

FACTORS INFLUENCING HEALTHCARE SATISFACTION IN TURKEY

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ABSTRACT

Objective: The study aimed to determine the factors affecting healthcare satisfaction using the data of the Life Satisfaction Survey (2014-2018) of the National Turkish Statistical Institute (TurkStat) with the help of a genetic algorithm.






Material and Method: The information about the TurkStat micro-data for 2018 includes 246 variables in 60 different question titles. The 2018 model tested the accuracy of the model that was applied on the data collected between the years of 2014 and 2017. The nnet package in the R software was used for prediction and the multinom function in the package was utilized for the multinomial regression estimation.

Results: Variables involved in results reflecting healthcare satisfaction were found to be over 43 years of age, cleanliness/hygiene in the health care facility, satisfaction

with the physical examination performed by the doctor, and the distance from the hospital. In addition to these variables, satisfaction with municipal services, having good relations with friends and relatives, being happy with one's life, satisfaction with public security services, administration of justice, and schooling, and digital public services; not experiencing any loss of income, being involved in religious matters, and not being interested in cultural and political issues also accounted for the healthcare satisfaction.

Conclusion: Healthcare satisfaction is related not only to the satisfaction of the healthcare service received from the healthcare institution, but also to the satisfaction with the municipal services, public security, and good relations with friends and relatives.

Keywords: Healthcare satisfaction, genetic algorithm, life satisfaction, service satisfaction, health care.

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TÜRKİYE'DE SAĞLIK HİZMETLERİNDEN MEMNUNİYETİ ETKİLEYEN FAKTÖRLER

ÖZET

Amaç: Çalışmada, Türkiye İstatistik Kurumu'nun (TÜİK) Yaşam Memnuniyeti Araştırması (2014-2018) verileri kullanılarak sağlık hizmetlerinden memnuniyeti etkileyen faktörlerin genetik bir algoritma yardımıyla belirlenmesini amaçlamıştır.

Materyal ve Metot: 2018 yılı TÜİK mikro verilerine ilişkin bilgiler 60 soru başlığında 246 değişkeni içermektedir. "Sağlık hizmetlerinden memnun musunuz?" bağımlı değişkenini açıklayan modelin bilinmeyen bağımsız değişkenleri araştırılmıştır. 2018 modelinden elde edilen sonuçların, 2014-2017 yılları arasında toplanan veriler üzerinde uygulanarak test edilmiştir. Tahmin için R yazılımındaki nnet paketi ve multinom regresyon tahmini için multinom fonksiyonu kullanılmıştır. Genetik algoritmalar problemlere tek bir çözüm üretmek yerine farklı çözümlerden oluşan bir çözüm kümesi üretir. Böylelikle, arama uzayında aynı anda birçok nokta değerlendirilmekte ve sonuçta global çözüme ulaşma olasılığı yükselmektedir.

Bulgular: Sağlık hizmetlerinden memnuniyeti açıklayan değişkenler, doğrudan alınan sağlık hizmet, 43 yaş üstü, sağlık kuruluşunda temizlik/hijyen, fizik muayene, doktor muayenesinden memnuniyet ve hastaneye olan uzaklığı içermektedir. Bu değişkenlerin yanı sıra, belediye hizmetlerinden memnuniyet, arkadaş ve akraba ilişkilerinin iyi olması, hayattan memnun olma, asayiş, adalet ve eğitim hizmetlerinden ve dijital kamu hizmetlerinden memnuniyet; gelir kaybı yaşamamak, dini konularla ilgilenmek, kültürel ve politik konularla ilgilenmemek de sağlık hizmetlerinden duyulan memnuniyeti açıklamaktadır.

Sonuç: Sağlık hizmetlerinden memnuniyet, sadece sağlık kuruluşundan alınan sağlık hizmetinden duyulan memnuniyetle değil, aynı zamanda belediye hizmetlerinden memnuniyet, kamu güvenliği, arkadaş ve akrabalarla iyi ilişkiler ile de ilgilidir.

Anahtar kelimeler: Sağlık hizmetlerinden memnuniyet, genetik algoritma, yaşam memnuniyeti, hizmet memnuniyeti, sağlık hizmetleri.

