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Araştırma Makalesi/Research Article

DETERMINATION OF THE FINANCIAL SUPPORT REQUIRED BY THE FAMILIES WITH DISABILITIES TO ACHIEVE STANDARD LIFE CONDITIONS WITH THE AHP METHOD

AHP YÖNTEMİ İLE ENGELLİ BİREYE SAHİP AİLELERİN STANDART HAYAT ŞARTLARINA ULAŞABİLMELERİ İÇİN GEREKLİ FİNANSAL DESTEĞİN BELİRLENMESİ

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Abstract
Financial difficulties make it difficult for families with disabilities to live a standard life. In this study, a model is developed to estimate the required financial support for the families with disabilities that ensures them to have lives like the families with non-disabilities by considering main consumption groups. Hence, the aim of the study is to determine the financial support for families with disabilities that need to have the same life standards as other families by taking into consideration main consumption groups. In the analyses, the Household Budget Survey (HBS) data prepared by Turkish Statistical Institute (TurkStat) are utilized. Furthermore, 101,504 households are included in the analysis. During the development of the model, the AHP method is used. Besides, a sensitivity analysis is conducted to demonstrate the stability of the proposed model. Moreover, the suggested model considers families having different individuals as well.

Keywords: Disability, Consumption, Household Budget Survey, AHP.

Öz
Maddi güçlükler, engelli bireye sahip ailelerin standart bir yaşam sürmelerini zorlaştırmaktadır. Bu çalışmada, temel tüketim grupları göz önünde bulundurularak engelli bireye sahip ailelerin, engelli bireye sahip olmayan aileler gibi hayatlarını sürdürebilmeleri için gerekli finansal desteği tahmin etmek üzere bir model geliştirilmiştir. Çalışmanın amacı, ana tüketim gruplarını göz önünde bulundurarak engelli bireye sahip ailelerin diğer ailelerle aynı yaşam standartlarına sahip olmaları için gereken finansal desteğin belirlenmesidir. Analizlerde, Türkiye İstatistik Kurumu (TÜİK) tarafından hazırlanan Hanehalkı Bütçe Anketi (HBA) verileri kullanılmıştır. Analizlere 101.504 hane dahil edilmiştir. Modelin geliştirilmesi sırasında AHP yöntemi kullanılmıştır. Ayrıca önerilen modelin kararlılığını göstermek için bir duyarlılık analizi yapılmıştır. Önerilen model, farklı sayıda bireye sahip aileleri de dikkate almaktadır.

Anahtar Kelimeler:: Engellilik, Tüketim, Hanehalkı Bütçe Anketi, AHP

GENİŞLETİLMİŞ ÖZET

Çalışmanın Amacı: Çalışmanın amacı, ana tüketim gruplarını göz önünde bulundurarak engelli bireye sahip ailelerin diğer ailelerle aynı yaşam standartlarına sahip olabilmeleri için gerekli olan finansal desteğin belirlenmesidir. Finansal destek miktarını tespit etmek için AHP yöntemi temelli bir model önerisinde bulunulmuştur.

Araştırma Soruları: Engelli bireye sahip aileler ile diğer aileler arasında ana harcama gruplarına göre fark var mıdır? Tüketim ana gruplarının önem ağırlıkları nedir? Engelli bireye sahip ailelerin ihtiyaç duydukları finansal destek ne kadardır?

Literatür Araştırması: Son yıllarda literatürde, engellilik konusuna artan bir ilginin olduğu görülmektedir. Aile bağlamında engellilik çalışması çerçevesinde de birçok çalışma yapılmıştır. Özellikle sosyal, psikolojik, psikososyal ve hizmet desteği çerçevesinde yapılmış çalışmaların oldukça fazla olduğu dikkat çekmektedir. Ancak finansal desteğe yönelik çok az sayıda çalışmanın olduğu söylenebilir.

Veri: Analizlerde kullanılan veriler, TÜİK tarafından hazırlanan hanehalkı bütçe anketinden (HBA) derlenmiş olup 2002-2011 yılları arasındaki on yılı kapsamaktadır. Bu anketle, ailelerin tüketim alışkanlıkları, tüketim harcamaları türleri, hanelerin sosyoekonomik özellikleri, hanehalkı üyelerinin istihdam durumu, hane halkının toplam geliri, gelir kaynakları vb. gibi bilgiler toplanmaktadır. Veriler uzun ve zorlu bir çalışmanın ardından analizlere uygun hale getirilmiştir. Bu süreçte, MS SQL ve MS Excel'de çeşitli programlama teknikleri kullanılmıştır.

Yöntem: Çalışmada analitik hiyerarşi yöntemi (AHP) kullanılmıştır. Önce, 12 temel harcama grubunun önem ağırlıkları karar vericilerin değerlendirmeleri esas alınarak belirlenmiştir. Burada, değerlendirmelerin tutarlılığının da kontrol edildiğini belirtmek gerekir. İkinci aşamada ağırlıklar normalize edilmiştir. Üçüncü aşamada, engelli bireye sahip olan ailelerle diğer aileler arasındaki tüketim harcaması farkları hesaplanmıştır. Son aşamada ise finansal destek miktarı hesaplanmıştır. Hesaplama yapılırken tüketim harcamalarının normalize edilmiş önem ağırlıkları ile üçüncü aşamada elde edilen değerlerden yararlanılmıştır.

