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RESEARCH PAPER

Estimating the Trend in Health Time Preference Rate (A Case Study of High-Income Countries)

Raziyeh Mohammadi Saber[a], Abbas Assari Arani[a,*], Amirhossein Mozayani[b], Lotfali Agheli[b]

a. Department of Economic Development and Planning, Faculty of Management and Economics, Tarbiat Modares University, Tehran, Iran
b. Economic Research Institute, Tarbiat Modares University, Tehran, Iran
* Corresponding author, E-mail: assari_a@modares.ac.ir

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Abstract

People's behavior is related to their time horizon. As people's time preference rate increases, planning becomes increasingly myopic. This study employs the MIMIC model to evaluate the shifts in the health-related time preference rate in several developed countries (France, Sweden, Netherlands, Switzerland, United States, Australia, Germany, Canada, Norway, and United Kingdom) between 2000 and 2019. The results show that the time preference rate for health has different trends, regarding the slope and intercept of the changes. These differences show the different effects of the policies implemented in the field of health on people's attitudes toward healthier living in the future. In France, the trend in time preference rates for health is downward with a small slope, in Sweden, and the US, whereas it is downward with a large slope in the Netherlands and Switzerland. Due to the severity of the changes in the slope of time preference rates for health, people in the Netherlands and Switzerland are more concerned about and invested in improving their health. The time preference rate for health has an upward trend in Australia, Germany, and Canada, and its slope is higher in Germany and Australia. Therefore, people prefer the interests of the present to the future in these three countries. In Norway and the UK, this trend has a constant slope, implying that people's attitudes have insignificantly changed toward health-related behaviors.

Keywords: Time Preference, Health, High-Income Countries, MIMIC Model.
JEL Classification: D91, I1, F00, C30.

1. Introduction

Individual attitudes towards risk shape a broad set of decisions relating to important outcomes such as savings and investments, occupational choice and labor supply, retirement decisions, insurance and health services purchase, health behaviors, and lifestyles (Banks et al., 2019). These decisions despite the limited resources available and to obtain the maximum benefit, sometimes have only short-term effects and in some cases, their effects are shifted to the future. The question

of whether a person's choice is to achieve more benefits in the present or the future relates to the concept of time preference. Usually, when one chooses to wait, it is because through waiting, one may be able to receive a larger reward. Standardly defined, time preference is the amount of future utility that is equivalent to the current utility of consuming a good or service (Lawless et al., 2013). Information on individuals' time preferences could help to understand health-affecting behavior and therefore be valuable for the design of policies for the promotion of health (Cairns And Van Der Pol, 1999).

The majority of theoretical models assume that risk preferences are time-invariant but such a view has been challenged by the empirical literature which shows that risk preferences may vary substantially over the life cycle (Chuang and Schechter, 2015; Schildberg-Horisch, 2018). Experimental findings show individuals oriented to the long term have lower time preferences and will adapt their behavior in the present to gain a potential benefit in the future. On the other hand, individuals who have relatively short time horizons and think more in the short term, tend to be more distrustful and untrustworthy, impolite, unpleasant, and bad-mannered (Howden et al., 2016). Thus, behaviors such as healthy eating, exercising, little or no drug use, etc., that improve a person's health in the future are associated with people with lower time preference, and risky behaviors such as smoking, excessive alcohol use, drug use, tattoos that put the person's health at risk in the future are associated with people with higher time preference.

It should be noted that understanding health time preferences is critical to understanding public health policy. For example, high time discount rates contribute to governmental emphasis on acute care, rather than preventative care. Of course, there are facets of governmental policy other than time preferences that can further complicate public policy decision-making. Subsidizing treatments and fee-based systems contribute to inefficiency through the overuse of some treatments and overconsumption of treatments in general, respectively. Understanding these interplaying factors can help frame the discussion of public policy (Watts and Segal, 2009). Therefore, by examining people's attitudes toward their current, past, and future health, the study of health time preferences not only reveals differences in health-related behaviors but also plays a prominent role in the policy process.

In this study, our objective is to estimate the health time preference (HTP) rate, which is considered a latent variable. Consideration of health as a variable and examination of time preferences associated with it has gotten less attention in existing studies. Consequently, the analysis of people's preferences in the sphere of health through time might reveal new dimensions of the amount of attention and the nature of the collective attitude towards the issue of health in the countries under study. First, we provide an overview of the theoretical foundations of the

time preference rate. Second, we use different time preference rate indicators in estimating the health time preference rate (HTP). Thus, the framework fits the Multiple Indicator Multiple Cause (MIMIC). Since there are many observed indicators of latent performance, the measurement equations (in the multiple indicator part of the model) link these observed indicators to the latent performance measure. Third, the data and model structure are described, and finally, the results of model estimation for the countries under study are analyzed.