INTRODUCTION

Life fulfillment is a general assessment of one's feelings and attitudes about one's life from negative to positive at a certain point. Work-life, family, and personality traits are the main determinants of life fulfillment. Life satisfaction is the degree to which a person positively evaluates the overall quality of his/her life as a whole. It is assumed that the less the discrepancy between an individual's desires and accomplishments, the greater the satisfaction of life.¹ Life satisfaction is the fact that the individual is satisfied with the conditions of life he or she is in and has the joy of living. There are studies linking life satisfaction with life. In a study carried out in this context, it was stated that three components came to the fore in definitions related to happiness. The first of these is the frequency of experiencing positive emotions, the second is the frequency of experiencing negative emotions, and the third is life fulfillment.²

Studies have shown that the factor most associated with life satisfaction levels is self-acceptance, followed by well-being, general environment, and personal knowledge. At the same time, it was revealed that self-acceptance and general environmental factors

affected the life satisfaction levels of the elderly the most.³ The general environment includes the broad economic, political/legal, sociocultural, demographic, technological, and global conditions that affect an organization. Patient satisfaction is an important measure of healthcare quality as it offers information on the provider's success at meeting clients' expectations and is a key determinant of patients' perspective behavioral intention. Patient satisfaction, a measure of care quality, gives providers insights into various aspects of medicine, including the effectiveness of their care and their level of empathy.⁴

Life satisfaction is a key indicator of subjective well-being. High satisfaction in life fulfillment indicates that the quality of life in the society concerned is good while low satisfaction indicates several serious deficiencies.

This is consistent with the indication that fulfillment in life reflects both the extent to which basic needs are met and how achievable various other goals are seen. Other conditions that affect life satisfaction are demographic, environmental, and interpersonal factors. It is stated that enjoying life, finding life meaningful, consistency in achieving the goals,

| Table 1. The content of the micro-data for 2018 |
|---|
| Gender: Male Female |
| Age (completed years) |
| Marital status |
| Education level |
| Working status |
| The sector worked at (public or private) |
| Status at work |
| Problems experienced at the workplace |
| Happiness and satisfaction with the individual status: |
| - The level of happiness / The person who makes you happy the at most |
| - The values that make you happy at most |
| - The level of life satisfaction |
| - The level of satisfaction related to your personal peculiarities such as health, education, etc. |
| - The level of satisfaction with other individuals in your social circle |
| - Problems with your job |
| - Perception of welfare |
| Using the public services and satisfaction with: |
| - The level of satisfaction with public services such as health, security forces, etc. |
| - Are you registered with any social security institution? / Which social security institution do you benefit from? |
| - Through whom do you benefit from the social security institution? |
| - The level of satisfaction according to the affiliated social security institution |
| - Which channel covers your medication and treatment costs? |
| - Which health institution/health care worker do you apply first when you get sick? |
| - Why did you choose this institution/healthcare worker? |
| - Do you have any problems with the health service? |
| - Which health institution did you have problems with? |
| - Which institution provides the public security service? |
| - Problems with public security services |
| - Problems with the administration of justice-judicature |
| - Satisfaction and problems with the educational services |
| - Satisfaction with the education-schooling received |
| - Satisfaction with the information transactions related to the public services |
| - Satisfaction with the municipal services |
| - Satisfaction with the special provincial administration services |
| - Satisfaction with transportation services |
| Environmental security: |
| - The level of feeling safe at home |
| - Feeling safe walking alone at night in the living environment |
| - Seeing someone using drugs in the living environment |
| - Perceptions that drug/substance use is becoming widespread |
| - Relatives, friends, or neighbors who can be of help when needed |
| - Public security-related events |
| Hopes, self-assessments and expectations in 5-year periods: |
| - The level of hope |
| - The level of development compared with 5 years ago |
| - The development outcomes look for 5 years later |
| - Your personal and country-based expectations for the coming year |
| Values: |
| - Values important to be respected in society |
| - The importance given to the situation of an people individual in the environment |
| - Perception of social pressure |
| - Changes in the lives of individuals in the during the previous year |
| - The level of interest in social issues |
| Overview of the European Union: |
| - Your forecasts on how the life of people will be affected by Turkey's membership in the European Union |
| - How individuals will vote in case of a referendum on Turkey's membership in the European Union |

positive individual identity, physical fitness, economic security, and social relationships are all important indicators of life satisfaction.¹ In general, more social life, spending leisure time actively, spending time with the family, having more fun, spending quality time with friends and family, and getting better work and family balance seem to be more satisfactory in terms of life satisfaction.⁵

According to the need theory, employees have multiple needs and meeting these needs should result in life fulfillment. Conflicts at work, job stress, role conflict have been shown to affect tension at work. It has therefore been suggested that job stress, along with job satisfaction, would be an indicator of the quality of work-life.⁶

Quality of work life is represented by job satisfaction, career satisfaction, and perceived job stress. Regarding the quality of out-of-work life, on the other hand, family, leisure time, health satisfaction, and perceived and experienced competence are explained as mechanisms that affect life satisfaction.⁷ The negative impact of working life on life fulfillment is that employees can try to improve their situation by quitting their jobs, discussing their roles, or psychologically distancing themselves from work. It is known that life satisfaction is the degree to which one positively evaluates the overall quality of his or her life as a whole.⁷⁻⁹ Some people give priority to welfare in life fulfillment, while others think that work or health is more important. Satisfaction with areas aligned with one's values is more important to one's life fulfillment.⁸

This study aimed to examine the healthcare satisfaction of the people who declared satisfaction with health services in Turkey and determine the variables that affect their satisfaction.