Değerlendirme ve Sonuç: Çalışma sonucunda 12 temel harcama grubu içinde en önemli görülen harcama kalemleri sırasıyla giyim ve ayakkabı; mobilya, ev aletleri ve ev bakım hizmetleri ile eğitim hizmetleri olmuştur. Restoran ve otel harcama grubunun ise en az önemli görülen harcama kalemi olduğu tespit edilmiştir. Çalışmada ayrıca engelli bireye sahip olan aileler ile diğer aileler arasındaki harcama miktarı farkları 12 temel harcama grubu bakımından ailelerdeki fert sayıları da dikkate alınarak hesaplanmıştır. Çalışmanın sonuçları, engelli bireye sahip olan ailelerin diğer ailelere göre daha fazla harcama yaptıklarını göstermiştir. Özellikle sağlık grubu ile alkollü içecekler, sigara ve tütün grubunda engelli bireye sahip olan ailelerin daha fazla harcama gerçekleştirdikleri belirlenmiştir. Elde edilen bir diğer bulguya göre ailedeki fert sayısı arttıkça ihtiyaç duyulan finansal desteğin azalmasıdır. Bunun nedeni olarak ailedeki fert sayısını artmasıyla birlikte çalışan birey sayısının artması ve dolayısıyla haneye giren toplam gelirin artması olduğu söylenebilir. Çalışmada, ailelerdeki fert sayıları dikkate alınarak da analizler yapılmıştır. Buna göre engelli bireye sahip ve iki kişilik ailelerin aylık yaklaşık 138 $ finansal desteğe ihtiyaç duydukları belirlenmiştir. Ayrıca bu aileler en fazla yiyecek ve alkolsüz içecekler grubunda desteğe ihtiyaç duymaktadırlar. Çalışma, engelli bireye sahip ve üç kişilik ailelerin aylık yaklaşık 97 $ finansal desteğe ihtiyaç duyduklarını ortaya koymuştur. Bu ailelerin en fazla desteğe ihtiyaç duydukları harcama grubu giyim ve ayakkabı olmuştur. Engelli bireye sahip ve dört kişilik aileler aylık yaklaşık 78 $ desteğe ihtiyaç duymaktadırlar ve en fazla yiyecek ve alkolsüz içecekler grubunda desteklenmeleri gerekmektedir. Engelli bireye sahip ve beş kişilik aileler aylık yaklaşık 50 $ desteğe ihtiyaç duymakta olup en fazla giyim ve ayakkabı grubunda desteklenmeye ihtiyaç duymaktadırlar. Aylık yaklaşık 23 $ finansal desteğe ihtiyaç duyan engelli bireye sahip ve altı kişilik aileler en çok konut, su, elektrik, gaz ve diğer yakıtlar harcama grubunda desteklenmelidirler. Bunlara ek olarak engelli bireye sahip olan yedi, sekiz ve dokuz kişilik aileler ise sırasıyla aylık 26 $, 15 $ ve 4 $ finansal desteğe gereksinim duymaktadırlar. Son olarak, önerilen modelin sağlamlığını ve kararlılığını göstermek için bir duyarlılık analizi yapılmıştır. Duyarlılık analizine göre harcama gruplarının önem ağırlıkları değiştiğinde, finansal destek miktarında farklılıklar ortaya çıkmıştır. Ancak, engelli bireye sahip aileler için finansal destek ihtiyaçları sırası aynı kalmıştır.

INTRODUCTION AND MOTIVATION FOR THE STUDY

The International Classification of Functioning, Disability and Health (ICF) defines disability as an umbrella term for impairments, activity limitations, and participation restric¬tions (WHO, 2011). However, the social model of disability defines disability as an outcome of the interaction of a person's functional status and their environment (Braithwaite and Mont, 2008).

More than a billion people are estimated to live with some form of disability, or about 15% of the world's population. This is higher than previous World Health Organization (WHO) estimates, which date from the 1970s and suggested around 10%. According to the most recent World Health Survey around 785 million (15.6%) persons 15 years and older living with a disability and 110 million people (2.2%) of them have very significant difficulties in func¬tioning (WHO, 2011). It is predicted that roughly one of ten people in developing countries is disabled (Braithwaite and Mont, 2008). For instance, it is estimated that approximately 20% of the UK's people of working age are disabled and UK had the second highest incidence of disability among the 15 EU countries in 2002 (Jones et al., 2007). Furthermore, there are roughly 3 million disabled people in Italy, accounting for 5% of all people aged 5 and over living in a family (Rosano et al., 2009). The American Community Survey (ACS) predicts that the overall proportion of people with disabilities in the United States is 12.6% (Lewis, 2017). However, there is no enough information on the number and proportion of disabled people and their socioeconomic characteristics in Turkey. Yet, we merely know total disability proportion in the overall population is 12.29 % (TurkStat, 2002). Thus, there is a general lack of awareness in Turkey, concerning the needs of families with disabilities.

In recent years, there has been an increasing interest in disability issues. Many studies have developed around the study of disability in the family context (Holmbeck et al., 2002; Jiyeon et al., 2002; Neely-Barnes and Marcenko, 2004; Saunders, 2005; Heller et al., 2007; Turnbull et al., 2007; Mitchell, 2007). In addition, a significant body of research has developed around the study of disability in the support context: social (Schulz and Decker, 1985; Wilcox et al., 1994; Sugisawa et al., 1994; Braithwaite et al., 1999; Allen et al., 2000; De Leon et al., 2001; Taylor and Scott, 2004; Yang, 2006; Lippold and Burns, 2009; Devereux et al., 2009; Bierman and Statland, 2010), psychosocial (Dalagdi et al., 2014; Patrick et al., 1986), psychological (Campbell et al., 2012; Livneh, 2012), and service (Sloper, 1999; Gilligan and Taylor, 2008; Baxter and Glendinning, 2010; Maddison and Beresford, 2012). Financial support is one of a number of ways that families with disabilities can be supported. However, only a few studies (Darling and Author, 2016; Canarslan and Ahmetoğlu, 2015; Doessel and Williams, 2011; Fujiura, 2010; Braddock, 2009; Braddock, 2007; Braddock, 2002) have examined the financial support for families with disabilities. Among these, for example, Braddock (2002) emphasized that public support for disability programs in the United States totaled $294 billion in 1997. In addition, nationally, 52% of public long-term care financial resources supported persons with disabilities in institutions, although great variation existed between states and across disability groups. According to Braddock (2007), the total public spending on intellectual disability in the United States was estimated to be $82.57 billion in 2004. Again, with respect to Braddock (2009), public spending on institutional, nursing home facilities and the parallel system of community-based programs for people with disabilities consumed approximately $181.7 billion in the USA in 2006. Fujiura (2010) used data from the 2007 American Community Survey and found 32.3% of the family-based population of adults with disabilities needed financial support. Among those meeting the support test, approximately 4 in 10 lived in households where the primary income earner was 60 years or older. Canarslan and Ahmetoğlu (2015) determined that the economic level of the families with disabilities had an effect on the quality of life. Finally, Darling and Author (2016) deal with the costs of disability in childhood.

