaction of urban migrants in China in a positive way (Lai et al. 2020). Rodriguez-Alvarez et al. (2019) have also some original findings on the impact of housing tenure on individual well-being. According to their study, individuals who get a mortgage to buy their homes have lower level of well-being than home owners without mortgages.

Foye (2018) delves into the question of whether having more room necessarily make people more content. According to the survey research he had done, people's satisfaction initially increased when they moved to an upsized house, but then it reduced within three years because their expectations regarding space changed. Besides, the number of rooms per person slightly increases life satisfaction and the mental health of men (Foye 2017). Another study showed that individual happiness also peaked at a house size of 135–164 m^2 (Rudolf and Potter 2015). The relationship between the size of dwelling and happiness is also assessed in the context of the United States (Wilson 2019). According to the research from Brigham Young University, having a larger home probably have positive outcomes. In other words, if people do not feel crowded in their homes, a larger home may make people feel better, however, subjective perceptions also matter. This means that it is important to understand how big is big enough for individuals. On the other hand, it is found that life satisfaction decreases when household size gets larger (Katsaiti 2012). Another study somewhat supported this finding that the level of happiness declines for both genders when they have a large family (Pouwels 2011).

On the Relationship between Happiness and Individual Characteristics

Another important point is to examine the relationship between happiness and individual characteristics such as income levels, gender and age. Examining the impact of income on happiness goes back to Easterlin's paper (1974). In his pioneering paper, he suggests that it is more likely that greater happiness goes with higher income on average. This statement also suggests that rich people are happier than the poor people. However, it is shown that this relationship holds in simple(individual) comparisons within and among countries at a one point in time. Comparing rich and poor countries or higher and lower income situations in a given country at two different times showed that this relationship did not exist. This situation is then called Easterlin paradox. In other words, this paradox shows that an increase in income leads to an increase in individual happiness, however, this relationship is not observed in the long run at the aggregate level. There are many studies that support (Scitovsky 1976; Layard 1980; Blanchflower and Oswald 2004; Clark et al. 2008; Walsh 2012) or challenge (Lane 1993; Hagerty and Veenhoven 2003; Headey et al. 2008; Stephenson and Wolfers 2008; Angeles 2011) the paradox. Another conspicuous view is that Easterlin paradox may not hold in the context of a developing country, which has high poverty and income inequality levels (Kollamparambil 2020). Recently, Muresan et al. (2020) found evidence for European countries to suggest that there is a certain income threshold at which happiness no longer increases with more money.

It is also suggested in the literature that women are happier than men, and age has a U-shaped relationship with happiness, which means that middle-aged are least happy (Eren and Aşıcı 2017). Although the relevant literature consist of different results (Easterlin 2006 for the relationship between age and happiness; Senik 2004 for the relationship between gender and happiness), some studies have similarly found that females are happier than males (Nolen-Hoeksema and Rusting 1999; Easterlin 2001; Subramanian et al. 2005; Blanchflower and Oswald 2011; Fortin et al. 2015; Arrosa and Gandelman 2016; Olivos 2020) and age has a U-shaped relationship with well-being (Blanchflower 2020; Nordheim and Martinussen 2020; Mulet 2020). This means that people's happiness reaches its minimum level in middle age, and then starts to increase.

Methodology and Data

Methodology

The general specification of the household happiness model is as follows:

$$\text{Household Happiness}_i = f(\text{fpov}_i, \text{hhsize}_i, \text{tenurestat}_i, \text{roomno}_i, \text{dwarea}_i, \text{income}_i, \text{gender}_i, \text{age}_i) \quad (1)$$

Household Happiness$_i$ is a five-category variable. It is coded numerically from 1 to 5. It will be used to obtain *household happiness levels* in Turkey. "1" indicates "very

happy", "2" indicates "happy", "3" indicates "neither happy nor unhappy", "4" indicates "unhappy", and finally "5" indicates "very unhappy".

$Fpov_i$ is a binary variable, which is coded numerically as 0 and 1. It will be used to obtain *household fuel poverty* in Turkey, using the *issue of heating* as a proxy. While "0" indicates "there is no problem about heating at homes", "1" indicates that "there is a problem about heating at homes".

$Hhsize_i$ is a four-category variable. It is coded numerically from 1 to 4. It will be used to obtain *household size* in Turkey. "1" indicates "households with 1 to 3 persons", "2" indicates "households with 4 to 6 persons", "3" indicates "households with 7 to 9 persons", and "4" indicates "households with 10 to 17 persons".

$Tenurestat_i$ is a binary variable, which is coded numerically as 0 and 1. It will be used to obtain *tenure status* in Turkey. While "1" indicates "becoming a home-owner", "0" indicates "others"; namely, tenants, people who live in public housing, and people who reside in someone else's house but do not pay rent".

$Roomno_i$ is a three-category variable. It is coded numerically from 1 to 3. It will be used to obtain *room numbers* in dwellings in Turkey. "1" indicates "dwellings with 1 to 4 rooms", "2" indicates "dwellings with 5 to 8 rooms", and "3" indicates "dwellings with 9 to 12 rooms".

$Dwarea_i$ is a seven-category variable. It is coded numerically from 1 to 7. It will be used to obtain *dwelling areas* in Turkey. "1" indicates "dwellings with 10 to 50 m^2 area, "2″ indicates "dwellings with 52 to 100 m^2 area, "3″ indicates "dwellings with 101 to 120 m^2 area, "4″ indicates "dwellings with 121 to 130 m^2 area", "5″ indicates "dwellings with 131 to 140 m^2 area", "6″ indicates "dwellings with 142 to 150 m^2 area", and "7″ indicates "dwellings with 151 to 750 m^2 area".