2. Theoretical Literature

Time preferences have been studied from such diverse perspectives as cognitive psychology, economics, and psychiatry, and yet, time preferences have a rich underlying theory, they are associated with many other variables (Chao et al., 2009). The first economists to look at the details of time preferences were Rae (1834), Böhm-Bawerk (1891), Ramsey (1928), Fisher (1930), Samuelson (1937), and Mises (1996). Interest in calculating people's temporal preferences grew after the discounted utility model of the 1930s, and economists and psychologists began to determine temporal preferences experimentally in the early 1980s.

In general, economic theories on the rate of time preferences can be considered in two main categories. While the traditional economic theory has assumed that individual preferences are fixed (Stigler and Becker, 1977), there is empirical evidence showing they can change (Cen et al., 2022) The traditional view partially, was enriched with the first mathematical model in 1928 when Ramsey published the well-known paper "A Mathematical Theory of Saving" (Rotschedl et al., 2015). Ramsey explains the relationship between the marginal product of capital and the subjective discount rate (ρ) and the real interest rate (r) and assumes that the subjective discount rate (ρ) is constant. In addition, he assumes that all agents are the same (Ramsey, 1928: 556). After Ramsey, others also developed discounting theory by considering various hypotheses, including Fisher (1930), Samuelson (1937), Ainslie (1975), Herrnstein (1981), Loewenstein and Prelec (1992). Another view is based on the tenet that individuals maximize utility functions in the life- cycle that are representations of preferences, given some constraints (Horn and Kiss, 2020). Maximizing the expected utility function causes people to rationally devalue consumption in periods of low expected felicity, that is, discount future consumption (Trostel and Taylor, 2001). To be more precise, in the early stage of the life cycle, the capacity to enjoy consumption may be expected to rise. Hence a young individual's discount rate may be negative. For more explanation of this point of view, pay attention to Figure 1:

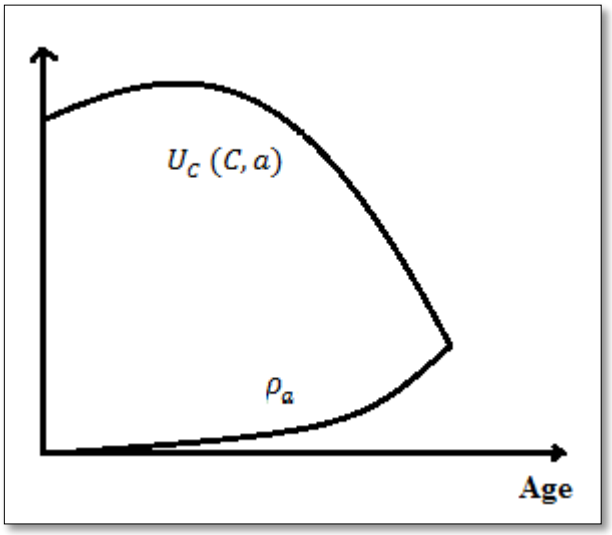

Figure 1. Life-cycle Marginal Felicity and Time Preference Functions
Source: Research finding.

Figure 1 illustrates this possibility with a hypothetical adult life-cycle marginal felicity function for a given level of consumption, $U_C\ (C, a)$(C denotes consumption and a denotes age), and its corresponding discount rate function, ρ_a. Usually, the ability to enjoy consumption eventually deteriorates over the life cycle along with other abilities (Trostel and Taylor, 2001) and the changes in the ability to enjoy consumption can also affect the rate of time preference, as illustrated in Figure 1. Based on this perspective, the purpose of this study is to examine the trajectory of change in the rate of health time preference for several developed countries through time.

2.1 Theoretical Literature of Health Time Preference

People make intertemporal decisions and express preferences in various domains, including health. Interest in extracting temporal health preferences has grown rapidly since the early 1990s. Earlier, Becker (1964) developed the theory of human investment and Grossman (1972) applied this theory to health, providing a good framework for thinking about health behaviors (Fuchs, 1986). Drummond et al. (1986) note the claim that health benefits are not reinvestable in the way that cash flows are, but counter this by pointing out that pure time preference is not necessarily concerned with the scope for reinvestment, and that "in any case, it is possible to think of individuals trading the quality of life through time; that is, making sacrifices now in return for healthy time later" (Cairns, 1992). Fuchs and Zeckhauser (1987) stress that it is the value of health benefits that should be discounted and argue that If we fail to discount, or do not take account of changing valuations, we will be taking Pareto-dominated actions.

