

Contextualising Subjective Well-Being Through Happiness and Life Satisfaction: A Microdata Analysis

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Öznel İyi Oluşu Mutluluk ve Yaşam Memnuniyeti Üzerinden Bağlamsallaştırmak: Mikro Veri Analizi

Abstract

The primary aim of this study is to identify the direct and indirect factors influencing the two dimensions of subjective well-being: happiness and life satisfaction. In this context, using pseudo-panel data and path analysis, the study investigates whether happiness and life satisfaction in Türkiye vary across different socioeconomic, demographic, and environmental factors. Furthermore, it examines whether satisfaction with health and future expectations mediate these relationships and whether gender moderates them. Key findings indicate that higher education negatively influences happiness but positively affects life satisfaction, highlighting the complex interaction between educational attainment and well-being. Notably, the study reveals shifting dynamics over time: higher education initially correlates with greater happiness through improved health satisfaction and future expectations, but later correlates with lower happiness due to reduced future expectations. Moreover, age's influence on life satisfaction is mediated by health satisfaction and future expectations, suggesting the importance of addressing health and outlooks to enhance overall well-being. Policy recommendations stemming from these insights include interventions to improve healthcare access, promote healthy lifestyles, mitigate socioeconomic disparities, and enhance educational and environmental conditions.

Keywords : Subjective Well-Being, Happiness, Life Satisfaction, Pseudo-Panel, Path Analysis.

JEL Classification Codes : C15, C23, C38, I31.

Öz

Bu çalışmanın temel amacı, öznel iyi oluşun iki boyutu olan mutluluk ve yaşam memnuniyeti üzerinde doğrudan ve dolaylı etkili olan faktörleri belirlemektir. Bu bağlamda, yapılan pseudo-panel data ve path (yol) analizleri ile Türkiye’de mutluluk ve yaşam memnuniyetinin çeşitli sosyoekonomik, demografik ve çevresel faktörler çerçevesinde farklılaşıp farklılaşmadığı; mutluluk ve yaşam memnuniyetinde sağlıktan memnuniyetin ve gelecek beklentilerinin aracılık etkisinin olup olmadığı ile cinsiyetin düzenleyici bir rolünün var olup olmadığı tespit edilmeye çalışılmıştır. Temel bulgular, yükseköğrenimin mutluluğu olumsuz, yaşam memnuniyetini ise olumlu yönde etkilediğini göstererek, eğitim düzeyi ile iyi oluş arasındaki karmaşık etkileşime dikkat çekmektedir. Sonuçlar, özellikle zaman içinde bu dinamiklerin değişebildiğine işaret etmektedir: Başlangıçta yükseköğrenim, artan sağlık memnuniyeti ve olumlu gelecek beklentileri aracılığıyla daha yüksek mutlulukla ilişkilendirilirken, ilerleyen dönemde azalan gelecek beklentileri nedeniyle mutluluk azalabilmektedir. Ayrıca, yaşam

yaşam memnuniyeti üzerindeki etkisinin sağlık memnuniyeti ve gelecek beklentileri aracılığıyla dolaylı olarak gerçekleştiği saptanmış; bu da genel iyi oluşu artırmak için sağlık ve bireylerin geleceğe dair bakış açılarına yönelik müdahalelerin önemini vurgulamaktadır. Bu bulgulardan hareketle geliştirilen politika önerileri arasında sağlık hizmetlerine erişimin iyileştirilmesi, sağlıklı yaşam biçimlerinin teşvik edilmesi, sosyoekonomik eşitsizliklerin azaltılması ve eğitim ile çevresel koşulların güçlendirilmesi yer almaktadır.

Anahtar Sözcükler : Özel İyi-Oluş, Mutluluk, Yaşam Memnuniyeti, Pseudo-Panel, Path Analizi.

1. Introduction

Health is defined not only as the absence of any disease or disability but as a state of complete physical, mental and social well-being (WHO, 1948). This state of well-being is a product of biological and environmental factors and has increasingly been evaluated holistically, especially in recent years. The consideration of health as a fundamental human right and, conversely, its direct impact on human capital distinguishes the healthcare sector, making it a primary concern of public interest in all societies (Sen, 2002; Wagstaff & Van Doorslaer, 2000). In this context, health is closely related to subjective well-being. The World Health Organisation (WHO) considers subjective well-being a cornerstone of public health and, in this regard, a prominent objective of health policies in developed countries (Barger et al., 2009).

Subjective well-being has long been viewed as a philosophical debate, but recently it has become an important political objective due to its deep connections to health, human capital, and development. Subjective well-being, in general terms, can be defined as an individual's subjective evaluation of their life as desirable, enjoyable, and good (Diener, 1984). Subjective well-being is fundamentally associated with feeling good and functioning well. It involves an interaction of factors such as the individual's ability to cope with normal life stresses, feeling in control of one's life, experiencing positive social relationships, and having a sense of purpose in life (Ruggeri et al., 2020).

Discussions followed, leading to a consensus on terminology within the field. The central proposition was to adopt "well-being" as the predominant term encompassing all related measures. Traditionally, the scientific exploration of well-being has often been equated with the study of "happiness". However, this label lacks precision because it fails to fully capture the diverse range of specific states and broader dimensions of well-being. While the term "happiness" appeals to its marketability and intuitive quality, it is essential to maintain scientific rigour by accurately representing the complex nature of the subject matter. Under the preferred terminology, measures of "happiness" are confined to those that explicitly address happiness, whereas broader aspects of well-being encompass evaluations of life satisfaction and various domains, such as job satisfaction, positive emotions, and the absence of negative emotions. This distinction ensures clarity in research discourse and

aligns with the nuanced understanding that different facets of well-being may operate independently to some extent (Diener et al., 2010).

Based on this discussion in the literature, it is possible to argue that the two dimensions of subjective well-being are life satisfaction and happiness. Life satisfaction is primarily associated with the environment in which individuals position themselves and the comparisons they make. Satisfaction is significantly influenced by an individual's goals and objectives, expectations and hopes in life, reference groups, and internal and external social groups. Apart from the other parameters, life satisfaction is also correlated with emotional well-being (Berlin & Connolly, 2019). Happiness, on the other hand, is an emotional state rather than a cognitive one, distinct from satisfaction, and is influenced by individuals' positive and negative experiences. While there is a certain degree of correlation between life satisfaction and happiness, they are fundamentally distinct (Selim, 2008).

One of the fundamental reasons for investigating subjective well-being is its relationship with health and, consequently, with social/human capital and development. There is a known positive relationship between improvements in individuals' health conditions and economic growth and human capital. Human capital, by definition, encompasses all knowledge, skills, and abilities that make individuals more beneficial and productive (Başar, 2008). Particularly in developed countries, productivity increases are nourished not only by physical capital but also by significant increases in labour productivity. Therefore, human capital is considered a crucial element of both growth and development (Mushkin, 1962).