People with disabilities need more money in attempting to maintain or improve their quality of life. Despite the fact that incomes are similar, families with disabilities achieve a lower standard of living than those of non-disabled households because disability generates extra costs of living (Zaidi and Burchardt, 2005). Disabled people suffer from at least two types of material disadvantages: they earn less income than the non-disabled, and because of their special needs, they need more income to achieve similar functioning (Robeyns, 2006). For instance, a person with disabilities need for a mobility taxi to bring her work represents an additional resource not required by a non-disabled worker. The difference in cost of using the mobility taxi compared to the cost incurred by a non-disabled person (e.g., own car) represents the additional resource required because of disability (Wilkinson-Meyers et al., 2010). Although the relation between disability and extra demand for money has been studied previously (Matthews and Truscott, 1990; Jones and O'Donnell, 1995; Martin and White, 1988; Klavus, 1999; Kuklys, 2005; Zaidi and Burchardt, 2005; Saunders, 2005), financial support of families with disabilities as to consumption expenditures has received little attention. To sum up briefly, growing demand for direct care personnel and the dearth of affordable and accessible housing alternatives may expand the need for financial support (Fujiura, 2010).

The efforts to facilitate daily activities of disabled people have recently increased. Examples include reorganizing the buses and walkways, building elevators in subways and special restrooms in shopping centers so that people using a wheelchair can move conveniently. Although these services are of great importance from a welfare state perspective, it should also be kept in mind that financial constraints may keep disabled people from benefiting from these services. For example, if the budget of a family with disabilities is not good enough to afford to eat at a restaurant designed for disabled people or to send their disabled children to a private school in which there is an elevator, all these efforts to give the disabled individuals a better life become useless. In short, families with disabilities need financial support to have the same life standards as the families without disabilities. Consequently, we purpose to develop a model to determine the financial support for families with disabilities that need to have the same life standards as other families. The model's purpose is not to provide support for all expenditure groups for families with disabilities. In other words, the purpose is not to give the same rate of support for all expenditure groups. In summary, the model has been developed to provide different levels of support for different expenditure groups. The proposed model determines the support families with disabilities need through two stages: (i) identification of main expenditure categories (ii) Determination of financial support for families with disabilities by identifying the differences in expenditures between families with disabilities and other families.

The study proceeds in five parts. The next section describes the data set and methodology. The third section presents a real world application to clarify the proposed model. The fourth section discusses the findings and the last section concludes.

1. METHODOLOGY

1.1. Household Surveys in Turkey: Survey Design

We obtained data from a national representative data derived from the Turkish Statistical Institute (TurkStat), Household Budget Survey (HBS), Consumption Expenditures, 2002-2011. HBS is designed for the purpose of data collection on socioeconomic status, consumption expenditures and income components in the Turkey by TurkStat. This survey compiles the data on the consumption habits, types of consumption expenditures, socioeconomic characteristics of households, employment status of household members, total income of a household, sources of income and etc. The entire members of the households that live within the borders of Turkey are included within the scope. The household consumption expenditure covers the purchase, consumption of their own production, consumption of the stocks of their own production, goods and services (consumption from in kind income) taken from the working places of the employed members, rental or property income in-kind and the purchase in order to give as a

present/support in the survey month. On the other hand, income covers the data on the available income obtain in the survey month and the last year. Household consumption expenditure covers the value of purchase of various goods and services in the form of advanced or partial payment in order to meet their needs by means of 12 expenditure groups. The outcome variables included these12 types of consumption expenditures as follows (TurkStat, 2009):

CE1. Food and non-alcoholic beverages

CE2. Alcoholic beverages, cigarette and tobacco

CE3. Clothing and footwear

CE4. Housing, water, electricity, gas and other fuels

CE5. Furniture, household appliances, and household care services

CE6. Health

CE7. Transportation

CE8. Communication

CE9. Entertainment and culture

CE10. Education services

CE11. Restaurants and hotels

CE12. Various good and services

More detailed information about the HBS methodology can be obtained from the Turkish Statistical Institute Web site (http://www.tuik.gov.tr).

1.2. Data and Methods

The estimation size of all HBSs was designed to represent rural and urban settlements of Turkey. The stratified multi-stage systematic cluster sampling method was used as sampling method. Each interviewer recorded the data on consumption expenditures and income of six sample households as a result of 8 times of visits in a month, including 1 visit prior to the survey month, twice during the 1st and 2nd weeks, once during 3rd and 4th weeks and once following the end of the survey month (TurkStat, 2009). In addition, all surveys were conducted during 1 January-31 December of the relevant year.

Table 1. Number of people as to HBS

Date	Urban	Rural	Total
2002	8091	1464	9555
2003	18,278	7486	25,764
2004	5985	2559	8544
2005	5985	2567	8559
2006	5930	2628	8558
2007	5893	2655	8548
2008	5958	2591	8549
2009	6811	3235	10,046
2010	6912	3170	10,082
2011	6873	3045	9918
Total	*76,716*	*31,400*	*108,116*

According to Table 1, it is deduced that the number of the families that are included in the HBS questionnaire from the urban areas is more than the number of the families from the rural areas. And also, most numbers of questionnaires were made in 2003.

We pooled data from 10 survey years. However, the data are conditioned after a long and tough work due to the data is not suitable to make an analysis. During this process, therefore, various programming techniques are used in MS SQL and MS Excel.

The median response rate for these survey years is 75% (range=72%-78%). We limited our analysis to people with disabilities in a sample size of 1855 from 81 provinces. Of the 108,116 households sampled, 1.8% contained at least one disabled member.