$Income_i$ is a five-category variable. It is coded numerically from 1 to 5. It will be used to obtain *income groups of households* in Turkey. Income-range of households varies over the years. Information on this variable can be found in Table 1 in more detail.

$Gender_i$ is a binary variable, which is coded numerically as 0 and 1. While "1" indicates "males", "0" indicates "females".

Age_i is a seven-category variable. It is coded numerically from 1 to 7. It will be used to obtain *age groups in households* in Turkey. "1" indicates "18-24 years of age", "2" indicates "25-34 years of age", "3" indicates "35-44 years of age", "4" indicates "45-54 years of age", "5" indicates "55-64 years of age", "6" indicates "65-74 years of age", and "7" indicates "75-101 years of age".

The ordered logit model (also known as the proportional odds model) will be used in our analysis (Liu and Agresti 2005). The reason of using this econometric model is that dependent variable and independent variables are categorical. Since we were already interested in happiness research (Ucal and Günay 2018) and energy studies (Ucal 2017; Ediger et al. 2018; Haug and Ucal 2019; Ucal and Xydis 2020) before, we aspired to look at the characteristics of the association between household happiness and household fuel poverty using as well as housing characteristics in Turkey. Before we analyzed the model, we put forth some hypotheses on the association between variables. Since the data we used is cross-sectional, our hypotheses have nothing to do with causal relationships between variables. They are as follows:

Table 1 Variables used in the econometric analysis

Variables	TURKSTAT survey questions	Characteristics of variables
Happiness	How happy are you when you think of your life as a whole?	Five-category variable: 1. Very Happy 2. Happy 3. Neither Happy nor Unhappy 4. Unhappy 5. Very Unhappy
Fuel Poverty (Fpov)	Is there a heating problem in the house you live in?	Binary variable: 0. No 1. Yes
Tenure Status(tenurestat)	What is the tenure status of the house you live in?	Binary variable: 0. Others (tenants, those who live in public housing, those who reside in someone else's house but do not pay rent) 1. Owner-occupied home
Household Size(Hhsize)	Household size(All those involved in the household members list)	Four-category variable: 1. households with 1 to 3 persons 2. households with 4 to 6 persons 3. households with 7 to 9 persons 4. households with 10 to 17 persons
DwellingArea(dwarea, m^2)	How many square meters is the net area used in the house you live in?	Seven-category variable: 1. 10 to 50 m^2 2. 52 to 100 m^2 3. 101 to 120 m^2 4. 121 to 130 m^2 5. 131 to 140 m^2 6. 142 to 150 m^2 7. 151 to 750 m^2
Number of Rooms(room_no)	How many rooms are there in the residence you live in, including the living room? (except kitchen, water closet, bathroom, store room)	Three-category variable: 1. 1 to 4 rooms 2. 5 to 8 rooms 3. 9 to 12 rooms
Income groups(income)	Which of the income groups I will read now does your household's total monthly net income(salary,wage, rent, interest, entrepreneur) fall into?	Five-category variable: 2014: 1. 0–1179 TL 2. 1180–1692 TL 3. 1693–2369 TL 4. 2370–3471 TL 5. 3472+ TL 2015: 1. 0–1264 TL 2. 1265–1814 TL 3. 1815–2540 TL

Table 1 (continued)

Variables	TURKSTAT survey questions	Characteristics of variables
		4. 2541–3721 TL
		5. 3722+ TL
		2016: 1. 0–1361 TL
		2. 1362–1953 TL
		3. 1954–2734 TL
		4. 2735–4005 TL
		5. 4006+ TL
		2017: 1. 0–1509 TL
		2. 1510–2166 TL
		3. 2167–3032 TL
		4. 3033–4442 TL
		5. 4443+ TL
		2018: 1. 0–1741 TL
		2. 1742–2499 TL
		3. 2500–3499 TL
		4. 3500–5126 TL
		5. 5127+ TL
Gender	Sex of the interviewee	Binary variable: 0. Female 1. Male
Age Groups (age)	The age groups of individuals	Seven-category variable:
		1. 18–24
		2. 25–34
		3. 35–44
		4. 45–54
		5. 55–64
		6. 65–74
		7. 75–101

Source: TURKSTAT LSS

- Because it is known in the literature that fuel poverty is an issue that affects people's standard of living in a negative way, we expect that being fuel poor in a household is negatively associated with household happiness in Turkey.
- Although belonging to a large family may provide an opportunity to develop good family relationships in terms of sharing some things with each other or supporting each other under all circumstances, we expect that there is a negative association between an increase in household size and household happiness in Turkey especially because of financial difficulties.

- Because becoming a homeowner may strengthen self-confidence of individuals and make them feel successful, we expect that there is a positive association between homeownership and household happiness in Turkey.
- Since a relatively large house may make people feel comfortable, we expect that there is a positive association between having more rooms and household happiness in Turkey. In the same way, we expect a positive association between having a large dwelling area and household happiness in the country.
- Since climbing the income ladder is more likely to improve people's standard of living and also to help open many doors for them, we expect that this will be reflected in the household. In other words, our expectation is that a positive association exists between being located in higher income groups and happiness at the household level in Turkey.
- Because age may have a negative psychological effect especially on older people, we expect that this will also be reflected in the household. Put it differently, we expect that climbing the age ladder is negatively associated with happiness at the household level in Turkey.
- Since it is widely accepted in the literature that females are happier than males individually, we expect that there will be a negative association between the presence of men in households as well as male(s) only households and household happiness in Turkey.