According to economists such as Mushkin (1962), Becker (1994), and Fuchs (1966), health is considered a component of human capital, while Grossman (1972) argues that health is a capital stock in itself. In this regard, health capital differs significantly from other forms of human capital. This is because an individual's accumulation of knowledge and health affects their productivity both in and out of the market, whereas an individual's health capital determines their preference between time spent in the production process and remaining time (Başar, 2008).

During the 1950s and 1960s, many developing countries achieved high per capita income figures. Despite this increase in income, the standard of living did not change in some countries. This situation is also valid from the perspective of subjective well-being. According to Appleton and Song (2008), the economic growth experienced in wealthy countries over the past 50 years has not had a significant impact on individuals' happiness in those countries. These findings in the related literature are also consistent with the Easterlin (1974) Paradox and may not exhibit the same synchrony between income and happiness across all countries (Caporale et al., 2009).

Subjective well-being is also associated with professional and personal success. It has been found that individuals with higher levels of subjective well-being exhibit greater productivity and creativity in both personal relationships and workplace settings.

Furthermore, panel data studies have demonstrated that subjective well-being is subject to intergenerational transmission mechanisms (Ruggeri et al., 2020). In this regard, the correlation between subjective well-being and performance at both the micro and macro levels, as well as its positive long-term effects on social capital, has been established (Di Tella et al., 2001).

The well-being literature has explored several central questions regarding the measurement and understanding of well-being on an international scale in recent years. These inquiries included determining the most effective methods for measuring well-being to enable comparisons across countries, assessing the variations in well-being measures among individuals and nations over time, and investigating whether the factors influencing well-being differ more within nations or among them. For instance, Inglehart (2004) measured subjective well-being using the World Values Survey and classified the rankings into four main groups (namely, high, medium-high, medium-low, and low). These rankings revealed that income and economic growth were important but not sufficient predictors for subjective well-being. Building upon these questions, the studies delved into two specific focal points. Firstly, they examined the role of certain parameters, such as income, in explaining differences in well-being within countries, across nations, and over time. Secondly, it explored whether international differences in well-being stem from shared reactions to local conditions or from culturally distinct evaluations of life circumstances. These comprehensive investigations aimed to shed light on the complex dynamics underlying global well-being and to provide insights into the factors shaping individual and societal perceptions of happiness and satisfaction. On the other hand, some studies focused mainly on internal factors and sought to analyse direct determinants of happiness and life satisfaction. In addition, some studies focused on mediating effects on happiness and life satisfaction rather than on the parameters that directly affect them. Whether focusing on direct or indirect effects, studies examined many socioeconomic and demographic factors (e.g., Frey & Stutzer, 2002; Dolan et al., 2008) and aimed to understand which factors were effective in shaping individuals' happiness and life satisfaction in that country. While the economics of happiness has been extensively studied in developed countries, empirical research on Türkiye has gained momentum with pioneering studies by Selim (2008), who investigated the socioeconomic determinants of happiness, and Dumludağ et al. (2016), who focused on the roles of income comparison in life satisfaction.

This study differs from the literature in two main points. Firstly, by separating happiness and life satisfaction, this study aims to identify the direct, mediated, and moderated effects on subjective well-being. Secondly, this study aims to investigate the direct and indirect effects on happiness and life satisfaction across a broader range of years, rather than a single year or period. The current study uses a pseudo-panel data approach to analyse direct effects on subjective well-being. Since longitudinal data covering such a broad time span for this aim are not available for Türkiye, relying solely on cross-sectional data would limit the understanding of dynamic changes over time. Therefore, constructing a pseudo-panel from repeated cross-sections would be a proper methodological choice to accurately capture long-term dynamics and overcome the limitations of single-year analyses.

To analyse mediated and moderated effects on subjective well-being, path analysis is conducted, and analyses are repeated for all examined years. Thus, it is observed whether there have been significant changes in the mediators and moderators over the years. Although some studies in the literature have utilised path analysis to demonstrate the mediating role of various variables in the model (e.g., see Lara et al., 2020; Patria, 2022), the existing literature employing the pseudo-panel data method remains relatively limited.

1.1. The Importance of Subjective Health Satisfaction, Hope and Future Expectations on Subjective Well-Being

In addition to examining various socio-economic and demographic determinants of subjective well-being, the current study places particular emphasis on subjective health satisfaction, hope, and future expectations. These factors are considered not only as direct influences on happiness and life satisfaction but also as key elements that may directly affect other variables influencing subjective well-being. In other words, individuals' health satisfaction and future expectations may also mediate the relationship between happiness and life satisfaction. For example, although many studies have shown the opposite, the literature often emphasises a U-shaped relationship between age and life satisfaction. However, when age and life satisfaction are positively synchronised, if the individual is also satisfied with their health, subjective health satisfaction may further boost life satisfaction. A similar pattern can be observed when considering hope and future expectations. The existing literature does not establish a generally accepted correlation between education level and life satisfaction. While some studies suggest that life satisfaction decreases as education level increases due to various factors, others argue the opposite. In this context, individuals' perspectives on their future may play a clarifying role. Specifically, hope and future expectations may mediate or partially mediate the relationship between education level and life satisfaction. Since self-consciousness and life expectations may increase among highly educated individuals, their future expectations and hopes may decrease relative to those of others, thereby negatively affecting their life satisfaction. This pattern may have deepened, especially in developing economies and in countries facing social and financial turbulence. In light of the exemplifications mentioned above, the current study tests both the direct and indirect effects of subjective health and future expectations. Indirect effects, in other words, mediating or partial mediating effects, are sought to be revealed with path analyses. A considerable amount of literature on subjective well-being has emphasised the importance of health and health-related subjects. The evidence reviewed here (see, for example, Okun et al., 1984; Habibov & Afandi, 2016; Ngamaba et al., 2017; and Kushlev et al., 2020) suggests a pertinent role for health satisfaction in both happiness and life satisfaction. On the other hand, numerous studies have attempted to understand the impacts of individuals' hopes and future expectations on happiness and life satisfaction. According to Snyder et al. (2005), hope includes both the will to achieve certain goals and the ways to achieve this effectively. Accordingly, hopes and expectations for the future can affect individuals' happiness and life satisfaction, both directly and indirectly. Many recent studies (e.g., Cotton Bronk et al., 2009; Hoy et al., 2013; Nie et al., 2019) have shown that future expectations mediated happiness and life satisfaction of individuals.