1.2.1. The AHP method

As one of the most utilized and well known multi-criteria decision making (MCDM) methods, the AHP method is developed by Saaty (1980). AHP has many advantages. For example, AHP provides a measure of consistency in decision makers' judgments or preferences. AHP also allows decision makers to start from pairwise comparisons that are simple enough to work with and often are preferred by the decision makers (Küçük and Ecer, 2008; Gao and Hailu, 2013; Ecer, 2018a; Ecer, 2018b). The basic steps of this method are as follows (Yu et al., 2011; Barker and Zabinsky, 2011; Ecer, 2014).

Step 1: Compose AHP structure

AHP structures a complex decision situation in terms of hierarchical decision criteria and their associated priorities, balancing the interactions among the criteria and synthesizing the information into a vector of preferences among the alternatives. With the AHP, the objectives, criteria and alternatives are arranged in a hierarchical structure. Usually, a hierarchy has three levels such as goal, criteria, and alternatives.

Step 2: Establish a pairwise comparison matrix

In order to determine the relative weight of criteria, the second step is the pair comparison of criteria. The pairwise comparison matrix contains numerical judgments assigned for each criterion, sub-criterion and alternative. In AHP, multiple pairwise comparisons are from a standardized comparison scale of nine levels shown in Table 2.

Table 2. The fundamental scale of pairwise comparisons

Definition	Value
1	Equal importance
3	Weak importance
5	Essential importance
7	Demonstrated importance
9	Extreme importance
2,4,6,8	Intermediate values

Suppose that $C=\{C_j,\ j=1,2,...,n\}$ be the set of criteria. Evaluation matrix can be gotten, in which every element $a_{ij}\,(i,\ j=1,2,\ldots,n)$ represents the relative weights of the criteria illustrated:

$$A=\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix}, \tag{1}$$

where $a_{ij}\,(i,\ j=1,2,\ldots,n)$ has complied with following condition:

$$a_{ij}=\frac{1}{a_{ji}},\ \ a_{ii}=1\ ,\ a_{ji}>0. \tag{2}$$

Step 3: Calculate criteria weight

By the formula:

$$AW = \lambda_{max} W . \quad (3)$$

The λ_{max} can be acquired. If the λ_{max} is equal to n and the rank of matrix A is n, A is consistent. In this case, the relative criteria can be discussed. The weight of each criterion will be calculated by normalizing any of the rows or columns of the matrix A.

Step 4: Test consistency

AHP must meet the requirement that the matrix A is consistent. There are two parameter consistency index (CI) and consistency ratio (CR). Both of them are defined as following:

$$CI = \frac{\lambda_{max} - n}{n-1}, \quad (4)$$

$$CR = \frac{CI}{RI}, \quad (5)$$

where RI is random index. For different count of criteria, it has different value demonstrated in Table 3. If CR is less than 0.10, the result can be acceptable and the matrix A is sufficient consistency. Otherwise, we have to return to step 1 and repeat again.

Table 3. The relationship between RI value and count of criterion

	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.52	0.89	1.11	1.25	1.35	1.4	1.45	1.49

1.2.2. The proposed model

The stages of the model are shown below:

Stage 1: Determining the weights

The weights of consumption items are determined at the first stage of the model. In this first stage where we use the AHP method, 12 main consumption items are ranked through considering their importance by the decision makers. Afterwards, the ranked items are used to generate the AHP matrix as explained in Section 3 in details and the weights are determined.

Stage 2: Normalization of weights

At the second stage, the weights of the consumption items are normalized that are obtained in the first stage. The normalization process is performed as formulized in Eq. 6.

$$\overline{W_i} = \frac{W_i}{W_{\max}}, \; i = 1,\ldots,n \quad (6)$$

Here, n represents the number of consumption items, $\overline{W_i}$ represents the normalized value of i^{th} consumption item, W_i represents the importance weight, W_{max} represents the importance weight of the consumption item with the highest weight.

Stage 3: Calculation of consumption differences between the families

At this stage, the consumption differences between the families with non-disabilities and families with disabilities are calculated separately with regard to each consumption item. Eq. 7 is used in the calculation process.

$$P_i = P_{ND_i} - P_{D_i} \text{ if } P_{ND_i} > P_{D_i} \quad (7)$$

Here, P_{ND_i} represents the consumption of families with non-disabilities, P_{D_i} represents the consumption of families with disabilities and P_i represents the consumption difference with regard to i^{th} consumption group.

Stage 4: Estimating the amount of financial support

At this last stage, the amount of financial support is calculated. As the *FS* represents the amount of financial support, the calculation is performed by using the following formula:

$$FS = \sum_{i=1}^{n} (P_i).\overline{W_i}, \quad \text{if } P_i > 0 \quad (8)$$

2. APPLICATION to HBSs DATA

In this part, an application of the model is given in order to clarify the suggested model. Within this scope, the decision-making team is formed that consist of 33 individuals. The decision makers involve people from different occupational groups (officer, house wife, lawyer, student, servant etc.) and different age groups (18-57). The application of the model can be explained step by step as follows:

Determining the weights: Firstly, it is required to generate the AHP matrix in order to determine the weights of main consumption weights. Within this scope, a questionnaire study is applied by using the face to face interview with the decision makers. Firstly, the main consumption groups are numbered from 1 to 12 and the decision makers are asked to rank the consumption groups by considering their importance in order to determine the importance weight of main consumption groups (1: very important, 12: least important). As a result of the questionnaire study, 12 items are ranked differently by 33 different individuals. In the next phase, the differences between the rank values are calculated in order to generate AHP matrix due to both the size of the differences between the rankings (i.e. what is the distance of the consumption group from another consumption group) and their directions (i.e. the importance perception of a consumption group with regard to another consumption group) are important information. Hence, if the main consumption groups are defined as $C = \{C_j, j = 1,...,12\}$ in this problem, $(i-j), i = 1,...,11, j = (i+1),...,12$ difference values are obtained in order to generate the upper triangle of the matrix by using ranking information that are obtained from the questionnaires. It is required to obtain only one value that will represent these values in the AHP matrix due to we would obtain 33 unit difference values for the 33 questionnaires between the first main consumption group and second main consumption group. In this study, the arithmetic mean and median values are examined and it is decided that each difference is represented by median due to the examined values expressed close results. In the following part, the obtained values that are potentially within the [-11,11] number interval, are transformed into numerical form suitable for matrix values. In this part, the negative values show that the j^{th} main consumption group that is used when calculating the difference is more important than the $(j+1)^{th}$ main consumption group. Therefore, when it is being transformed into AHP matrix through converting their positive values into the inverse of their new values. Another important fact is that the criteria are required to take values between [1,9] in the AHP matrix. Thus, the [0,11] interval is required to be converted. The preferred method for the conversion in this study is given in Table 4.