MATERIAL AND METHOD

For this purpose, the micro-data of Life Satisfaction Survey (LSS) conducted annually by the Turkish Statistical Institute (TurkStat) was used. To investigate healthcare satisfaction care within the National TurkStat Life Satisfaction Survey (2014-2018) and within research data related to life satisfaction, a genetic algorithm was used to determine factors affecting satisfaction with health care within life satisfaction data.

For this study, the individual-level data of the Life Satisfaction Survey (LSS), which was annually conducted on a regular basis by the Turkish Statistical Institute (TurkStat) between 2014 and 2018 were used since 2003.⁹ It fits the purpose of this study as there are also questions about the problems that people experience while receiving health services and that measure their satisfaction with health services. The LSS included a sample of adults (18+ years of age) composed of citizens and foreigners residing in Turkey and a face-to-face survey was conducted. Institutional population (student dormitories, hotels, nursing homes, hospitals, prisons, barracks, and military units etc.) was excluded from the survey. The content of the micro-data is shown in Table 1. The data are available for a total of 45,947 people between 2014 and 2018. The answers given to the questions asked in the LSS were designed in accordance with the Likert type scale.

Study Design

Participants' levels of satisfaction with health care in the LSS study were measured by their responses to the question of 'Are you satisfied with health care?' using the answers as compatible to Likert scale ranging from (1) very satisfied to (5) very unsatisfied.⁹ Also, the inclusion of the '(6) no idea' option impairs the ordinal nature of the variable. The LSS also allows a rich set of background variables to be studied. A micro-data information of 246 variables is available, including gender, age, place of residence (rural/urban), educational level, marital status, work-life, as well as satisfaction with municipal and security services. The data for 45,947 individuals, in which 7984 in 2014, 9387 in 2015, 8981 in 2016, 9876 in 2017, and 9719 subjects were interviewed in 2018, were used (Table 1).

Regression Models

Variable or feature selection and detailed explanation of the model are one of the most important steps. Direct use of a medical database without a prior analysis can often be inefficient, especially in the case of medical decision-making. In this way, the variable selection represents a method of selecting the most related attributes from the database to build a robust model of learning models and thus improve the performance of models used in the decision process. The goal of variable selection in medical research is the exclusion of unrelated or confusing variables and the selection