In general, there are two main reasons for the importance of extracting health time preferences in studies: “Concerns about appropriately accounting for time in economic evaluations” and “the desire to better understand behaviors related to health care and personal health.” The literature on time preference for health has developed innovative ways to respond to specific challenges posed by the unique nature of health. The health sector has also shown a tendency to explore a broader range of basic models compared to the monetary sector.

2.2 A Brief Review of the Empirical Studies

A review of the literature shows that many studies of time preferences in health care have been conducted in recent years, and they differ in many ways. These differences can be attributed to the way time preferences are extracted (Fuchs, 1980; Olsen, 1994; Cairns and Van der Pol, 1997; Frederick et al., 2002; Lawless et al., 2013; Cen et al., 2021), the type of time preferences (individual or social) (Lipscomb, 1989; Horowitz and Carson, 1990; Cropper et al., 1991; Cairns, 1992; MacKeigan, 1993; Robberestad, 2005; Rotschedl et al., 2015), the period studied (at a specific time or over a specific period), and the countries studied (Robberestad, 2005; Cen et al., 2021).

Most of these studies have identified time preferences by collecting information using a questionnaire and then applying different methods to estimate individual or social time preferences about health (Redelmeier and Heller, 1993; Olsen, 1994; Cairns, 1994; Cropper et al., 1994; Chapman and Elstein, 1995; Chapman, 1996; Johannesson and Johansson, 1996; Chapman and Coups, 1999; Lazaro et al., 2002; Robberestad, 2005; Khwaja et al., 2007; Hardisty and Weber, 2009; Attema et al., 2012; Attema and Versteegh, 2013; Attema and Brouwer, 2013; van der Pol et al., 2015; Bleichrodt et al., 2016; Galizzi et al., 2016). However, some studies have estimated time preferences using data from databases (van der Pol and Cairns, 1999; Cen et al., 2021).

This study, using data collected by the World Bank for several high-income countries, based on the theoretical foundations of time preference and using the MIMIC model, seeks to estimate the evolution of time preference rates in health in the countries studied from 2000 to 2019. Considering time preference in health as a latent variable and developing a model to explain it, and finally predicting this latent variable over a period for a set of countries is the distinctive feature of this study. A comparison of the trends identified for the time preference rate of health in the countries under study can describe the behaviors related to the health of individuals and the importance of health to them in the future. Knowledge of these behaviors can also help policymakers tailor health policies to meet the needs of individuals.

3. Methods

The MIMIC model explains the relationship between observable variables and an Unobservable variable by minimizing the distance between the sample covariance matrix and the covariance matrix predicted by the model. The observable variables are divided into causes of the latent variable and its indicators (Buehn and Schneider, 2008). It consists of two sets of equations, which are:

$$\eta_t = \gamma' X_t + \varsigma_t \quad (1)$$

$$y_t = \lambda \eta_t + \varepsilon_t \quad (2)$$

Equation (1) is the structural equation model, where $x_t' = (x_{1t}, x_{2t}, \dots x_{qt})$ is a (1*q) vector of time series variables as indicated by the subscript t. Each time series $x_{it},\ i = 1, \dots q$ is a potential cause of the latent variable η_t. $\Upsilon' = (\Upsilon_1, \Upsilon_2, \dots \Upsilon_q)$, $a\ (1 * q)$ vector of coefficients in the structural model describing the "causal" relationships between the latent variable and its causes. The error term ςt represents the unexplained component. E(η_t)=E(X_t)=E(ς_t)=0 and E($X_t \varsigma'_t$)=E($\varsigma_t X'_t$)=0. The variance of ςt is abbreviated by ψ and Φ is the (q*q) covariance matrix of the causes X_t.

Equation (2) is the measurement model which represents the link between the latent variable and its indicators, i.e. $y'_t = (y_{1t}, y_{2t}, \dots \dots y_{Pt})$ is a (1*p) vector of individual time series variables $\varepsilon_{jt}, j = 1, \dots \dots, p$ is a (1*p) vector of disturbances where every $\varepsilon_{jt}, j = 1, \dots \dots, p$ is a white noise error term. Their (p*p) covariance matrix is given by Θε. The single $\lambda_j, j = 1, \dots \dots, p\ in\ the\ (p * 1)$ vector of regression coefficients λ, represents the magnitude of the expected change of the respective indicator for a unit change in the latent variable. it is assumed that the error terms in the measurement model do not correlate either to the causes X_t or to the latent variable η_t, hence, $E(X_t \varepsilon'_t) = E(\varepsilon_t X'_t) = 0\ and\ E(\eta_t \varepsilon'_t) = E(\varepsilon_t \eta'_t) = 0$. A final assumption is that the ε_t s do not correlate to $\varsigma_i, i.e. E(\varepsilon_t \varsigma'_t) = E(\varsigma_t \varepsilon'_t) = 0$.