Table 4. Value conversion for the generation of AHP matrix

Old values	New values
1	0.82→1.00
2	1.64
3	2.45
4	3.27
5	4.09
6	4.91
7	5.73
8	6.55
9	7.36
10	8.18
11	9.00

The values presented in Table 4 are calculated by estimating on the basis of 9, for example, "What is the value of 9 if it is 1 for 11?". However, the "1" value is used instead of the first value 0.82 due to it represent the equal importance. The conversions can be given as algorithms as follows.

Algorithm (determining the weights).

Step 0. 33x12 matrix is generated from the conducted $i=1,\ldots.33$ questionnaires as a result of ranking the $j=1,2,\ldots,12$ criteria.

Step 1. The difference values for $(i\text{-}j)$, $i=1,2,\ldots,11; j=(i+1),\ldots,12$ are generated one by one for each questionnaire.

Step 2. The median values are calculated one by one for the difference values with 66 columns that are generated at the Step 1.

Step 3. The obtained median values are placed in the AHP matrix with their new values according to the conversions in Table 4.

Step 4. The consistency of the AHP matrix is calculated.

The AHP matrix that is generated by taking the answers that are given in the questionnaire into account and by using the above algorithm is shown in Table 5.

Table 5. AHP matrix

CE	1	2	3	4	5	6	7	8	9	10	11	12
1	1.00	2.45	0.61	1.64	0.61	1.64	3.27	3.27	1.00	0.61	4.91	1.00
2	0.41	1.00	0.20	0.41	0.20	0.41	1.00	1.00	0.41	0.31	2.45	0.31
3	1.64	4.91	1.00	2.45	1.00	3.27	4.91	5.73	1.64	1.64	6.55	1.64
4	0.61	2.45	0.41	1.00	0.41	1.00	2.45	2.45	0.61	0.41	4.09	0.41
5	1.64	4.91	1.00	2.45	1.00	3.27	4.09	5.73	1.64	1.00	8.18	2.45
6	0.61	2.45	0.31	1.00	0.31	1.00	1.64	2.45	1.00	0.41	4.09	1.00
7	0.31	1.00	0.20	0.41	0.24	0.61	1.00	1.00	0.41	0.24	2.45	0.31
8	0.31	1.00	0.17	0.41	0.17	0.41	1.00	1.00	0.31	0.20	1.64	0.24
9	1.00	2.45	0.61	1.64	0.61	1.00	2.45	3.27	1.00	0.61	4.91	1.00
10	1.64	3.27	0.61	2.45	1.00	2.45	4.09	4.91	1.64	1.00	6.55	1.00
11	0.20	0.41	0.15	0.24	0.12	0.24	0.41	0.61	0.20	0.15	1.00	0.17
12	1.00	3.27	0.61	2.45	0.41	1.00	3.27	4.09	1.00	1.00	5.73	1.00

It is deduced that the generated AHP matrix is consistent (CR=0.01). Thus, the vector of weight values that are generated for the main consumption groups are as follows.

$$W^T = [0.0955 \quad 0.0338 \quad 0.1652 \quad 0.0648 \quad 0.1648 \quad 0.0674 \quad 0.0339 \quad 0.0286 \quad 0.0899 \quad 0.1345 \quad 0.0179 \quad 0.1034]$$

According to this issue the most important three consumption groups are CE3, CE5 and CE10. However, CE11 is evaluated as the least important consumption group.

Normalizing the weights: The weights of consumption groups are normalized by using the Eq. 6. The normalized values are given in Table 6.

Table 6. Normalized values

	Importance weights (w)	Normalized values ($\|w\|$)
CE1	0.095534	0.578338
CE2	0.033878	0.205089
CE3	0.165187	1.000000
CE4	0.064857	0.392628
CE5	0.164839	0.997893
CE6	0.067405	0.408053
CE7	0.033971	0.205652
CE8	0.028565	0.172925
CE9	0.089952	0.544546
CE10	0.134515	0.814320
CE11	0.017893	0.108320
CE12	0.103405	0.625988

Calculation of the consumption differences between the families by considering the disability situation: As it is understood from the data, the number of individuals in a family might reach up to 26. However, only the families up to 9 individuals that correspond to 93.88% of all data are included in our model in order to prevent over-distribution. In this case 101,504 households are included in the analysis. At this step, the calculation is performed in the light of the information that are given in the Appendix and Table 7 is generated.

Table 7. Consumption differences ($/month) between the families with non-disabilities and other families

	Number of individuals in the family							
	2	3	4	5	6	7	8	9
CE1	53.71	0.99	-8.69	3.87	1.19	1.65	3.2	-29.46
CE2	6.66	10.19	8.02	0.26	-1.49	-0.08	2.56	-12.82
CE3	22.86	22.87	14.41	12.76	-1.93	8.82	2.37	-0.63
CE4	74.47	51.65	45.23	30.75	27.37	6.69	-13.25	6.73
CE5	14.29	9.75	7.59	3.41	-0.01	1.57	-3.06	0.47
CE6	5.21	-5.54	-0.79	-6.02	-10.75	-5.18	2.93	-20.8
CE7	63.89	49.38	54.68	19.09	0.66	17.27	9.89	-0.51
CE8	13.86	15.2	10.97	4.96	3.28	-0.57	2.31	0.91
CE9	12.83	12.39	5.61	8.88	4.44	3.57	2.5	1.68
CE10	5.02	15.48	15.81	11.8	4.73	1.43	-0.18	0.49
CE11	15.55	25.13	18.42	7.22	5.22	1.91	9.57	-1.1
CE12	14.15	11.81	9.49	-10.27	6.69	8.28	8.34	-1.64

Determining the financial support: Table 8 is generated by using the Eq. 8 and normalized values that are achieved at the second step. Here, it is required to mention that the negative values that are achieved at the previous steps are not considered in this step.