| Table 2. Variables used in the prediction model with the 2018 data | | | | | |
|---|-----|----|----|----|-----|
| | Min | Q1 | Q2 | Q3 | Max |
| Are you satisfied with health services? (Dependent Variable) | 1 | 2 | 2 | 3 | 6 |
| 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | | | | | |
| 1) Age (completed years):..... | 18 | 32 | 43 | 56 | 101 |
| 2) Level of education that was lastly completed: 1 Literate, 2 Primary school, 3 Secondary school, 4 General/technical high school, 5 4-year vocational high school or faculty, 6 Master degree (including 5-or 6-year faculties), 7 PhD | 1 | 2 | 4 | 5 | 7 |
| 3) Considering your life as a whole, how happy are you? 1 Very happy, 2 Happy, 3 Neither happy nor unhappy, 4 Unhappy, 5 Very unhappy | 1 | 2 | 2 | 3 | 5 |
| 4) Are you satisfied with your health? 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | 1 | 2 | 2 | 3 | 5 |
| 5) Are you satisfied with the neighborhood you are currently residing in? 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | 1 | 2 | 2 | 2 | 5 |
| 6) Are you satisfied with your relationship with relatives? 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | 1 | 2 | 2 | 2 | 5 |
| 7) Are you satisfied with your relationship with your friends? 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | 1 | 2 | 2 | 2 | 5 |
| 8) Are you satisfied with public security services? 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | 1 | 2 | 2 | 3 | 6 |
| 9) Are you satisfied with judiciary? 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | 1 | 2 | 2 | 5 | 6 |
| 10) Are you satisfied with schooling? 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | 1 | 2 | 2 | 4 | 6 |
| 11) Do you use digital public services? 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | 1 | 1 | 1 | 2 | 3 |
| 12) Can you please state your satisfaction with the municipal garbage and environmental waste collection service? 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | 1 | 1 | 1 | 1 | 2 |
| 13) Do you have any problems with cleaning/hygiene in general with the health care you receive? 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | 1 | 2 | 2 | 2 | 3 |
| 14) Are you satisfied with the physical examination performed at the health care institutions in general? 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | 1 | 1 | 1 | 2 | 3 |
| 15) In general, is there a problem with the way doctors treat patients, regarding the organizations where you receive health care? 1 Yes, 2 No, 3 No idea | 1 | 2 | 2 | 2 | 3 |
| 16) In general, do you find the fees for physical examination and tests high, regarding the institutions where you receive health care? 1 Yes, 2 No, 3 No idea | 1 | 1 | 1 | 2 | 3 |
| 17) In general, do you see any problems with drug prices, regarding the organizations you receive health care? 1 Yes, 2 No, 3 No idea | 1 | 1 | 1 | 2 | 3 |
| 18) In general, is there a problem in waiting in line for a physical examination and/or test, regarding the institutions you receive health care? 1 Yes, 2 No, 3 No idea | 1 | 1 | 2 | 2 | 3 |
| 19) Does the police or gendarmerie respond to events in time? 1 Yes, 2 No, 3 No idea | 1 | 1 | 1 | 2 | 3 |
| 20) Have you experienced victimization for any reason other than these in 2018? 1 Yes, 2 No | 1 | 2 | 2 | 2 | 2 |
| 21) In general, is there a problem in the fair and impartial application of laws to all, regarding the court and the judicial system? 1 No problem, 2 Few problems, 3 Many problems | 1 | 2 | 3 | 4 | 4 |
| 22) Please state your satisfaction with the road transport services you have used in the last year? 1 Very satisfied, 2 Satisfied, 3 Neither satisfied nor unsatisfied, 4 Unsatisfied, 5 Very unsatisfied, 6 No idea | 1 | 2 | 2 | 2 | 7 |
| 23) When you think of the welfare level of people living in Turkey as "0" the lowest and "10" the highest" level, what level do you find yourself at?:..... | 1 | 5 | 6 | 7 | 10 |
| 24) When you think about the next 5-year period, what do you expect your situation to be like in general? 1 Will improve, 2 Will remain at the same level, 3 Will decline, 4 No idea | 1 | 1 | 2 | 3 | 4 |
| 25) If there is a referendum (popular vote) on Turkey's accession to the European Union, how would you vote? 1 Supporting membership, 2 Against membership, 3 No idea | 1 | 1 | 2 | 2 | 3 |
| 26) How do you think our country will change in the next 5 years in terms of the delivery of public services? 1 In a good way, 2 Will not change, 3 In a bad way, 4 No idea | 1 | 1 | 2 | 3 | 4 |
| 27) I went bankrupt/closed my shop the previous year 1 Yes, 2 No, 3 Not associated | 1 | 2 | 2 | 3 | 3 |
| 28) My income declined the previous year 1 Yes, 2 No, 3 Not associated | 1 | 1 | 2 | 2 | 3 |
| 29) I have turned to the consumption of cheaper products the previous year 1 Yes, 2 No | 1 | 1 | 1 | 2 | 2 |
| 30) How important are circles of friends of others around you? 1 Important, 2 Moderately important, 3 Not Important | 1 | 1 | 1 | 3 | 3 |
| 31) How important are the religious beliefs of others around you? 1 Important, 2 Moderately important, 3 Not Important | 1 | 1 | 2 | 3 | 3 |
| 32) Do you feel any social pressure on you because of your religious beliefs and behavior? 1 Never, 2 Sometimes, 3 Frequently, 4 Always | 1 | 1 | 1 | 1 | 4 |
| 33) How interested are you in culture, art, and literature? 1 Interested, 2 Moderately interested, 3 Not interested, 4 No idea | 1 | 1 | 3 | 3 | 4 |
| 34) How interested are you in politics? 1 Interested, 2 Moderately interested, 3 Not interested, 4 No idea | 1 | 2 | 3 | 3 | 4 |
| 35) How interested are you in religion? 1 Interested, 2 Moderately interested, 3 Not interested, 4 No idea | 1 | 1 | 1 | 2 | 4 |

(Q1): 25%th quantile values, (Q2): 50%th quantile values, (Q3): 75%th quantile values, Maximum: 100%th quantile values

of clinically and statistically significant variables. Several methods exist for variable selection, but there are no limitations in any of them. Genetic algorithms (GA) are heuristic optimization approaches and can be used for variable selection in regression models.

The survey data for 2018 included 246 variables under 60 different question titles and any model that describes the dependent variable “Are you satisfied with health care?” and the variables of that model are unknown. Previous studies showed that overall health satisfaction was estimated by the Multinomial regression method. Since the dependent variable takes the values 1, 2, 3, 4, 5, and 6, and each value represents a class rather than the numerical value of the number it represents, the problem in question can be treated as a classification problem. As in the study of 11, the Multinomial regression method was selected in this study. The `nnet` package in the R software was used for prediction and the `multinom` function in the package was utilized. The compatibility of the estimation results obtained from 2018 with the 2014-2017 data will be evaluated.