1.2. Moderated Role of Gender: Do the Determinants of Happiness and Life Satisfaction Differ by Gender?

This study investigates the moderating role of gender in the relationship between subjective well-being, future expectations, and subjective health satisfaction. Accordingly, one of the basic hypotheses of this study is that the direct and indirect factors affecting happiness and life satisfaction may differ across gender. While some studies indicate general similarity in the predictors of life satisfaction and happiness across genders (see, for example, Diener et al., 2000; Joshi, 2010; Della Giusta et al., 2011; Joshanloo, 2018; Fugl-Meyer et al., 2002), a significant portion of the relevant literature also highlights the moderating role of gender in the context of subjective well-being (see, for example, Inglehart, 2002; Tiefenbach & Kohlbacher, 2014; Meisenberg & Woodley, 2015; Gagne et al., 2022; Comolli et al., 2024) aligning with the hypotheses of this study.

2. Data & Methodology

2.1. Data & Pseudo-Panel Construction

This study conducts a comprehensive analysis using microdata from the Life Satisfaction Survey (LSS) datasets provided by the Turkish Statistical Institute (TURKSTAT) for the years 2004, 2017 and 2022. However, the use of data in this study is incidental to the broader aim of demonstrating the robustness and applicability of the methodological framework employed. While the dataset offers valuable insights specific to the Turkish context, the study's primary focus is not limited to these country-specific findings. Instead, it illustrates how advanced analytical methods, such as pseudo-panel data construction and path analysis, can be applied to examine subjective well-being across various contexts.

The key point of this research lies in the methodological innovations, which can be generalised to other regions, countries, and datasets. By utilising a large micro dataset, this study demonstrates how to account for both direct and indirect effects on well-being, providing a widely applicable model. The choice of Türkiye as the data source was based on availability and the time span of the LSS, but the underlying relationships among variables such as education, health satisfaction, and future expectations are not unique to Türkiye. These relationships reflect broader social and psychological processes that transcend national boundaries.

Moreover, the methodological approach used to explore mediating and moderating factors, as well as the dynamic nature of subjective well-being over time, can be applied to data from other countries. The tools used in this study are designed to uncover generalizable patterns, making them suitable for comparative analysis. This enables researchers to replicate the approach with similar datasets from different regions and achieve comparable insights.

The paper is structured around two main pillars. First, it examines the direct impact of socio-economic, demographic, and environmental factors on individual happiness and life satisfaction. In this phase, the pseudo-panel data model (PPDM) is employed to convert these cross-sectional datasets into a panel data format, facilitating panel analyses of happiness and life satisfaction trends in Türkiye. Second, the study investigates the relationships between income, age, education, environmental factors, and life satisfaction and happiness, and analyses whether health and future expectations play a mediating role and whether gender has a moderating effect. For these analyses, path analysis is utilised.

However, it is noteworthy that the inclusion of life satisfaction questions in the LSS micro datasets began only in 2017. Consequently, while the cohorts for happiness analysis span the years 2004 to 2022, the analysis specifically focusing on life satisfaction is restricted to the period from 2017 to 2022. An overview of the pseudo-panel method and path analysis is provided subsequently.

Many studies on happiness and life satisfaction rely on cross-sectional data from a single year. The main problem with this approach is that it captures only factors affecting life satisfaction and happiness in that specific year, limiting understanding of changes over time.

In addressing this methodological drawback, Deaton's work (1985) on pseudo-panel data models (PPDMs) offers a pragmatic solution. PPDMs enable comprehensive analyses even in the absence of panel datasets by aggregating cross-sectional data into synthetic panel data. This technique involves segmenting cross-sectional data into distinct clusters or cohorts, thereby emulating the dynamics of panel data across successive time periods.

One of the most important points to consider when using the PPDM is that the clustering process must be applied according to variables that do not change much over time. For instance, when applying clustering, variables such as age and gender should be selected rather than income, which is more likely to change annually (Baltagi, 2008). According to Deaton (1985), PPDM also has advantages over panel data. For example, PPDM is not affected by the attrition problem in standard panel data. The attrition problem is one of the problems encountered in longitudinal panel data. The person may initially decide to join survey and longitudinal studies; however, they may stop participating over time for various reasons (personal preference, death, etc.). Since this situation is cumulative, the loss in each period can add up to a large overall observation loss over time. This may have biased effects on the quality and validity of surveys and the results of the research. In addition, clustering cross-sectional data enables larger micro- and macro-level analyses.

2.2. Econometric Strategy: Pseudo-Panel and Path Analysis Model

To estimate the direct and indirect effects on subjective well-being, a two-stage estimation strategy is employed, combining pseudo-panel fixed effects and path analysis.

2.2.1 Analysis Direct Effects with Pseudo-Panel Data (PPDM) Models

The brief representation of PPDM is as follows:

$$Y_{it} = a + \beta X_{it} + \mu_{it} \quad i = 1, \dots, N; \quad t = 1, \dots, T \quad (1)$$

Here, i indicates the cross-section and t indicates the time dimension. Additionally, a is a scalar, X_{it} is the vector of explanatory variables for the i^{th} observation at time t , and β is the vector of parameters to be estimated. In panel data analysis, the one-way error component model, as described below, is most commonly used.

$$\mu_{it} = \mu_i + v_{it} \quad (2)$$

Here, μ_i represents specific effects that are unobserved and do not change over time, while v_{it} represents unobserved effects that vary both across individuals and over time. When the 1st and 2nd equations are combined, equation (3) is formed.

$$Y_{it} = a + \beta X_{it} + \mu_i + v_{it} \quad i = 1, \dots, N; \quad t = 1, \dots, T \quad (3)$$

In the standard panel data model, specific effects can be estimated by least squares if they are uncorrelated with the explanatory variables. On the other hand, when specific effects are correlated with explanatory variables, the fixed effects model is estimated by taking the difference between each variable and its time average. Since specific, identical units are not included in independent cross-sectional data sets, the aforementioned model cannot be used. For this reason, Deaton (1985) suggested cluster (cohort) modelling and showed that consistent estimators could be obtained in repeated cross-sectional data. Thus, the same unit effect can be achieved with clusters with common features (Kaya-Aydın, 2021). As a result of clustering all observations, equation (4) can be achieved.

$$\bar{Y}_{ct} = \bar{x}_{ct}\beta + \bar{\mu}_{ct} + \bar{v}_{ct} \quad c = 1, \dots, C; \quad t = 1, \dots, T \quad (4)$$