In order to clarify how the calculations are done at this step, we can give an example for the families with 2 individuals.

For CE1: 53.71*0.578338=31.06

For CE2: 6.66*0.205089=1.37

…

For CE12: 14.15*0.625988=8.86

Table 8. The financial support that will be provided to the families with disabilities ($/family)

	Number of individuals in the family							
	2	3	4	5	6	7	8	9
CE1	31.06	0.57	-5.03	2.24	0.69	0.95	1.85	-17.04
CE2	1.37	2.09	1.64	0.05	-0.31	-0.02	0.53	-2.63
CE3	22.86	22.87	14.41	12.76	-1.93	8.82	2.37	-0.63
CE4	29.24	20.28	17.76	12.07	10.75	2.63	-5.20	2.64
CE5	14.26	9.73	7.57	3.40	-0.01	1.57	-3.05	0.47
CE6	2.13	-2.26	-0.32	-2.46	-4.39	-2.11	1.20	-8.49
CE7	13.14	10.16	11.25	3.93	0.14	3.55	2.03	-0.10
CE8	2.40	2.63	1.90	0.86	0.57	-0.10	0.40	0.16
CE9	6.99	6.75	3.05	4.84	2.42	1.94	1.36	0.91
CE10	4.09	12.61	12.87	9.61	3.85	1.16	-0.15	0.40
CE11	1.68	2.72	2.00	0.78	0.57	0.21	1.04	-0.12
CE12	8.86	7.39	5.94	-6.43	4.19	5.18	5.22	-1.03
Total	**138.07**	**97.79**	**78.39**	**50.54**	**23.16**	**26.02**	**15.99**	**4.58**

3. DISCUSSION

If we examine Table 8, the negative values are so conspicuous. It means that, as it has been mentioned before, the families with disabilities consumes more than other families. For example, it is determined that the families with disabilities and having 4 individuals spend approximately $5 more with regard to CE4 consumption group in comparison with other families.

In Fig. 1, the relationship between the number of individuals in families and the financial support that they require is presented. Hence, the results show that as the number of individuals in a family increases, the amount of the required financial support decreases with the exception of families with 7 individuals. The reason for this can be explained as the number of individuals in a family increases, meaning that the number of people who can bring money for the family increases.

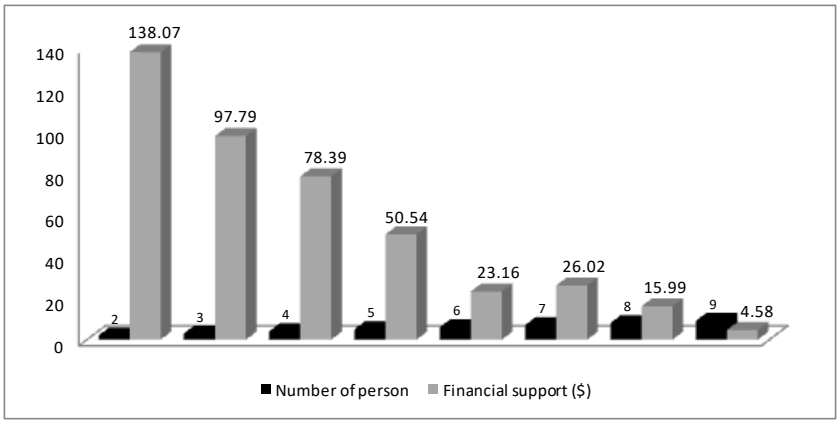

Fig. 1. Relationship between financial support and number of individuals in the families

If it is required to make evaluations on the basis of number of individuals in families, it is determined that the families with disabilities in the families with 2 individuals group need financial support at each 12 consumption groups. The financial support that they mostly need with regard to consumption

items are respectively: "Food and non-alcoholic beverages", "housing, water, electricity, gas and other fuels" and "clothing and footwear". The consumption items that are least required to be supported are "alcoholic beverages, cigarette and tobacco".

The financial support that the families with 3 individuals mostly need with regard to consumption items are "clothing and footwear", "housing, water, electricity, gas and other fuels". Unlike the families with 3 individuals, the families with 2 individuals need for the support with regard to "food and non-alcoholic beverages" is comparatively so low. On the other hand, it is realized that the "health" is not required to be supported due to they spend much more on that item. However, it can be interpreted as they cut the necessary consumption of other items and shift this amount to the necessary consumption of "health".

When we examine the families with 4 individuals, it is realized that the families with disabilities spend more on "health" same as the families with 3 individuals. Beside this, it is determined that they also spend more on "food and non-alcoholic beverages" in comparison with families with non-disabilities. Housing, "housing, water, electricity, gas and other fuels", "clothing and footwear" and "educational services" are the consumption groups that the families in this group and with disabilities need financial support most.

It is found that the families with disabilities make more consumption on 2 consumption groups in comparison with the families with non-disabilities among families with 5 individuals: "various goods and services" and "health". The consumption groups that they mostly need financial support are respectively: "clothing and footwear", "housing, water, electricity, gas and other fuels" and "education services". Besides, the families with disabilities have similar propensity to consume with the families with non-disabilities with regard to the "alcoholic beverages, cigarette and tobacco".