Genetic Algorithm Method

A genetic algorithm was used to determine the arguments contained in the model. In this genetic algorithm, each chromosome is composed of genes whose value can be either 0 or 1, indicating whether the corresponding variable is included in the model. The AIC (Akaike Information Criterion) value obtained from the prediction model was used as the fitness value. In the problem, which was treated as an optimization problem, independent variables that minimize the AIC value were selected. Genetic algorithms are optimization and search algorithms that mimic the principles of natural selection and genetics. It works with a population of randomly generated candidate solutions. An analogy is used between the success of each candidate solution in achieving its goal function and the degree to which living things adapt to the environment. The candidate solution with higher fitness is selected (selection) and in this way, the formation of new individuals is enabled (reproduction). Search iterations are continued with a collection of new candidate solutions (offspring) formed by crossover and mutation of selected candidate solutions (generation). In this study, the candidate solutions were expressed with a sequence of 1 and 0s (chromosome) indicating the presence and absence relationship, and a prediction model that minimized the AIC criterion was sought.^{10, 11}

RESULTS

When satisfaction with health services is considered between 2014 and 2018; it shows that as of 2014, the distribution of satisfied and very satisfied by years is 70.2%, 72.2%, 75.2%, 74.8% and 69.8%, respectively.

When life satisfaction is evaluated according to years; it shows that the distribution of the general happiness level of those who are happy and very happy is 56.26%, 56.6%, 61.33%, 58.04% and 53.37% as of 2014. High rates of health services and life satisfaction of the majority are observed.

The variables used in the “satisfaction with health care” prediction model with 2018 data are shown in Table 2.

The variable list that minimizes the AIC value of the estimated model and the 0th (minimum), 25th (Q1), 50th (Q2), 75th (Q3), and 100th (maximum) quantile values of these variables are revealed .

Table 2 shows when the variables accounting for the satisfaction with health care are evaluated according to their median values: individuals over 43 years of age; graduates of secondary schools or higher education; individuals who were happy with their lives; those satisfied with their health, the neighborhood, or district currently resided in, friends and relatives; those satisfied with public security services, judicature, schooling, digital public, and the municipal services; individuals satisfied with the cleanliness/hygiene, and those happy with the physical examination performed by the physician, those satisfied with the healthcare they receive were the ones who were more satisfied with health services. In addition to this, those who thought that the security services responded to events in time and those who have not experienced victimization in any case stated that there was a problem with judicial system in the application of laws, and those who were satisfied with transportation expressed their welfare level (out of 10 points) by 6 points and above, and expressed that their situation would not change in the next 5 years, thought of voting against the EU membership, thought that the public services would not change in the next 5 years, said they did not experience any loss of income, tended towards more economical products in terms of consumption,

Table 3. $\#(Y = i | \hat{Y} = j)$ for the year 2018 data

| | $\hat{Y} = 1$ | $\hat{Y} = 2$ | $\hat{Y} = 3$ | $\hat{Y} = 4$ | $\hat{Y} = 5$ | $\hat{Y} = 6$ |
|---------|---------------|---------------|---------------|---------------|---------------|---------------|
| $Y = 1$ | 112 | 388 | 2 | 5 | 0 | 0 |
| $Y = 2$ | 34 | 5966 | 66 | 214 | 0 | 2 |
| $Y = 3$ | 3 | 1096 | 75 | 234 | 1 | 0 |
| $Y = 4$ | 2 | 709 | 65 | 481 | 0 | 2 |
| $Y = 5$ | 1 | 107 | 11 | 100 | 1 | 0 |
| $Y = 6$ | 0 | 29 | 2 | 6 | 0 | 5 |

Y : Are you satisfied with health care; \hat{Y} : Genetic algorithm prediction model, estimating the value of the dependent variable