We will use ordered logistic regression so as to understand whether our expected outcomes will occur or not. Ordered logit model(also known as the proportional odds model) is used in analyses when dependent variable has more than two categories and the values of each category of the variable have a meaningful sequential order (Torres-Reyna 2012).

Let y^* be defined as a latent variable ranging from $-\infty$ to ∞. The structural model is as follows (Long and Freese 2014):

$$y_i^* = x_i\beta + \varepsilon_i;$$

where i indicates observation and ε indicates random error.

If there is only one independent variable, the model is written as below:

$$y_i^* = \alpha + \beta x_i + \varepsilon_i$$

Let y^* be divided into J ordinal categories:

$$y_i = m \ if \ \tau_{m-1} \leq y_i^* < \tau_m \ for \ m = 1 \ to \ J;$$

where τ indicates cutpoints/thresholds. Assume that $\tau_0 = -\infty$ and $\tau_J = \infty$.

Now, we will give an example in order to illustrate the measurement model. In the survey data we used, participants are asked to respond to the following statement:

How happy are you when you think of life as a whole? The responses are

1. Very Happy
2. Happy
3. Neither Happy nor Unhappy
4. Unhappy
5. Very Unhappy

respectively.

According to these responses,

$$
y_i = \begin{cases}
1 \rightarrow \text{Very Happy} & \text{if } \tau_0 = -\infty \leq y_i^* < \tau_1 \\
2 \rightarrow \text{Happy} & \text{if } \tau_1 \leq y_i^* < \tau_2 \\
3 \rightarrow \text{Neither Happy Nor Unhappy} & \text{if } \tau_2 \leq y_i^* < \tau_3 \\
4 \rightarrow \text{Unhappy} & \text{if } \tau_3 \leq y_i^* < \tau_4 \\
5 \rightarrow \text{Very Unhappy} & \text{if } \tau_4 \leq y_i^* < \tau_5 = \infty
\end{cases}
$$

It is understood that there are four cutpoints(τ) and five ordinal categories of y.

The probability of observing y = m for given values of the x's is as follows:

$$
\Pr(\, y = m \mid x \,) = \Pr\left(\, \tau_{m-1} \leq y^* < \tau_m \mid x \,\right)
$$

After substituting $x\beta + \varepsilon$ for y^* and using some algebra, the standard formula for the predicted probability in the ordered logit model could be obtained as follows:

$$
\Pr(y = m \mid x) = F(\tau_m - x\beta) - F(\tau_{m-1} - x\beta);
$$

where F represents the cumulative distribution function(cdf) for ε.

While F is normal with Var(ε) = 1 in the ordered probit model, it is logistic with Var(ε) = $\Pi^2/3$ in the ordered logit model.

The ordered logit model can also be developed as a nonlinear probability model without referring to an underlying latent variable (Long and Freese 2014):

The odds that an outcome is less than or equal to m versus greater than m given x could be defined as follows:

$$
\Omega_{\leq m \mid > m}(x) \equiv \frac{\Pr(y \leq m \mid x)}{\Pr(y > m \mid x)} \text{ for m} = 1, \text{J}-1.
$$

For instance, we could compute the odds of being very happy, happy, neither happy nor unhappy, unhappy(that is, m $\leq$ 4) versus being very unhappy(that is, m > 4). The log of the odds is written as follows:

$$
In\Omega_{\leq m \mid > m}(x) = \tau_m - x\beta
$$

It is important to mention that for all values of m, the β's will be the same.

For one independent variable, four cutpoints and five ordinal categories(we fix the intercept(β) to equal 0 and estimate τ's), the model will be:

$$In\frac{\Pr(y\leq 1\mid x)}{\Pr(y > 1|x)} = \tau_1 - \beta x,$$

$$In\frac{\Pr(y\leq 2|x)}{\Pr(y > 2|x)} = \tau_2 - \beta x,$$

$$In\frac{\Pr(y\leq 3|x)}{\Pr(y > 3|x)} = \tau_3 - \beta x,$$

$$In\frac{\Pr(y\leq 4|x)}{\Pr(y > 4|x)} = \tau_4 - \beta x.$$

Data

We used TURKSTAT's non-open access LSS data in our analysis. TURKSTAT uses two-stage stratified cluster sampling as sampling procedure. The weighting was performed by TURKSTAT because probabilities of selection were used from the data set obtained as a result of sampling as required in multi-stage sample design. Final weights consist of combination of many factors. First, initial weights were calculated by taking the inverse of probabilities of selection. Second, out of scope and non-response corrections were made. Finally, iterations were carried out through the integrated calibration method and projected population and the number of all households in general throughout Turkey were reached by using the finite population correction factor.