In this equation, c indicates the cluster (cohort) number. $\bar{Y}_{ct}$ represents the average of all individuals belonging to cluster c at time t , according to the Y . Unlike μ_i obtained from standard panel data, Equation 3, $\bar{\mu}_{ct}$ retains the subscript t to indicate that the cluster mean for each period is calculated from new and likely different individuals. This results in a potentially different value for each period. In practice, if the number of individuals in each cell is large, the assumption of ($\bar{\mu}_{ct} = \bar{\mu}_c$) is made for each t and the pseudo-panel equation is written as the fixed cluster effect $\bar{\mu}_c$ and fixed individual effect $\bar{\mu}_i$ as equation (5) (Russell & Fraas, 2005).

$$\bar{Y}_{ct} = \bar{x}_{ct}\beta + \bar{\mu}_c + \bar{v}_{ct} \quad c = 1, \dots, C; \quad t = 1, \dots, T \quad (5)$$

In the context of pseudo-panel data modelling (PPDM), the fixed effects model succeeds owing to the underlying assumption that idiosyncratic effects are orthogonal to the explanatory variables in the random effects framework. Consequently, the need for synthetic clustering, a characteristic feature of random-effects modelling, is avoided. In accordance

with this methodological framework, fixed-effects analyses are systematically conducted for both the happiness and life satisfaction pseudo-panels. This approach ensures robust control for unobserved individual-specific heterogeneity, thereby enhancing the robustness of the analyses. For clustering, age was selected in the (LSS) and the micro data sets were converted into panel format with the PPDM. In this way, the clustering process around continuous and changing data, as Baltagi (2008) noted, was avoided, and panel data were created by clustering the appropriate age variable. To ensure consistency across LSSs, data from individuals aged 18-90 were used in the study. For the clustering process, ages were grouped into three ranges, resulting in 24 cohorts. The choice of a 3-year birth interval was driven by the need to balance cohort homogeneity and sample size sufficiency. Deaton (1985) and Verbeek (2008) emphasise that the number of observations in each cohort must be sufficiently large to minimise the measurement error of cohort means. As demonstrated in Table 2 (and Appendix), this study utilises a very large dataset with sufficiently large cohort sizes. These sizes are well above the recommended thresholds for safely ignoring sampling error bias. Table 1 shows how the variables were obtained from LSS microdata sets.

Table: 1
Explanations of the Variables

Variables Name	Sub-groups	Obtained from which question	Scale of the variables
life_satisfaction	-	When you think as a whole, rate your recent life satisfaction (between 1-11)	1: not at all satisfied 11: very satisfied
happiness	-	When you think of your life as a whole, how happy are you? (between 1-5)	1: not happy to all 5: very happy
income_sat	-	Are you satisfied with your household's monthly income? (between 1-5)	1: not happy to all 5: very happy
health_sat	-	Are you satisfied with your health? (between 1-5)	1: not happy to all 5: very happy
expectations	-	When you think about the next 5-year period, how do you expect your situation to be in general? (between 1-3)	1: will deteriorate 3: will develop
education	-	What is your completed level of education?	1: No school completed or illiterate; 2: primary-secondary school; 3: high school; 4: associate or bachelor's degree 5: postgraduate
environment	houses	Are you satisfied with your residential houses? (between 1-5)	1: not happy to all 5: very happy
	district	Are you satisfied with the district where you live? (between 1-5)	1: not happy to all 5: very happy
	neighbours	Are you satisfied with the relationships with your neighbours? (between 1-5)	1: not happy to all 5: very happy
	public security services	Are you satisfied with the public security service? (between 1-5)	1: not happy to all 5: very happy

As shown in Table 1, all variables analysed were continuous. The variables presented in Table 1 (happiness, life satisfaction, etc.) are measured on Likert-type ordinal scales. Although these variables are categorical, treating them as continuous is common in the literature when the number of categories is sufficiently large (typically 5 or more) (Ferrer-i-Carbonell & Frijters, 2004). Therefore, in this study, these ordinal variables are treated as continuous to facilitate the calculation of means for the pseudo-panel construction and subsequent path analysis. To examine the impact of external environmental factors on happiness and life satisfaction, an environmental variable was constructed by aggregating

and averaging responses to questions regarding housing, district, neighbours, and public order in the datasets. Additionally, individuals' education levels were categorised into five levels.

Table: 2
Descriptive Statistics after Clustering

Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
		Happiness Analysis					Life Satisfaction Analysis			
education	456	2.144	.481	1	3.228	144	2.326	.489	1.357	3.228
environment	456	3.808	.113	3.125	4.188	144	3.809	.103	3.583	4.048
Expectations	456	2.068	.235	1	2.672	144	1.957	.162	1.659	2.539
Income_sat	456	3.015	.203	1.5	4	144	3.06	.188	2.759	3.63
Health_sat	456	3.466	.317	2.385	4.5	144	3.516	.295	2.692	4.057
happiness	456	3.518	.127	3	4.125					
life satisfaction						144	6.46	.252	5.143	7.19
age group	456	12.5	6.93	1	24	144	12.5	6.946	1	24
Year	456			2004	2022	144			2017	2022

Table 2 presents descriptive statistics for the transformed dependent and independent variables following the pseudo-panel data conversions. As shown in Table 2, individuals aged 18 to 90 were clustered into three age ranges, yielding a total of 24 clusters in both the happiness and life satisfaction analyses. To analyse the determinants of happiness and life satisfaction using PPDM fixed-effects analyses, the variables *happiness* and *life_satisfaction* were set as the dependent variables for the respective analyses, with the others as independent variables in both analyses. Detailed descriptive statistics on sample sizes, gender distributions, and education levels for each of the 24 cohorts are provided in the Appendix. These tables confirm that, despite the natural demographic decline in older age groups, sample sizes remain sufficiently large to neglect the measurement error bias inherent in pseudo-panel estimation (Deaton, 1985; Verbeek, 2008).

2.2.2. Analysing Mediated and Moderated Effects on Happiness and Life Satisfaction with Path Analysis

The PPDM fixed-effects model will reveal which factors have a statistically significant impact on happiness and life satisfaction over time. However, do these variables directly affect happiness and life satisfaction? Alternatively, do some specific factors that were at the forefront in the related literature play a mediating role? In other words, when examining the relationships between socioeconomic, demographic, and environmental factors such as income, age, education, and environment and life satisfaction and happiness, do an individual's health satisfaction and expectations for the future play a mediating role? To test whether such a relationship exists, path analysis was performed in the study.

With path analysis, estimates are produced of the magnitude and importance of hypothetical causal connections among sets of variables, which can be visualised using path diagrams. As is well known, diagrams are used in path analysis, and a brief explanation of the method is provided below.

$$M = i_M + a_1X + e_M \quad (6)$$

$$Y = i_Y + c'_1X + b_1M + e_Y \quad (7)$$

Equations 6 and 7 show the path model of Hayes (2012) with one dependent variable Y , one independent variable X , and one mediating variable M . Here, a_1 and b_1 represent indirect effects, c'_1 represents direct effects, and the total effect is shown as $c_1 = a_1b_1 + c'_1$. The direct and indirect effects of the independent variable are derived from two linear models, one of which predicted the mediating variable from the independent variable (Hayes, 2012).