Table 4. Application of 2018 prediction model to the 2014 - 2017 data

| Years | | $\hat{Y} = 1$ | $\hat{Y} = 2$ | $\hat{Y} = 3$ | $\hat{Y} = 4$ | $\hat{Y} = 5$ | $\hat{Y} = 6$ |
|-------|-------|---------------|---------------|---------------|---------------|---------------|---------------|
| 2014 | $Y=1$ | 96 | 307 | 1 | 7 | 1 | 0 |
| | $Y=2$ | 22 | 4945 | 21 | 189 | 5 | 9 |
| | $Y=3$ | 5 | 799 | 17 | 129 | 6 | 6 |
| | $Y=4$ | 6 | 687 | 13 | 355 | 7 | 7 |
| | $Y=5$ | 0 | 133 | 5 | 125 | 15 | 1 |
| | $Y=6$ | 1 | 46 | 0 | 11 | 0 | 7 |
| 2015 | | $\hat{Y} = 1$ | $\hat{Y} = 2$ | $\hat{Y} = 3$ | $\hat{Y} = 4$ | $\hat{Y} = 5$ | $\hat{Y} = 6$ |
| | $Y=1$ | 75 | 495 | 1 | 4 | 0 | 0 |
| | $Y=2$ | 18 | 6006 | 32 | 154 | 1 | 0 |
| | $Y=3$ | 5 | 940 | 45 | 189 | 0 | 0 |
| | $Y=4$ | 0 | 698 | 42 | 350 | 1 | 0 |
| | $Y=5$ | 0 | 146 | 7 | 110 | 3 | 0 |
| | $Y=6$ | 0 | 58 | 1 | 12 | 0 | 4 |
| 2016 | | $\hat{Y} = 1$ | $\hat{Y} = 2$ | $\hat{Y} = 3$ | $\hat{Y} = 4$ | $\hat{Y} = 5$ | $\hat{Y} = 6$ |
| | $Y=1$ | 100 | 446 | 3 | 5 | 0 | 0 |
| | $Y=2$ | 21 | 6023 | 24 | 131 | 1 | 0 |
| | $Y=3$ | 4 | 900 | 35 | 114 | 2 | 0 |
| | $Y=4$ | 4 | 686 | 40 | 240 | 1 | 0 |
| | $Y=5$ | 1 | 81 | 9 | 53 | 2 | 0 |
| | $Y=6$ | 0 | 46 | 0 | 6 | 0 | 3 |
| 2017 | | $\hat{Y} = 1$ | $\hat{Y} = 2$ | $\hat{Y} = 3$ | $\hat{Y} = 4$ | $\hat{Y} = 5$ | $\hat{Y} = 6$ |
| | $Y=1$ | 59 | 423 | 0 | 5 | 0 | 0 |
| | $Y=2$ | 10 | 6368 | 28 | 196 | 0 | 3 |
| | $Y=3$ | 6 | 1011 | 37 | 227 | 0 | 5 |
| | $Y=4$ | 1 | 786 | 30 | 415 | 1 | 3 |
| | $Y=5$ | 0 | 94 | 6 | 100 | 3 | 0 |
| | $Y=6$ | 0 | 38 | 0 | 6 | 0 | 15 |

Y : Are you satisfied with health care; \hat{Y} : Genetic algorithm prediction model, estimating the value of the dependent variable

thought that the circle of friends was important, thought that the beliefs of the people around them are moderately important, felt no pressure about religious beliefs, were not interested in culture, art, and politics; and those who were interested in religious issues were more satisfied with health care.

All these variables were determined by a variable selection process conducted by the genetic algorithm based on minimizing the value of the AIC.

Table 3 can be examined for the evaluation of the classification of performance of the model. The values in row i and column j of Table 3 represent the number of cases where the dependent variable has the value of i and the predicted value is j , $i=1,2,\dots,6$ and $j=1,2,\dots,6$. For example, the prediction model estimated the value of the dependent variable to be 2 5966 times while it was only 2.

Average Absolute Deviations (MeAD) for 2018 was 0.44. Mean Square Error (MSE) was 0.75 and Mean Absolute Percent Error criteria was found to be 0.16. It is seen that the values calculated are close to their lower limits.

Although these quantities are generally used for measuring the performance of a time series forecast, they are presented here to reveal the cumulative distances between the real and estimated values of the independent variable using different metrics and scales in the defined ranges. When the estimation rates of the model are evaluated; Total Observation 9719, Accurate prediction 6640 Accuracy Rate was 0.68.

The analysis of the variable estimates obtained from the 2018 model between 2014 and 2017 are given in Table 4.

The values in row i and column j of Table 4 represent the number of cases where the dependent variable has the value i and the predicted value is j . For example, the prediction model estimated the value of the dependent variable to be 2 4945 times, while it was only 2. It was correctly estimated 6006 times in 2015 data, 6023 times in 2016, and 6368 times in 2017.

The prediction performance of the variables obtained from the 2018 model between 2014-2017 is given in Table 5.

It is seen that the forecast values obtained in the 2018 model are very close to the values obtained between 2014 and 2017. Prediction rates of the model when the 2018 prediction model was applied to the 2014 -2017 data were found to be 0.68, 0.68, 0.71, and 0.69 in 2014, 2015, 2016, and 2017, respectively.

DISCUSSION

This study investigates the variables that affect the complacency towards the health care using the micro data of Life Satisfaction Survey between 2014 and 2018. Turkey has implemented the Health Transformation Program which is a population-based program ensuring many other reforms for the citizens. The main purpose of all these reforms is to increase the quality of health care provided to citizens. When satisfaction with health care is examined, the distribution of satisfied and very satisfied people by years has been found as 70.2%, 72.20%, 75.20%, 74.8%, and 69.8% since 2014, respectively. The general level of happiness shows that the distribution of those who are satisfied and very satisfied by years has been calculated as 56.26%, 56.6%, 61.33%, 58.04%, and 53.37% since 2014, respectively. Half of the individuals stated that he/she was satisfied.

When the variables affecting satisfaction with health care from the grand data of life satisfaction surveys are analyzed, it has been observed that variables such as age, educational level, self-health satisfaction, satisfaction with their neighborhood, relatives, friends, public order, the administration of justice, educational services, electronic services, municipal services, hygiene status of health care providers, physical examination by physicians, not having problems with the doctor, waiting in line without having any problems, not having any problems with security forces, not having problems with transportation, the hope of life, future comparison, EU referendum, satisfaction with public service delivery, economic bankruptcy, income reduction, preferring cheap products, caring for friends, religious belief, culture, politics, and religion all affect the satisfaction rates.