We used 2014–2018 time period for our analysis because since 2014, the sample size of the research has been designed by TURKSTAT to give estimation at Turkey's total level. The pooled cross-sectional dataset created after data merging process consists of 45,957 observations both at the household and the individual level. Due to TURKSTAT's survey characteristics, our dependent variable was individual happiness. Independent variables were fuel poverty, tenure status, household size, income groups, dwelling area, number of rooms as household characteristics; and other variables, namely, gender and age as individual characteristics. We weighted the whole data at the household level using weighting factors so as to make our data representative of the target population correctly. *Tenure status* data was categorical, therefore we transformed it into dummy variable for the sake of ease of interpretation. *Household*

size was a continuous data, therefore we transformed it into a categorical variable so as to see the impact of each category on the response variable. In a similar vein, we transformed *dwelling area*, *number of rooms* and *age* data into categorical variables. All of them could be seen in the Table 1 below:

Because all of the variables are categorical in Table 2, means of them show the general tendency towards corresponding categories of these variables. For example, while the general tendency is towards the second(2nd) category of *household happiness*, it is towards zero(0) for the *household fuel poverty* variable. This means that, on average, households are happy and they do not have fuel poverty problem in Turkey.

Results and Discussion

We used STATA 14.2 statistical package for our analysis. We used i.syntax in front of each independent variable because it denotes that these variables are factor(categorical) variables. Using this syntax is important in ordered logit/probit analyses in order to estimate the association between dependent and independent variables correctly.

We will examine the results based on ordered logistic regression. In the first part, we will interpret the coefficients in terms of ordered log odds. In the second part, we will interpret the coefficients in terms of proportional odds. In this way, we think interpretations will complement each other and also strengthen our analysis. Table 3 shows the results in terms of ordered log odds. Table 4 shows the results in terms of proportional odds.

According to Table 3, for a one unit increase in *household fuel poverty*, the ordered log odds of being in a lower happiness level would increase by 0.449531 for households in Turkey when the other variables in the model are held constant. This means that those who have a heating problem in their homes are likely to report being less happy in the country. This finding is consistent with our expectations and also appears to be in line with panel studies of Biermann (2016); Churchill et al. (2020) and Llorca et al. (2020). Contrary to these studies, we used household happiness data in our analysis but this consistency still provides important insight on the nature of this

Table 2 Descriptive statistics of the household-level data

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Household happiness	45,957	2.480536	0.8434807	1	5
Household fuel poverty	45,957	0.2101095	0.4073906	0	1
Tenure status	45,957	0.6359641	0.481164	0	1
Household size	45,957	1.566225	0.6394237	1	4
Dwelling area	45,957	3.124943	1.640553	1	7
No. of rooms	45,957	1.071132	0.2589872	1	3
Income groups	45,957	2.794221	1.430544	1	5
Gender	45,957	0.4593642	0.4983514	0	1
Age groups	45,957	3.481472	1.648854	1	7

Source: TURKSTAT LSS. Authors' calculations

Table 3 Ordered logit modelling of household happiness

Household Happiness(very happy=1,2,3,4,5=very unhappy)		Coef.	Robust Std. Err.	z	P>|z|	[95% Confidence Interval]	
	1.Fuel poverty	0.449531	0.0264489	17.00	0.000	0.397692	0.50137
	1.Tenure status	-0.1890605	0.0226742	-8.34	0.000	-0.2335011	-0.1446199
Household size							
	2	-0.0576776	0.0221892	-2.60	0.009	-0.1011677	-0.0141876
	3	-0.0334917	0.0510973	0.66	0.512	-0.0666571	0.1336405
	4	0.2471535	0.0983456	2.51	0.012	0.0543996	0.4399073
Dwelling area							
	2	-0.3753602	0.0672089	-5.58	0.000	-0.5070872	-0.2436332
	3	-0.4822863	0.0698857	-6.90	0.000	-0.6192598	-0.3453128
	4	-0.4488463	0.077983	-5.76	0.000	-0.60169	-0.2960025
	5	-0.5534429	0.0799594	-6.92	0.000	-0.7101604	-0.3967254
	6	-0.4501097	0.0834756	-5.39	0.000	-0.6137189	-0.2865005
	7	-0.5766718	0.0795666	-7.25	0.000	-0.7326196	-0.4207241
No. of rooms							
	2	-0.1769983	0.046725	-3.79	0.000	-0.2685775	-0.085419
	3	0.8200525	0.3956482	2.07	0.038	0.0445963	1.595509
Income groups							
	2	-0.2210968	0.0319096	-6.93	0.000	-0.2836384	-0.1585551
	3	-0.2466361	0.0302305	-8.16	0.000	-0.3058868	-0.1873853
	4	-0.2824007	0.0318041	-8.88	0.000	-0.3447356	-0.2200658
	5	-0.4342682	0.0344905	-12.59	0.000	-0.5018684	-0.366668
	1.Gender	0.3297742	0.0205938	16.01	0.000	0.2894111	0.3701373
Age groups							

Table 3 (continued)

2	0.1450931	0.0391879	3.70	0.000	0.0682864	0.2218999
3	0.3831695	0.0375085	10.22	0.000	0.3096541	0.4566848
4	0.5283947	0.0397855	13.28	0.000	0.4504165	0.6063729
5	0.3823034	0.0432488	8.84	0.000	0.2975373	0.4670694
6	0.1969515	0.0493221	3.99	0.000	0.100282	0.2936209
7	0.0668438	0.054367	1.23	0.219	−0.0397135	0.1734012
/cut 1	−2.821215	0.0768949			−2.971927	−2.670504
/cut 2	0.0322942	0.0747652			−0.114243	0.1788314
/cut 3	1.872491	0.0757958			1.723934	2.021048
/cut 4	3.581142	0.0818776			3.420665	3.741619