Here, it also shows that i is the cutoff point, equation (5) shows that M is estimated from X , and equation (6) shows that Y is estimated from both X and M . The direct effect of X on Y is estimated by c'_1 in equation (6). Here it is shown how much a one-unit change in X affects Y , independent of the change in M . On the other hand, the indirect effect of X on Y through M is estimated by a_1b_1 . More clearly, a_1 in equation (6) represents the effect of X on M , and b_1 in equation (7) represents the effects of M , which controls X , on Y . The direct and indirect effects of X on Y are summed to give the total effect of X on Y . This total effect can also be estimated with the following regression (8):

$$Y = i_{Y^*} + c_1X + e_{Y^*} \quad (8)$$

As in this study, it is possible to test multiple mediators rather than a single mediation relationship. In this case, the effects of more than one mediating variable can be analysed using the parallel multiple mediator model. Suppose that X can affect mediators k and k can causal relations with Y . However, mediators k cannot affect each other. In this scenario, equation 9 shows the direct and indirect effects of k number of mediators M from X . As a result, the model containing all k mediators, independent variables X and dependent variable Y might be created as in equation 10.

$$M_i = i_M + a_iX + e_M \quad (9)$$

$$Y = i_Y + c'_1 + \sum_{j=1}^k b_jM + e_Y \quad (10)$$

Here, the direct effect of X is estimated by c'_1 and the specific indirect effect of X on Y through M_j is estimated by a_jb_j . There are k specific indirect effects that add up to the total indirect effect of X on Y through k variables. As in the simple model with a single agent, the total effect of X (like c_1 in equation 7) is the sum of the direct effect of X and the k specific indirect effects of X up to M . So, the total indirect effect is shown in equation (11).

$$c_1 = c'_1 + \sum_{j=1}^k a_jb_j \quad (11)$$

In other words, total indirect effects are the difference between total and direct effects, which is shown in equation (12).

$$\sum_{j=1}^k a_jb_j = c_1 - c'_1 \quad (12)$$

Before the interpretation of the drawn path diagrams, the goodness of fit must also be tested. Related literature recommends checking RMSEA (root mean square error of approximation), CFI (Comparative Fit Index), and TLI (Tucker-Lewis Index) values. Accordingly, for the path diagram to be statistically significant, the RMSEA should be less than 0.08 (Hooper et al., 2008; Kim et al., 2016; UCLA, 2022). TLI and CFI are expected to be greater than 0.90. Furthermore, to statistically test whether the identified indirect effects are significant, the Sobel test was employed (Sobel, 1982). While Path Analysis estimates the magnitude of indirect pathways, the Sobel test determines whether the mediator variable carries the influence of the independent variable to the dependent variable at a statistically significant level. The test statistic (z-value) is calculated from the path coefficients and their standard errors.

As mentioned above, this study has two mediators, namely health satisfaction and future expectations. The mediating effect of these variables on happiness and life satisfaction levels was examined with path analyses. The 2004 and 2022 LSS microdata sets were used to identify happiness mediators, whereas the 2017 and 2022 LSSs were used for life satisfaction analysis. Therefore, it is also possible to observe whether there was a significant change in mediators over the years.

Tables 3 and 4 present descriptive statistics for the datasets used in the path analyses.

Table: 3
Descriptive Statistics of the Path Analysis for Happiness

Variables	2004					2022				
	N	mean	sd	min	max	N	mean	sd	min	max
age	5950	41,23	15,84	18	90	8383	43,97	15,91	18	90
health sat	5950	3,516	0,945	1	5	8383	3,656	0,814	1	5
income sat	5950	2,781	1,051	1	5	8383	2,933	1,053	1	5
happiness	5950	3,511	0,893	1	5	8383	3,387	0,893	1	5
expectations	5950	2,301	0,698	1	3	8383	1,935	0,835	1	3
environment	5950	3,725	0,542	1	5	8383	3,777	0,509	1	5
education	5950	2,155	0,848	1	5	8383	2,658	0,998	1	5

Table: 4
Descriptive Statistics of the Path Analysis for Life Satisfaction

Variables	2017					2022				
	N	mean	sd	min	max	N	mean	sd	min	max
age	8286	43,96	16,21	18	90	8383	43,97	15,91	18	90
life satisfaction	8286	6,497	2,173	1	11	8383	6,532	2,328	1	11
health sat	8286	3,624	0,809	1	5	8383	3,656	0,814	1	5
income sat	8286	3,094	0,990	1	5	8383	2,933	1,053	1	5
expectations	8286	2,188	0,781	1	3	8383	1,935	0,835	1	3
environment	8286	3,762	0,467	1	5	8383	3,777	0,509	1	5
education	8286	2,477	0,984	1	5	8383	2,658	0,998	1	5

Table 3 shows that individuals' average happiness levels and their hopes and expectations for the future decreased in 2022 compared to 2004. On the other hand, average health satisfaction levels, income and environment have increased. When the two reference periods are compared, the average education levels and ages of the individuals included in the study are higher in 2022.

When the average data for individuals in the study for 2017 and 2022 were compared, it was observed that their life satisfaction and satisfaction with health and the environment increased. However, satisfaction with income and expectations for the future decreased in 2022.

3. Results

This section first presents the results of the PPDM analysis, which directly examines factors influencing happiness and life satisfaction, followed by the results of the path analysis, which assesses indirect effects.

3.1. Pseudo-Panel Data Analyses Results

Table: 5
PPDM Fixed Effects Analyses Results

Variables	Happiness	Life Satisfaction
education	-0.143*** (0.0282)	0.479* (0.237)
environment	0.301*** (0.0723)	0.203 (0.493)
income_sat	0.240*** (0.0366)	0.781** (0.267)
health_sat	0.197*** (0.0377)	0.451 (0.276)
expectations	0.296*** (0.0291)	0.0655 (0.217)
Constant	0.658* (0.267)	0.470 (1.925)
Observations	456	144
Number of cohorts (age group)	24	24

*Standard errors in parentheses. * $p < .05$, ** $p < .01$, *** $p < .001$.*

Table 5 presents the outcomes of the fixed-effects analyses conducted within the PPDM framework for both happiness and life satisfaction. Notably, the happiness analysis yielded statistically significant results for all independent variables examined. Specifically, a negative correlation emerged between individuals' education level and happiness, suggesting that happiness decreases with higher educational attainment. Conversely, a positive association was observed between individuals' happiness and their satisfaction with the living environment, household income, satisfaction with health, and positive outlook towards the future. These findings indicate that higher satisfaction with one's living environment, higher household income, greater satisfaction with health, and optimistic expectations for the future are associated with higher levels of happiness.