Most research on life satisfaction has focused on one main factor and various social demographic variables to define the determinants of life satisfaction. However, studies that examine life satisfaction with a holistic approach is quite limited. Young people, females, married participants and the ones with higher socio-economic status, those who were born in Canada 5 are very religious and have a high level of neighborhood interaction and are more satisfied with life. The results show that a holistic approach is necessary to understand the causal process of life satisfaction.^{5,12,13} Michalos's studies, the municipality

Table 5. Prediction performance of the 2014-2017 estimate for the 2018 data

| | | MeAD | MAD | MSE | MAPE |
|------|---------|-------|-----|-------|-------|
| 2014 | Minimum | 0 | 0 | 0 | 0 |
| | Value | 0.494 | 0 | 0.927 | 0.174 |
| | Maximum | 5 | 5 | 25 | 5 |
| 2015 | Minimum | 0 | 0 | 0 | 0 |
| | Value | 0.454 | 0 | 0.812 | 0.169 |
| | Maximum | 5 | 5 | 25 | 5 |
| 2016 | Minimum | 0 | 0 | 0 | 0 |
| | Value | 0.417 | 0 | 0.728 | 0.158 |
| | Maximum | 5 | 5 | 25 | 5 |
| 2017 | Minimum | 0 | 0 | 0 | 0 |
| | Value | 0.437 | 0 | 0.754 | 0.161 |
| | Maximum | 5 | 5 | 25 | 5 |

MeAD: Average Absolute Deviations, MAD: Mean Absolute Deviation, MSE: Mean Square Error, MAPE: Mean Absolute Percentage Error

announced 32%, 20%, and 19% of the satisfied variance reported by the provincial and federal government officials on the basis of their satisfaction with public services. Sixty percent of the explained variation in happiness scores was attributable to self-reported health scores, while only 18% of the explained variation in satisfaction with life and with the overall quality of life scores was attributable self-reported health scores.^{12,13}

Şehribanoğlu *et al.*¹⁴ examined the results of Life Satisfaction 2013 research with the CHAID algorithm. When the formed decision tree is analyzed, the highest level of happiness belongs to the group, 90.2% of whom are very satisfied with their income and think that their financial situation will improve the following year. The lowest happiness rate belongs to the group, 13.3% of whom are "not satisfied" with their income, are not hopeful for their future, and are not satisfied with their time and health. In the data set divided into two as training and test, the correct classification percentage of the outcomes for the training data was 63.9% and the same ratio for the decision tree that was formed on the test set, which was never seen in the development of the model, was 63.5%. A substantial income, good physical and mental health, and health insurance coverage are important factors for older adults pursuing a happy life.¹⁵

Due to the nature of the necessity, continuity and complexity of the health need, satisfaction-related criteria differ from those in other service sectors.¹⁶ For example, customers can show their dissatisfaction by changing the providers in restaurants, shopping malls, GSM operators, however the possibility of being able to choose is limited in the health sector.¹⁶ This may stem from two factors. The first factor is its proximity to the hospital, particularly places such as the emergency room where even minutes are vital. Another important factor is the health institutions to which individuals are affiliated and those institutions' being supported by the government.¹⁷ Özcan's study included variables explaining a model comprising transportation to hospital, examination, hygiene and satisfaction with electronic services.¹⁶

Erhan *et al.* have found that when examining the age groups, patients in the age group of the 51 and over who received inpatient treatment reported more satisfaction in terms of laboratory and radiology service quality, general cleaning, food quality and clinical cleaning compared to other age groups.¹⁸ The results of Erhan's study are similar to this study's findings.

Zerenler's study, the factors such as short waiting time, the easy appointment system as well as the proximity of the hospital to the patient's residential area were investigated on the hospital choice and patient satisfaction.^{18,19} Those who are satisfied with their lives, health, the neighborhood, relationship with friends and relatives, the public order, judicial system and schooling, and the services provided in the electronic environment are variables that explain satisfaction with health care in this study. Easy access to hospitals has been designated as a factor affecting satisfaction in many studies from the literature.

Uğur *et al.* discovered that satisfaction with health care has significantly increased between 2003 and 2016.²⁰ This study comprises cleaning/hygiene, satisfaction with the doctor's physical examination as well as the variables to determine health care satisfaction. On the other hand, electronic access to healthcare services has been one of the variables affecting life satisfaction. Easy access to hospitals has been reported as a factor affecting satisfaction in many studies from the literature.²¹ The factors such as short waiting time, easy appointment system, as well as the proximity of the hospital to the patient's residential

area were found to be significant on the hospital choice and patient satisfaction. It was concluded that patients generally prefer hospitals close to them and they want to receive health care from these places. This result shows that quality and patient satisfaction in health care should be considered as a whole, not on a hospital basis. In other words, the fact that one or more hospitals provide quality services in a province/district does not show that an adequate level has been reached in healthcare. The quality of the services offered by all hospitals needs to be improved to reach socially acceptable health services.