Among the families with 6 individuals the families with disabilities make more consumption on 4 consumption groups in comparison with other families: "alcoholic beverages, cigarette and tobacco", "clothing and footwear", "furniture, household appliances and household care services" and "health". Therefore, the remained 8 consumption groups require financial support. The consumption groups that they mostly need support are "housing, water, electricity, gas and other fuels". Beside these consumption group, they do not almost need any financial support for the consumption groups such as "transportation", "communication" and "restaurants and hotels".

It is determined that the families with 7 individuals require financial support with regard to 9 consumption groups. The group that is required to be supports is "clothing and footwear". Same as the previous cases the families with disabilities make more consumption on "health" in comparison with the families with non-disabilities. Also, all the family types have a similar propensity to consume on "restaurants and hotels".

We found the families with 8 individuals and disabilities make more consumption on "housing, water, electricity, gas and other fuels" that other families. With regard to this group, "health" requires financial support mostly. In addition, "various good and services" is the consumption group that requires financial support mostly within all consumption items.

Finally, our results showed that the families with 9 individuals and with disabilities make consumption on 7 groups more than other families. The most 2 high-point consumption items within these items are "food and non-alcoholic beverages" and "health". Also the consumption group that requires financial support mostly is "housing, water, electricity, gas and other fuels".

In sum, it is determined that the families with disabilities make more consumption on "health" in general. This finding can be interpreted as the families with disabilities that already have low income necessarily cut their consumption on other items and switch that part of their income toward "health". If

it is required to make an overall assessment, the number of consumption groups that the families with disabilities need financial support is too much. It is an important finding that "entertainment and culture" is a consumption group that is required to be supported financially regardless of the number of individuals in a family. Because the families with disabilities tend to switch their consumption towards more compulsory consumption groups such as "health", "food and non-alcoholic beverages" and "furniture, household appliances and household care services" rather than consuming on "entertainment and culture" item. The other important finding shows that the "alcoholic beverages, cigarette and tobacco" is the following consumption group that the families with disabilities make consumption mostly after "health" in comparison with other items. This finding can be explained by the negative psychology of the family members.

3.1. Sensitivity Analysis

In determining the financial support for families with disabilities in the proposed model, the role of importance weights is crucial. Hence, a sensitivity analysis is provided to check the stability of the proposed model in this study. Therefore, a sensitivity analysis of weights is realized to follow up how the amount of financial support behaves while importance weights of criteria are changed. To achieve this aim, the importance weights gained from the entropy method is changed for two selection criteria while the others are unchanging (Ecer, 2018a). In other words, the importance weight of the CE1 is changed with CE2, CE3 and so on, sequentially, while the others are unchanging. Afterwards, the AHP method is applied in determining final financial support. Consequently, the proposed model's behavior against importance weight changes is analyzed. In this study, 11 mutual importance weight change is performed during the sensitivity analysis. Eventually, Table 9 shows the cases that considered for sensitivity analysis. Additionally, all cases in Table 9 are analyzed and the radar plot based on Table 9 is illustrated in Fig. 2. According to Fig. 2, financial support of families with disabilities is also changing while the importance weights are changing reciprocatively. For instance, even CE1 and CE2's importance weights are changed, then the financial support of families with 2 individuals springs from 138.07 to 141.86, and families with 3 individuals springs from 95.53 to 113.57 in Scenario 6. However, the orders of financial supports do not change. In sum, families with 2 individuals are identified as families who need the most financial support according to the sensitivity analysis results. The financial support order of the other families does not change. Consequently, sensitivity analysis of weights indicates that although the final order of financial support for families with disabilities remains the same, there is only a change in the amount of financial support.