Source: TURKSTAT LSS. Authors' calculations

Table 4 Ordered logit modelling of household happiness

Household Happiness (very happy = 1,2,3,4,5 = very unhappy)	Odds Ratio	Robust Std. Err.	Z	P > |z|	[95% Confidence Interval]
1. Fuel poverty	1.567577	0.0414608	17.00	0.000	1.488386 1.650982
1. Tenure status	0.8277364	0.0187683	−8.34	0.000	0.7917567 0.8653512
Household size					
2	0.9439542	0.0209456	−2.60	0.009	0.9037815 0.9859126
3	1.034059	0.0528376	0.66	0.512	0.935516 1.142982
4	1.280376	0.1259193	2.51	0.012	1.055906 1.552563
Dwelling area					
2	0.6870418	0.0461753	−5.58	0.000	0.6022473 0.7837751
3	0.6173703	0.0431454	−6.90	0.000	0.5383428 0.7079989
4	0.6383642	0.0497815	−5.76	0.000	0.5478849 0.7437856
5	0.5749668	0.045974	−6.92	0.000	0.4915653 0.6725187
6	0.6375582	0.0532206	−5.39	0.000	0.5413339 0.7508867
7	0.5617649	0.0446977	−7.25	0.000	0.4806482 0.6565712
No. of rooms					
2	0.8377812	0.0391453	−3.79	0.000	0.7644662 0.9181275
3	2.270619	0.8983662	2.07	0.038	1.045606 4.930836
Income groups					
2	0.8016391	0.02558	−6.93	0.000	0.7530389 0.8533759
3	0.781425	0.0236229	−8.16	0.000	0.73647 0.8291242
4	0.7539715	0.0239794	−8.88	0.000	0.7084076 0.802466
5	0.6477385	0.0223408	−12.59	0.000	0.6053985 0.6930397
1.Gender	1.390654	0.0286388	16.01	0.000	1.335641 1.447933
Age groups					
2	1.156147	0.0453069	3.70	0.000	1.070672 1.248446
3	1.466927	0.0550222	10.22	0.000	1.362954 1.578831
4	1.696207	0.0674845	13.28	0.000	1.568966 1.833768
5	1.465657	0.0633879	8.84	0.000	1.346539 1.595312
6	1.217685	0.0600587	3.99	0.000	1.105483 1.341275
7	1.069129	0.0581253	1.23	0.219	0.9610647 1.189343
/cut 1	−2.821215	0.0768949			−2.971927 -2.670504
/cut 2	0.0322942	0.0747652			−0.114243 0.1788314
/cut 3	1.872491	0.0757958			1.723934 2.021048
/cut 4	3.581142	0.0818776			3.420665 3.741619

Source: TURKSTAT LSS. Authors' calculations

association between the variables. On the other hand, for a one unit increase in *tenure status*, the ordered log odds of being in a higher happiness level would increase by 0.1890605 for households in Turkey when the other variables in the model are held constant. This means that owners of a property are likely to report being happier than those who do not own a property. For a one category increase in *household size*, the

ordered log odds of being in a higher happiness level would increase by 0.0576776 for households in Turkey when the other variables in the model are held constant. This means that households are likely to report being happier when the household size increases from 1 to 3 to 4–6 persons. While the third category of the variable is not statistically significant, the second and the fourth categories of it are statistically significant at .01 and .05 level, respectively. This is in contradiction with our expectations. It is more likely that households feel less happy when the household size is greater than 10 persons. This may also imply that there may be a certain *threshold* in household size in which households feel happier. It is seen that for a one category increase in *dwelling area*, the ordered log odds of being in a higher happiness level would increase by 0.3753602 for households in Turkey when the other variables in the model are held constant. This means that households are likely to report being happier when dwelling area increases from 10 to 50 m^2 to 52–100 m^2. This finding is consistent with our expectations. The highest positive association between household happiness and dwelling area is seen in the last category of dwelling area(151+ m^2) although the association is positive and significant for all of the categories. It is seen that compared to the other categories, the third, fifth and the seventh categories of dwelling area further increase the odds of being in higher happiness levels for households. For a one category increase in *the number of rooms*, the ordered log odds of being in a higher happiness level would increase by 0.1769983 for households in Turkey when the other variables in the model are held constant. This means that households are likely to report being happier when the number of rooms increases from 1 to 4 to 5–8 rooms. This finding is consistent with our expectations so far. However, it is seen that the ordered log odds of being in a lower happiness level for those who live in houses that have 9+ rooms are 0.8200525 when the other variables in the model are held constant. This may also imply that households may feel happier at a certain *threshold* of number of rooms. As for the income groups of households, it is more likely that the higher the income groups of households, the greater their happiness levels are. For a one category increase in *income group* of households, the ordered log odds of being in a higher happiness level would increase by 0.2210968 for households in Turkey when the other variables in the model are held constant. In addition, the ordered log odds of being in a higher happiness level for those who belong to the highest income groups is 0.4342682 when the other variables in the model are held constant. Males resided in a household increase the ordered log odds of being negatively associated with household happiness by 0.3297742 when the other variables in the model are held constant. This result is consistent with our expectations since women in Turkey are generally happier than men individually and thereby, they are more likely to be positively associated with household happiness. However, it should also be noted that according to our dataset, male(s)-only households increase(s) the ordered log odds of being negatively associated with household happiness by 0.3297742. Further studies will reveal these associations more thoroughly. Finally, it is seen that a one category increase in *age groups* in households increases the ordered log odds of being negatively associated with household happiness by 0.1450931 in Turkey when the other variables in the model are held constant. This finding is consistent with our expectations so far. However, the negative association between variables does not continually increase. The highest negative association between household happiness and age groups in households is found in the fourth category of the age groups(45–54). After this threshold, coefficients that show the