In contrast, the examination of life satisfaction revealed statistically significant associations solely with education and income levels. The fixed-effects analysis within the PPDM framework shows that as individuals' educational attainment and household incomes increase, life satisfaction increases in parallel.

The PPDM analyses underscored direct determinants influencing both happiness and life satisfaction. However, the mediation hypotheses regarding the indirect effects of

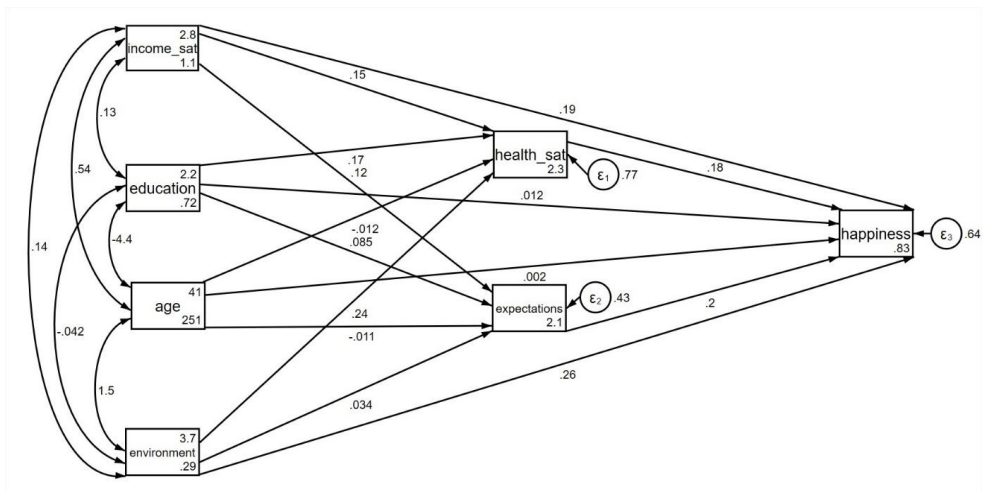
individuals' satisfaction with their health and expectations for the future remained unexplored. To address these mediation dynamics, a subsequent examination employing path analysis was undertaken.

3.2. Path Analyses Results

3.2.1. Happiness Analysis Results

LSS 2004 and 2022 microdata sets were used to determine whether health satisfaction and expectations for the future have a mediating role on individuals' happiness levels. In this way, the aim was to observe whether the mediation effect has changed over the years.

Figure: 1
Happiness Analysis Path Results for 2004



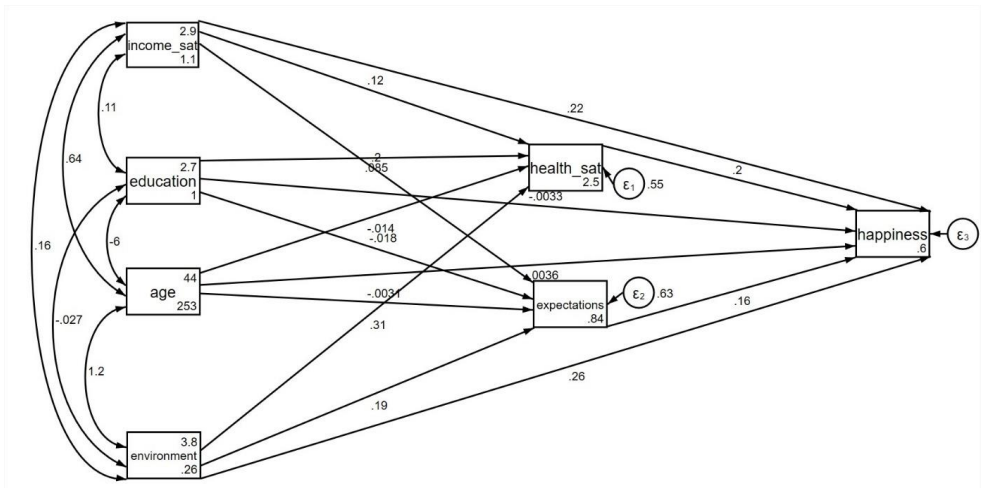
The findings of the path analysis, which examined the mediating effects of health satisfaction and future expectations on the associations between individuals' income, educational attainment, age, satisfaction with their environment, and happiness in 2004 and 2022, are illustrated in Figures 1 and 2, respectively. Notably, the goodness-of-fit indices of the path models were significant (RMSEA: .07, CFI: .99, and TLI: .85 for 2004; RMSEA: .05, CFI: .99, and TLI: .92 for 2022).

The results of the path analyses show that health satisfaction and future expectations served as mediators in the relationship between educational attainment and happiness. A direct correlation between educational level and happiness was not observed in either 2004 or 2022. Instead, the analyses revealed an indirect effect whereby increases in educational attainment were associated with higher levels of health satisfaction and future expectations, thereby elevating individuals' happiness in 2004 due to the positive trend in these mediators.

However, in 2022, the mediation effects of future expectations between education and happiness shifted: increases in educational level were associated with decreases in future expectations, which in turn led to declines in individuals' happiness.

Furthermore, health satisfaction was identified as a partial mediator in the relationships between income, age, satisfaction with the environment, and individuals' happiness levels in 2004, as evidenced by Sobel test statistics of $Z=10.635$, $Z=-16.35$, and $Z=9.07$, respectively. Similarly, future expectations were found to have partial mediating effects on the relationships between income satisfaction, age, environmental satisfaction, and individuals' happiness levels in 2004, with Sobel test values of $Z=9.38$, $Z=-12.50$, and $Z=2.07$, respectively. These findings underscore the interplay among the principal variables, shedding light on the intricate mechanisms that underlie the determinants of happiness.