Thirty-five variables that explain health service satisfaction were found to be significant, and one or more variables that were regarded as significant in other studies were included in our model, as well.

The study of Stokes *et al.* included people who were satisfied with their health, those over age 50, women, people living in rural areas, those using primary public institutions, those who are happy with other services among the factors affecting health care satisfaction in Turkey.²² Considering the variables obtained in this study, the median age is 43 and being satisfied with municipal services explain satisfaction with health care.

In a study conducted with 1957 people in Spain, 67.3% and 63.8% of the participants were satisfied/very satisfied with the care and health information that they have received. This study uses the service examination they received from the institution, the satisfaction with the doctor to explain the health service satisfaction.²³

The research conducted by Lulejian *et al.* showed that there is a statistically significant improvement in patient satisfaction regarding the transition to the tablet-based system in the health system.²⁴ The convenience and comfort in the use of a paperless registration system can help maintain or increase patient and staff satisfaction while offering new workflows and increasing the efficiency of the ambulatory process. The results of the study of Lulejian *et al.* can be explained with satisfaction from the services provided electronically in this study.²⁴ Through the applications developed on the mobile phone platforms, appointment, test results can be obtained with an ID number and a paperless

healthcare environment is provided. In the study of Yang *et al.*, individuals under State Health Insurance, the most generous program, reported higher life satisfaction.²⁵ In contrast, those covered by narrow coverage insurance reported lower life satisfaction with standard deviations of 0.155, 0.106, and 0.112, respectively.

When studies using genetic algorithms were evaluated, learning multilevel thresholds in mammography, making pharmacotherapy decisions in patients with more than one morbidity was also used as a solution to the ambulance routing problem and modeled as an open ambulance guidance problem. Genetic algorithm has also been used to select the appropriate traffic areas that can reduce the traffic congestion and air pollution and will increase the satisfaction of the citizens in another study.²⁶⁻²⁹ In addition to its use in medicine, it has been seen that genetic algorithm studies are very common in the fields of production and design. It is seen that genetic algorithms provide better outcomes in production problems, especially in the fields of tabulation, cellular production and design compared to traditional methods.³⁰ Patient satisfaction with health services is known to promote adherence and improve clinical outcomes, population satisfaction may affect how people utilize services and whether they trust the health messages the system promotes. However, evidence on satisfaction of the general population with their health system is limited and concentrated mainly in countries of developed countries.³¹

The fact that satisfaction with health services was not questioned with a one-to-one interview with a sample selected in the study can be considered as a limitation. However, it is one of the rare studies that use genetic algorithms to explain health service satisfaction from the life satisfaction survey representing Turkey. Considering the changes that explain health care satisfaction, it is observed that the variables of hygiene status of health care providers, physical examination performed, not having problems with the doctor, short waiting list, short waiting in line without problems, not having any problems with security forces, not having problems with transportation are included in the model. It is seen that health care satisfaction is not only affected by the service provided by an institution, but also by the ease of transportation and not having problems.

Determining quality standards in health services and measuring patient satisfaction levels is very important in terms of protecting public health and improving society. Healthcare providers and managers should develop projects on this issue. Service providers who aim to increase patient satisfaction in health services should first determine the factors affecting patient's expectations and satisfaction. Hence, the essentiality of improving the performance of the service provided, repeating the satisfaction measurements at regular intervals and improving again when necessary. This result shows that quality and patient satisfaction in health care should be considered as a whole, not on a hospital basis. In other words, the fact that one or more hospitals provide quality services in a province/district does not show that an adequate level has been reached in healthcare services. A holistic approach is necessary for evaluating satisfaction in achieving socially acceptable health services. The results obtained from this study provide evidence for the results of user satisfaction through a representative sample of the national health system in Turkey and offers an example for good practices including the assessment tools that introduce the implementation of reforms.

CONCLUSION

The variables obtained in the Results reflecting healthcare satisfaction were found to be: being over 43 years of age, hygiene in the health care facility, satisfaction with the physician's physical examination, satisfaction with municipal services, having good relations with friends and relatives, being happy with life, satisfaction with public security services, digital public services and distance from the hospital. It is very important to continue planning and to allocate necessary resources for the continuation of the indicators of satisfaction with health care.

According to the results of our study, the satisfaction of citizens with general life also affects their satisfaction with the health care system. The health reform movement in Turkey has increased trust in the health system, facilitated access to medicines and health personnel, reduced waiting lists, shortened waiting times and increased health service quality. Thus, satisfaction with health care has increased. Governments (decision makers) taking measures to increase the general well-being and life satisfaction of citizens will increase trust in the health system and increase satisfaction.

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