negative association between age groups in households and household happiness tend to decrease. This may imply that there may be a U-shaped association between age groups and happiness to a certain age threshold at the household level in Turkey. It was first striking to see that U-shaped association may exist at the household level in Turkey since this association is generally found at the individual level in relevant literature but it is also quite understandable because the presence of an unhappy person(s) or a certain age group in a household may affect household happiness in a negative way. It is also important to note that the negative association between the variables is statistically insignificant in the last category of age groups in households. Further research is needed to shed light on this relationship.

According to Table 4, for a one unit increase in *household fuel poverty*(going from 0 to 1), the odds of households being very unhappy versus the combined very happy, happy, neither happy nor unhappy and unhappy categories are 1.57 greater in Turkey, given that all of the other variables in the model are held constant. Likewise, the odds of households the combined being happy, neither happy nor unhappy, unhappy and very unhappy categories versus being very happy are 1.57 greater, given that all of the other variables in the model are held constant. This finding is consistent with that of Table 3 and also strengthens it. For a one unit increase in *tenure status*(going from 0 to 1), the odds of households being very unhappy versus the combined very happy, happy, neither happy nor unhappy and unhappy categories are 0.83 greater, given that all of the other variables in the model are held constant. Likewise, the odds of households the combined being happy, neither happy nor unhappy, unhappy and very unhappy categories versus being very happy are 0.83 greater, given that all of the other variables in the model are held constant. Contrary to the results taken by Table 3, this finding indicates that the negative association between household happiness and tenure status is stronger and manifests itself more explicitly in Table 4. For a one category increase in *household size*(going from 1 to 2), the odds of households being very unhappy versus the combined being very happy, happy, neither happy nor unhappy and unhappy categories are 0.94 greater, given that all of the other variables in the model are held constant. Likewise, the odds of households the combined being happy, neither happy nor unhappy, unhappy and very unhappy categories versus being very happy are 0.94 greater, given that all of the other variables in the model are held constant. The third category of household size is statistically insignificant. For a one more category increase in *household size*(going from 3 to 4), the odds of households being very unhappy versus the combined being very happy, happy, neither happy nor unhappy and unhappy categories are 1.28 greater, given that all of the other variables in the model are held constant. Similarly, the odds of households the combined being happy, neither happy nor unhappy, unhappy and very unhappy categories versus being very happy are 1.28 greater, given that all of the other variables in the model are held constant. This result seems to be somewhat consistent with the results in Table 3 in the sense that for an increase in household size from the third category to the fourth category, the odds of households being lower happiness levels increase. This finding may indicate that there is a negative association between increase in the household size and household happiness due to possible financial difficulties since large households find it difficult to make ends meet. For a one category increase in *dwelling area*(from 1 to 2), the odds of households being very unhappy versus the combined being very happy, happy, neither happy nor unhappy and unhappy categories are 0.69 greater, given that all of the

other variables in the model are held constant. Likewise, the odds of households the combined being happy, neither happy nor unhappy, unhappy and very unhappy categories versus being very happy are 0.69 greater, given that all of the other variables in the model are held constant. While the highest negative association between dwelling area and household happiness exists for the second category of the independent variable, the smallest negative association between these variables exists for the seventh category($151+ m^2$) of it. It is understood that the results are partly consistent with those taken by Table 3 in the sense that the third, fifth and the seventh categories of dwelling area decrease the odds of being in lower happiness levels for households in contrast to the 2nd, 4th and the 6th categories. For a one category increase in the *number of rooms*(going from 1 to 2), the odds of households being very unhappy versus the combined being very happy, happy, neither happy nor unhappy and unhappy categories are 0.84 greater, given that all of the other variables in the model are held constant. Likewise, the odds of households the combined being happy, neither happy nor unhappy, unhappy and very unhappy categories versus being very happy are 0.84 greater, given that all of the other variables in the model are held constant. For a one more category increase in the *number of rooms*(going from 2 to 3), the odds of households being very unhappy versus the combined being very happy, happy, neither happy nor unhappy and unhappy categories are 2.27 greater, given that all of the other variables in the model are held constant. Likewise, the odds of households the combined being happy, neither happy nor unhappy, unhappy and very unhappy categories versus being very happy are 2.27 greater, given that all of the other variables in the model are held constant. It shows that living in a house that has 9+ rooms increases the odds of households being in lower happiness levels. According to this, there may be a certain *threshold* in which households locate themselves in higher happiness levels. It is understood that the results are somewhat consistent with those taken by Table 3 in the sense that for an increase in the number of rooms from the second category to the third category, the odds of households being in lower happiness levels increase. For a one category increase in *income group*(going from 1 to 2) of households, the odds of households being very unhappy versus the combined being very happy, happy, neither happy nor unhappy and unhappy categories are 0.80 greater, given that all of the other variables in the model are held constant. Likewise, the odds of households the combined being happy, neither happy nor unhappy, unhappy and very unhappy categories versus being very happy are 0.80 greater, given that all of the other variables in the model are held constant. It indicates that as households move up into higher income groups, the odds of households being in lower happiness categories decrease. In this sense, these findings are consistent with those of Table 3. Table 3 showed that as households move up into higher income groups, the ordered log odds of households being in higher happiness levels increase. The odds of males in households (also the odds of male(s)-only households) being associated with the lowest happiness category(very unhappy) versus being associated with the combined higher happiness categories(very happy, happy, neither happy nor unhappy and unhappy) are 1.39 greater compared to females in households(and also female(s)-only households), given that all of the other variables in the model are held constant. Likewise, the odds of males in households (and also male(s)-only households) being associated with the combined the lower happiness categories(happy, neither happy nor unhappy, unhappy and very unhappy) versus being associated with the highest happiness category(very