Figure: 2
Happiness Analysis Path Results for 2022

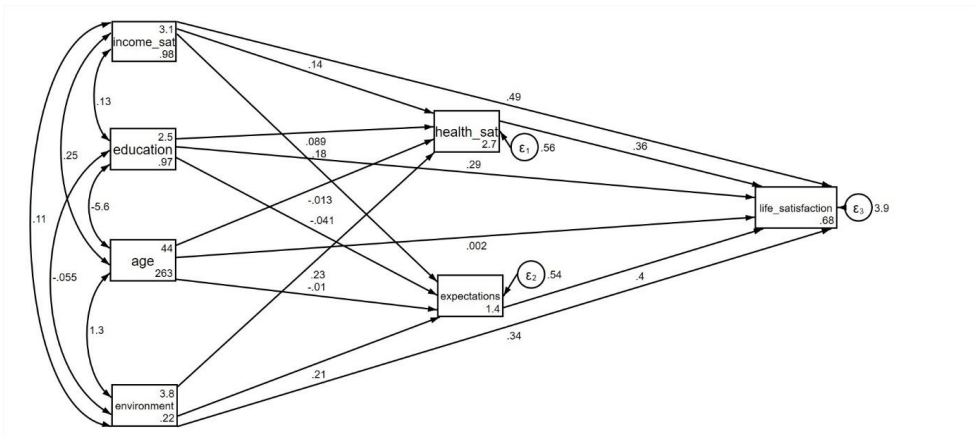


In Figure 2, the depicted findings show the role of health satisfaction as a partial mediator in the relationships between individuals' income satisfaction (Sobel test score: $Z=11.10$), age ($Z=-14.23$), satisfaction with their environment ($Z=12.67$), and happiness levels in the year 2022. Simultaneously, the examination of mediating effects on future expectations revealed a significant partial mediation. Specifically, future expectations emerged as a substantial mediator between income (Sobel test score: $Z=12.52$), age ($Z=-4.95$), satisfaction with the environment ($Z=8.49$), and individuals' happiness levels. These Sobel test scores provide quantitative evidence of the mediating roles of health satisfaction and future expectations.

3.2.2. Life Satisfaction Analysis Results

With the main goal of identifying the potential mediating roles of health satisfaction and future expectations in individuals' life happiness, path analyses were conducted using the Life Satisfaction Survey (LSS) microdata for 2017 and 2022. We decided to use the 2017 LSS dataset because, as we discussed in earlier sections, the explicit question on life satisfaction levels was added to the full LSS administration for the first time in 2017. Through iterative path analyses of the 2017 and 2022 datasets, the study sought to determine whether significant changes in the mediator effects occurred between 2017 and 2022.

Figure: 3
Life Satisfaction Analysis Path Results for 2017



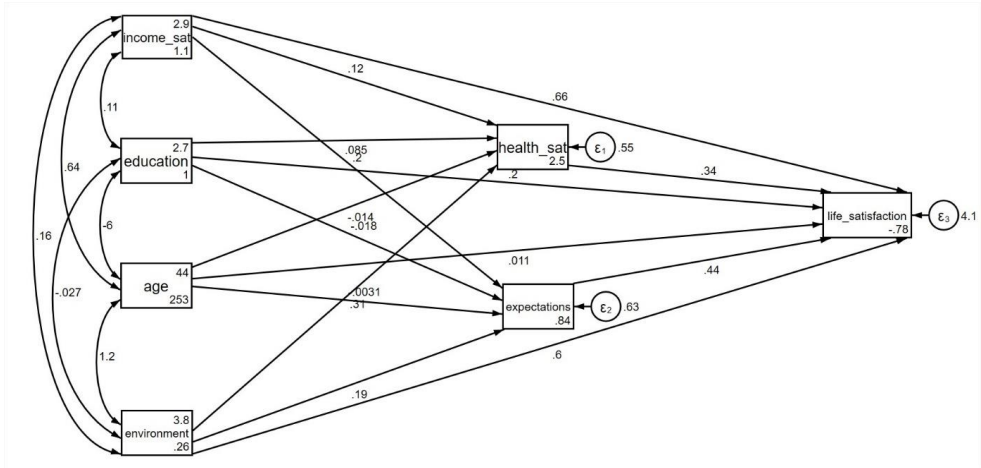
The path analysis's schematic depiction is shown in Figure 3, where the goodness of fit indices yielded statistically significant values (RMSEA: .05, CFI: .99, and TLI: .93). The ensuing analysis unveiled the robust mediating roles of health satisfaction and future expectations in the relationship between age and individuals' life satisfaction.

Interestingly, the findings emphasise the absence of a direct association between age and life satisfaction. However, an important indirect effect was observed: advancing age was correlated with diminished health satisfaction and future expectations, resulting in a decline in individuals' life satisfaction in 2017.

Additionally, a partial mediation analysis was conducted between health satisfaction and financial satisfaction (Sobel test score: $Z=9.96$), education ($Z=7.71$), environmental satisfaction ($Z=8.89$), and people's life satisfaction. In a similar vein, future expectations were found to be a partial mediator between people's levels of life satisfaction and their wealth ($Z=8.98$), education ($Z=7.42$), and environmental satisfaction ($Z=8.61$). These Sobel test results provide quantitative evidence of the mediating roles of health satisfaction and

future expectations in explaining the complex interactions among socioeconomic variables, environmental perceptions, and people's subjective well-being.

Figure: 4
Life Satisfaction Analysis Path Results for 2022



The path diagram for the 2022 life satisfaction analysis is shown in Figure 4. Goodness of fits of the analysis were found significant (RMSEA: .05; CFI: .99, and TLI: .92). In contrast to the findings observed in 2017, as presented in Figure 2, the mediating roles of health satisfaction and future expectations in the relationship between age and life satisfaction transitioned to partial mediation effects in the subsequent analysis. Notably, life satisfaction also partially mediated the effects of income (Sobel test score: $Z=8.98$), education ($Z=7.42$), and satisfaction with the environment ($Z=9.76$) on individuals' overall life satisfaction in 2022.

Similarly, future expectations were identified as partial mediators between income ($Z=12.91$) and satisfaction with the environment ($Z=8.61$) in influencing individuals' life satisfaction levels during the same temporal epoch. However, no discernible mediating effect of future expectations was observed in the relationship between education and life satisfaction in 2022.

These findings highlight the nuanced evolution of mediating dynamics over time, revealing shifts in the relationships among socio-economic factors, environmental perceptions, and individuals' subjective well-being across different temporal contexts.

4. Discussion and Conclusion

The primary objective of this study is to investigate the factors influencing subjective well-being, considering both individual and structural components. Beyond identifying

these factors, the study also aims to explore the mediating and moderating variables involved and to track their evolution over time. A key methodological contribution is the application of the pseudo-panel data method and path analysis, tools commonly utilised in other disciplines but less frequently applied in well-being research. These methods allow for a more detailed analysis of both direct and indirect effects, using a large micro dataset.