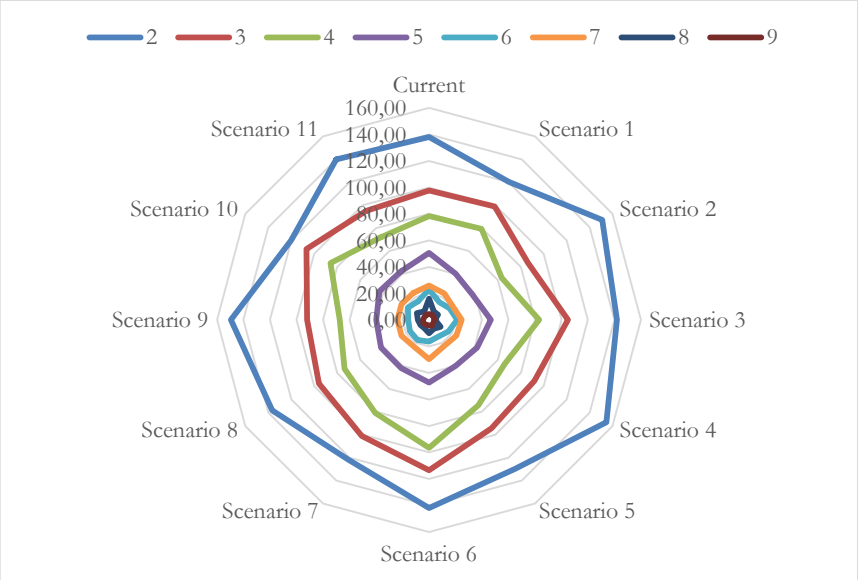

Fig. 2. Result changes due to sensitivity analysis

Table 9. Sensitivity analysis results

Scenario	Variables	Criteria											
		CE1	CE2	CE3	CE4	CE5	CE6	CE7	CE8	CE9	CE10	CE11	CE12
CS*	w_1	*0.578*	0.205	1.000	0.393	0.998	0.408	0.206	0.173	0.545	0.814	0.108	0.626
	Ranking	F2I (138.07) ≻ F3I (97.79) ≻ F4I (78.39) ≻ F5I (50.54) ≻ F7I (23.16) ≻ F6I (26.02) ≻ F8I (15.99) ≻ F9I (4.58)											
1	w_2	0.205	*0.578*	1.000	0.393	0.998	0.408	0.206	0.173	0.545	0.814	0.108	0.626
	Ranking	F2I (120.50) ≻ F3I (98.97) ≻ F4I (79.28) ≻ F5I (40.31) ≻ F7I (15.53) ≻ F6I (23.14) ≻ F8I (7.35) ≻ F9I (4.64)											
2	w_3	1.000	0.205	*0.578*	0.393	0.998	0.408	0.206	0.173	0.545	0.814	0.108	0.626
	Ranking	F2I (151.07) ≻ F3I (86.31) ≻ F4I (63.31) ≻ F5I (37.90) ≻ F7I (17.84) ≻ F6I (20.77) ≻ F8I (7.94) ≻ F9I (4.23)											
3	w_4	0.393	0.205	1.000	*0.578*	0.998	0.408	0.206	0.173	0.545	0.814	0.108	0.626
	Ranking	F2I (141.92) ≻ F3I (104.94) ≻ F4I (83.06) ≻ F5I (46.64) ≻ F7I (21.39) ≻ F6I (24.73) ≻ F8I (4.54) ≻ F9I (3.96)											
4	w_5	0.998	0.205	1.000	0.393	*0.578*	0.408	0.206	0.173	0.545	0.814	0.108	0.626
	Ranking	F2I (154.60) ≻ F3I (91.86) ≻ F4I (66.22) ≻ F5I (41.85) ≻ F7I (17.03) ≻ F6I (23.82) ≻ F8I (10.22) ≻ F9I (4.04)											
5	w_6	0.408	0.205	1.000	0.393	0.998	*0.578*	0.206	0.173	0.545	0.814	0.108	0.626
	Ranking	F2I (129.81) ≻ F3I (94.42) ≻ F4I (74.39) ≻ F5I (39.97) ≻ F7I (14.49) ≻ F6I (22.63) ≻ F8I (7.54) ≻ F9I (4.76)											
6	w_7	0.206	0.205	1.000	0.393	0.998	0.408	*0.578*	0.173	0.545	0.814	0.108	0.626
	Ranking	F2I (141.86) ≻ F3I (113.57) ≻ F4I (96.66) ≻ F5I (47.32) ≻ F7I (16.33) ≻ F6I (29.61) ≻ F8I (10.08) ≻ F9I (4.32)											
7	w_8	0.173	0.205	1.000	0.393	0.998	0.408	0.206	*0.578*	0.545	0.814	0.108	0.626
	Ranking	F2I (121.91) ≻ F3I (101.29) ≻ F4I (81.02) ≻ F5I (42.09) ≻ F7I (17.38) ≻ F6I (22.89) ≻ F8I (7.23) ≻ F9I (4.12)											
8	w_9	0.545	0.205	1.000	0.393	0.998	0.408	0.206	0.173	*0.578*	0.814	0.108	0.626
	Ranking	F2I (136.68) ≻ F3I (95.92) ≻ F4I (73.53) ≻ F5I (41.82) ≻ F7I (16.64) ≻ F6I (23.85) ≻ F8I (7.57) ≻ F9I (5.01)											
9	w_{10}	0.814	0.205	1.000	0.393	0.998	0.408	0.206	0.173	0.545	*0.578*	0.108	0.626
	Ranking	F2I (149.56) ≻ F3I (92.11) ≻ F4I (67.26) ≻ F5I (39.78) ≻ F7I (15.69) ≻ F6I (23.84) ≻ F8I (8.39) ≻ F9I (4.67)											
10	w_{11}	0.108	0.205	1.000	0.393	0.998	0.408	0.206	0.173	0.545	0.814	*0.578*	0.626
	Ranking	F2I (120.13) ≻ F3I (106.88) ≻ F4I (85.79) ≻ F5I (43.23) ≻ F7I (18.42) ≻ F6I (23.91) ≻ F8I (10.58) ≻ F9I (4.15)											
11	w_{12}	0.626	0.205	1.000	0.393	0.998	0.408	0.206	0.173	0.545	0.814	0.108	*0.578*
	Ranking	F2I (139.95) ≻ F3I (95.02) ≻ F4I (72.18) ≻ F5I (42.33) ≻ F7I (16.27) ≻ F6I (23.47) ≻ F8I (7.35) ≻ F9I (4.32)											

The amounts of financial support are reported in the parenthesis. * Current situation. F2I: Families with 2 individuals, F3I: Families with 3 individuals, etc.

CONCLUSIONS

In this study, a financial support model for families with disabilities is proposed on the basis of the AHP model. The main idea of the model is that with disabilities may not require the same amount of financial support for the same consumption item. The required financial support amounts are calculated by summing the values that are obtained through multiplying the difference between the consumption amount of the families with disabilities and consumption of families with non-disabilities, by the values that are obtained through normalizing the weights. Indeed, as a result of the analyses that are performed by using the HBS questionnaire data, it is deduced that the families with disabilities and with varying number of individuals require financial support with varying amounts. The model also suggests the required financial support with details by considering each consumption group. Herein, when the number of individuals in a family is taken into consideration, it is determined that financial support is needed for any consumption group in a family type while other family type make more consumption of that group

and do not need any financial support in contrast. This model is all important due to its potential to achieve such a crucial mission.

In order to demonstrate the robustness and stability of the proposed model, a sensitivity analysis was performed in this study. When the importance weights were changed, there were differences in the amount of financial support. However, the order of financial support needs for families with disabilities remained the same. Namely, families who need the most financial support are families with 2 individuals. Families with 3 and 4 individuals followed them, respectively.

Politicians would be able to allocate financial support with varying amounts for the families with disabilities by using the suggested model and they would be able to quit practicing of financial support with equal amounts. Thus, it would be possible to achieve better integration for the families with disabilities into society that receive insufficient financial support through increasing the amount of financial support.

The limitation of this study is the findings based on the opinion of the decision makers. In other words, when the decision makers are replaced, the findings might change. Therefore, it is required to select the decision makers very carefully in order to obtain realistic suggestions from the model. Herein, it might be offered to establish a decision makers committee that includes members from different age groups, different income levels, different genders and whose family is with disabilities and non-disabilities etc. As a direction for future research, the fuzzy AHP method which takes into account human thoughts and judgments can be utilized to determine financial support for the families with disabilities.

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