happy) are 1.39 greater, given that all of the other variables in the model are held constant. The result is consistent with our finding in Table 3 except that the association is stronger in Table 4 than that in Table 3. It is also seen that the odds of age groups in households being negatively associated with household happiness increase up to the fourth category(45–54) and then the odds of age groups in households in the fifth and the sixth categories being negatively associated with household happiness decrease, except the last category, which was found to be insignificant. This result may indicate U-shaped association to a certain age threshold between happiness and age groups at the household level in Turkey. The result is consistent with our former findings in Table 3.

Since our study is based on a large sample data, differentiating statistical and practical significance of results is also crucial. It is quite possible to obtain statistically significant results if the sample size is very large or the sample variability is low. At this point, it is important to find effect size of variables in the model used. We used odds ratios as effect sizes in our analysis (Ialongo 2016). However, the effect sizes are considered to be only an estimate since it is based on the sample used. Therefore, confidence intervals are included in the analysis (Frost 2020). Because of these reasons, we made use of confidence interval estimation regarding odds ratios in order to determine the practical significance of variables in ordered logistic regression model (Ialongo 2016). If confidence interval is relatively narrow, we will be sure about the precision of our estimation. Otherwise, we will decide that the uncertainty of our estimation is relatively large and more information is needed for talking about the practical significance of the variable in question (Higgins et al. 2020). Based on *Example 5B*, we determined whether the width of confidence intervals was wide or narrow (Ialongo 2016).

When we look at the practical significance of the estimated effect of household fuel poverty in Table 4, we see that the confidence interval is relatively narrow. We can infer from this that it is possible to make decisions with enough precision about the practical significance of the variable. Also, it can be inferred that the estimated effect of tenure status has also some practical significance because the confidence interval is considerably narrow. When it comes to the practical significance of the estimated effect of household size, it can be inferred from the confidence interval that the 2nd category of the variable has relatively greater practical significance compared to other categories. However, we can say that the estimated effect of the variable has still some practical significance overall. Although the third category of it is statistically insignificant, it is inferred that it may be still practically significant to some extent because its confidence interval is relatively quite narrow. When we look at the estimated effect of the practical significance of dwelling area, we see that confidence interval is again relatively quite narrow for all of the categories of the variable. Therefore, we can say that the estimated effect of the variable may have some practical significance in Turkey. When it comes to the estimated effect of the practical significance of number of rooms, we see that confidence interval of the third category of the variable is quite wide. This means that one should be careful when interpreting the point estimate of 2.27 because of the uncertainty of the estimation, which can also be used as the effect size of the variable, number of rooms, although this category is statistically significant at .05 level. The estimated effects of household income groups have some practical significance since the confidence intervals are considerably narrow. When we think about the estimated

effect of the practical significance of gender, we see that confidence interval is considerably narrow. Thus, we can infer that the estimated effect of the variable has also some practical significance in Turkey. Finally, age groups in households have quite narrow confidence intervals which indicate the presence of practical significance of the estimated effect of the variable in the country.

From the information given above, it can be understood that the effect of a variable can be statistically significant although it is not practically significant. On the other hand, the effect of a variable can still have some practical significance even if it is statistically insignificant when its confidence interval is quite narrow. Still, one should be careful when interpreting the point estimates(effect sizes) of variables because they may not be large or meaningful enough for the real-world analysis (Ialongo 2016) (Table 5).

Advantages and Disadvantages of the Study

In this part, we will explain some advantages and disadvantages of this analysis as well as methodological and conceptual advances of the paper. At first, it is important to note that one methodological drawback of our analysis is that survey analysis may suffer from unobserved heterogeneity because responses to survey questions on the term happiness may also reflect the subjective nature of this term. This problem may also cause response bias. We will give an example to understand the issue more clearly:

Let A and B denote two individuals in our example. Even if both of them choose the same category of happiness such as "very (un)happy", their happiness level may vary because of their own individual characteristics(e.g. optimism, pessimism etc.). In other words, categorical responses are not homogenous in survey analyses. Therefore, it is difficult to make comparisons between individuals. The solutions for unobserved heterogeneity would be to use the panel data methods or to use cross-sectional data with the method of anchoring vignettes (King 2020), however, TURKSTAT LSS data has no panel data characteristics or the survey does not include more than one question (closed-ended or indirect questions) that measure happiness in a different way (Servet 2017). Still, since LSS has the characteristic of TURKSTAT's first research on social

Table 5 Decision criteria for practical significance of the estimated effect

Condition	Decision
(If) the confidence interval of odds ratio (OR) is relatively narrow	The effect is precisely estimated
(If) the confidence interval of OR is wider	Greater uncertainty arises in the estimation
(If) the confidence interval of OR is very wide	Further information is needed to draw more certain conclusion