By employing these methods, this study uncovers the complicated relationships between education, happiness, and life satisfaction. The main findings indicate that higher levels of education have a negative impact on happiness but a positive effect on life satisfaction. This finding suggests that while higher education might not necessarily increase happiness, it could contribute to greater life satisfaction. This could be due to various factors, such as higher levels of education providing individuals with more opportunities, a sense of accomplishment, or a greater ability to navigate life's challenges. Understanding these nuances can be crucial for policymakers and educators when designing programs aimed at improving well-being. In the existing literature, while some studies may suggest that education has little influence on happiness (e.g., Layard, 2005; Michalos, 2017), others indicate a more nuanced relationship where education can impact life satisfaction positively, even if its effect on happiness is less clear or negative (e.g., see Shields et al., 2009; Veenhoven, 2010). These varying perspectives highlight the complexity of the issue and the need for further research to understand the mechanisms at play. On the other hand, the decrease in happiness associated with increased education can also be considered in light of the theory advanced by Graham and Pettinato (2002). According to this theory, education raises individuals' expectations and aspirations regarding income, social status, and job quality. However, in developing economies or during periods of economic fluctuation, structural constraints such as high unemployment rates among graduates or mismatches between skills and wages can prevent the realisation of these aspirations. Based on this theory, the inverse relationship between education and happiness in Türkiye can be discussed within this framework.

Perhaps most importantly, one key aspect is to explore the mediators underlying the effects observed in studies of factors influencing happiness and life satisfaction. This involves identifying the variables that indirectly influence the relationship in question, as well as their changes over time. In this regard, the path analysis results reveal that educational attainment indirectly influences happiness through health satisfaction and future expectations. In 2004, higher education was linked to greater health satisfaction and future expectations, which in turn increased happiness. However, by 2022, this relationship changed, with higher education now associated with lower future expectations and decreased happiness. Furthermore, the path analysis results for life satisfaction indicate that health satisfaction and future expectations mediate the relationship between age and life satisfaction. While age itself is not directly linked to life satisfaction, older age is associated with lower satisfaction with health and future expectations, leading to reduced life satisfaction. Additionally, health satisfaction and future expectations partially mediate the relationship between income, education, satisfaction with the environment, and life satisfaction. Based on these findings, policy recommendations could include interventions

to improve health satisfaction and foster positive future expectations among the population. This could involve initiatives to enhance healthcare access and quality, promote healthy lifestyles, and support individuals in planning and achieving their future goals. Additionally, policies that address socio-economic disparities and improve educational and environmental conditions may help enhance overall life satisfaction.

These findings have important implications for both methodological and practical applications. Methodologically, the study illustrates how pseudo-panel data and path analysis can be used to capture temporal changes in subjective well-being and its determinants, even when longitudinal data are unavailable. This approach is especially useful in research fields that rely heavily on cross-sectional data, providing a framework for assessing the impact of time without requiring extensive longitudinal datasets.

While the findings in this study stem from a specific dataset, the methods employed are broadly applicable. Researchers can implement similar methodological frameworks across different contexts and countries to analyse subjective well-being and other complex social phenomena. By doing so, they can compare the factors influencing well-being across various regions and identify both universal and context-specific variables. This methodological flexibility makes the study's approach highly valuable for future well-being research.

While the findings are intriguing and provide valuable insights, the study is subject to certain limitations. One of these is the potential for response bias in survey-based studies, particularly in a study with such a subjective and relative subject matter. Respondents may provide inaccurate or biased information, either intentionally or unintentionally. This can occur due to social desirability bias, in which respondents provide answers they believe are socially acceptable, or due to recall bias, in which respondents may not accurately remember past events. Second, specific to this study, because data on happiness and life satisfaction in Türkiye are cross-sectional and lack a longitudinal dimension, a pseudo-panel had to be constructed to account for the effect of time on missing information.

A recommendation for future studies is to compare the findings of this study with those from other countries or regions. Such comparisons could provide valuable insights into the factors influencing happiness and life satisfaction across different contexts. This approach could help identify universal factors.

In conclusion, the main contribution of this study lies in its methodological advancements, particularly the use of pseudo-panel data and path analysis to explore subjective well-being. While the data provide valuable insights, the methodological framework offers a robust tool for analysing complex relationships in the absence of longitudinal data, making it a key asset for researchers in this field. Future studies may benefit from replicating these methods in diverse contexts to uncover further the factors that shape happiness and life satisfaction globally.

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Appendix: Detailed Descriptive Statistics of the Constructed Cohorts

Table: A1
Descriptive Statistics by Cohorts for Happiness Analysis (2004-2022)

age_group	age	age (mean)	women %	education (mean)	N_sample
1	18-20	18,97	57,19	2,51	14942
2	21-23	22,06	57,50	2,72	15682
3	24-26	25,02	56,43	2,80	17334
4	27-29	28,01	57,43	2,72	17909
5	30-32	31,00	55,89	2,68	19352
6	33-35	34,00	55,51	2,61	19730
7	36-38	37,00	55,09	2,53	18685
8	39-41	39,97	53,87	2,42	18895
9	42-44	42,96	53,60	2,37	17535
10	45-47	45,99	53,30	2,29	16414
11	48-50	49,00	53,03	2,22	16650
12	51-53	52,04	51,01	2,19	14542
13	54-56	54,98	51,18	2,13	13167
14	57-59	57,94	49,71	2,08	12582
15	60-62	60,87	50,65	1,98	10534
16	63-65	63,99	50,74	1,87	10092
17	66-68	66,99	51,20	1,82	7389
18	69-71	69,97	51,76	1,73	6142
19	72-74	72,95	50,92	1,66	5114
20	75-77	75,84	52,76	1,55	4318
21	78-80	79,10	50,67	1,50	3276
22	81-83	81,93	47,90	1,47	1933
23	84-86	84,84	53,03	1,42	1137
24	87-90	87,69	54,36	1,43	447

Table: A2
Descriptive Statistics by Cohorts for Life Satisfaction Analysis (2017-2022)

age_group	age	age (mean)	women %	education (mean)	N_sample
1	18-20	18,94	48,16	2,67	2631
2	21-23	22,03	52,47	2,92	2733
3	24-26	25,03	52,17	3,03	2902
4	27-29	28,01	54,17	3,02	3120
5	30-32	31,00	51,73	2,97	3120
6	33-35	34,01	51,14	2,89	3189
7	36-38	37,02	51,66	2,75	3370
8	39-41	39,98	49,93	2,70	3459
9	42-44	42,99	51,97	2,64	3244
10	45-47	45,99	50,15	2,49	3055
11	48-50	48,95	48,76	2,40	2820
12	51-53	52,01	48,60	2,34	2570
13	54-56	55,00	47,79	2,30	2534
14	57-59	57,97	47,59	2,27	2198
15	60-62	60,96	47,50	2,19	1939
16	63-65	64,01	49,07	2,10	1771
17	66-68	66,99	48,98	2,01	1472
18	69-71	69,93	48,47	2,01	1207
19	72-74	72,91	48,78	1,91	941
20	75-77	75,89	51,59	1,83	692
21	78-80	78,88	52,16	1,68	462
22	81-83	81,88	49,83	1,62	291
23	84-86	84,88	50,91	1,56	220
24	87-90	87,73	46,15	1,51	104

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