Source: Higgins et al. (2020)

Note: The idea of showing conditions of practical significance of the estimated effect comes from Higgins et al.(2020). However, based on Ialongo (2016), we applied our subjectively determined thresholds into Table 5. If the confidence interval ranges between 1.46-6.72, Ialongo (2016) accepts this as quite wide confidence interval. Therefore, we accepted the confidence interval of the third category of number of rooms in our model, which ranges between 1.04 - 4.93, as the only (relatively) wider confidence interval.

content and subjective items such as individual happiness, hope etc. in Turkey, it provides an important research opportunity to researchers. This implies one of the methodological advances of the study. The second methodological advance of this study is that despite the fact that cross-sectional studies cannot determine causal relationships between variables as in panel studies, which is also indicative of one of the methodological drawbacks of the study, their findings can be used to create an in-depth research in future studies and can also be helpful in policy-making (Wang and Cheng 2020). In this sense, our study can help understand both the concepts of happiness and fuel poverty and also our findings can help make some inferences about possible relationships between these variables at the household level through dissemination of relevant information/findings based on cross-sectional survey data for the first time in Turkey.

In addition to this, although cross-sectional data allows research at one point in time and this limits the extent of research conducted, this data can still be used to calculate the odds ratios (Satia 2016). Therefore, we tried to understand the association between household happiness and household fuel poverty as well as housing characteristics through ordered logistic regression. When we performed the model by using weight command in STATA, it reports Wald Chi squared test (Long and Cheng 2004) in its output, which shows whether all of the coefficients of the variables in the model are zero. Based on the output obtained (Wald chi2(24) =1358.63), we can reject this null hypothesis and suggest that independent variables in our model are significant in explaining their association with household happiness. Therefore, removing them from the model will harm the fit of it. It is worthy noting that odds ratios are also helpful to reveal practical significance of the variables in the study.

On the other hand, interdisciplinary researches have an important place in academic literature. They help scholars and researchers to combine different perspectives towards concepts in hand comprehensively (Szostak et al. 2016). In this sense, we tried to integrate the concepts of happiness, which is mostly from the fields of interest of psychology and philosophy and fuel poverty, which is studied in the fields of geographical / engineering sciences and economics into our paper and in this way, we tried to strengthen the conceptual framework and methodological analysis of the paper because in some way, these disciplines try to solve the issue of (household) fuel poverty in a body. In this way, it may also become easier to build concrete theories on the relationship between these concepts and make some strong inferences on it.

Conclusion

From the very beginning, inquiring and finding happiness has been a top priority for philosophers and humankind in general. However, happiness research has become very popular in academic disciplines such as psychology, neuroscience and economics in recent years. Many studies have been seeking determinants of happiness for understanding the concept in depth. Fuel poverty is another multi-disciplinary and hotly-debated subject. Since both of these subjects are very important for improving people's quality of life, this paper attempts to look at the association between them at the household level as well as other variables considered as important. Because the concept of household is the second most important social arrangement in a society that comes after individual, we focused

on doing a household-level analysis. According to the results of both models, we found a negative association between household happiness and household fuel poverty in Turkey. The only difference was that this association was much stronger in the latter model than that of the former one since the latter also included comparison across the categories of happiness given one category increase in fuel poverty. This result also relates to the difference in interpretation of models. On the other hand, climbing income ladder at the household level was found to be positively associated with household happiness in Turkey. In a similar way, a significant (little) positive association existed between household happiness and tenure status of households in the country. When interpreting the result in terms of odds ratios, this association became negative to a large extent, which was contrary to our expectations. Still, this finding is important in the sense that it complements our finding in Table 3. Similarly, the results taken for household size, dwelling area and the number of rooms were partly different than we expected before. The association between household happiness and household size varied across categories of the independent variable as was the case with the association between household happiness and the number of rooms and between household happiness and dwelling area in Turkey. We found a negative association between men resided in households as well as male(s) only households and household happiness in the country. Our finding also seemed to support U-shaped association between age groups in households and household happiness to a certain threshold in Turkey.

This paper provides a valuable insight into unraveling the association between household happiness and household fuel poverty as well as housing characteristics in Turkey since relevant literature in the country is still quite limited. We hope that our study will help policy-makers to design relevant policies for the country in the future. However, further research is still required for Turkey and other developing countries in the next years so as to understand the nature of the relationship between these variables approaching the subject with different data and methods. Still, looking at the association between household happiness and household fuel poverty by taking advantage of cross-sectional data can be seen as a quite positive step for developing countries because cross-sectional studies help prove and/or disprove assumptions made about the associations between dependent and independent variables and their findings can also be analyzed to create new theories.

As for Turkey, it is quite important to note that it will be helpful if future studies define what is fuel poverty and who are fuel-poor households in the country and target these households properly by finding common housing characteristics regarding fuel poverty in the country. Also, the possible relationship between gender and household happiness may be quite interesting to study in the future. Exploring the role of women in households on household happiness could be very insightful in the sense that this kind of research may help understand family relationships or interactions in households and their impact on household happiness in Turkey. Similarly, it will be helpful if future studies show the possible relationship between household age groups and household happiness in Turkey particularly targeting specific age groups. To achieve them, using primary data would be quite helpful.

Compliance with Ethical Standards

Conflict of Interest We declare that we have no conflict of interest.

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