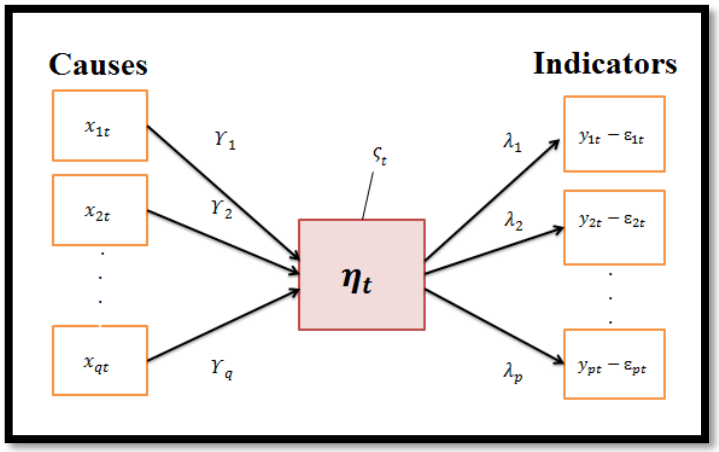

Figure 2. General Structure of the MIMIC
Source: Research finding.

From Equations (1) and (2) and making use of the definitions, we can derive the MIMIC model's covariance matrix Σ. The model's covariance matrix is given by:

$$\Sigma = \begin{bmatrix} \lambda(\Upsilon'\Phi\Upsilon + \psi) + \Theta\varepsilon & \lambda\Upsilon'\Phi \\ \Phi\Upsilon\lambda' & \Phi \end{bmatrix} \quad (3)$$

where Σ is a function of the parameters λ, γ and the covariances contained in Φ,Φ_ε, and Ψ This matrix describes the relationship between the observed variables in terms of their covariances. Decomposing the matrix derives the structure between the observed variables and the unobservable, latent variable, here, the health time preference rate.

Before the review of data and the research model, first, we will look at the factors affecting the time preference rate, and then by generalizing this relationship to the field of health, we will review the proposed model.

3.1 Factors Affecting Time Preference

Several factors can affect the time preference rate, including Personal, Biological, Environmental or external and institutional factors. In the following, a brief explanation of each factor will be provided.

Table 1. Factors Affecting the Time Preference Rate

Factors	Description
Personal	Purely subjective and individual valuations: individual preferences. A worrier constantly concerned with the future can be said to have a low time preference but the hedonist living in the moment has a very high time preference (Howden et al., 2016).
Biological	As time is scarce owing to the finite nature of human life, an individual's time preference differs from another is depending on how scarce their remaining life is. Children typically have extremely high rates of time preference, as illustrated by their generally low ability to delay present consumption for a much greater future amount (Mischel et al., 1972; Shoda et al., 1990).
skills	Many studies show that non-cognitive skills are important determinants of educational attainment. The evidence in the literature suggests that there is a positive relationship between patience and educational attainment (Horn and Kiss, 2020).
Environmental or external	1. Events in neither an actors' physical environment whose outcome he can directly nor indirectly control (Hoppe, 2001). (Since they are out of the actors' control, they only affect his time preference insofar as they are expected, and they can be divided into positive and negative events.)
	2. The general conditions in which an individual finds himself (Howden et al., 2016). (The relative certainty of the environment that surrounds the actor in a stable and more certain environment the future is more easily planned for, and thus the time preference rate will tend to be lower. The more uncertain the surrounding environment is, the higher the time preference would tend to be.)
Institutional	Time preference is closely related to the concepts of certainty and uncertainty. While perceived increases in uncertainty also increase an individual's time preference, alert entrepreneurship within effective institutions can combat this effect (Howden et al., 2016).
Economic	Constant and ongoing inflation will have the effect of reducing both present income and future income and will raise time preference rates and shift time preference scales upwards. There are various examples that show that time preference is associated with unemployment and income (Howden et al., 2016).

4. Data and Model

In this study, World Bank data for a set of high-income countries were used to determine the trend of time preference rate in health. The model used in the study is the MIMIC model, which is constructed as follows.

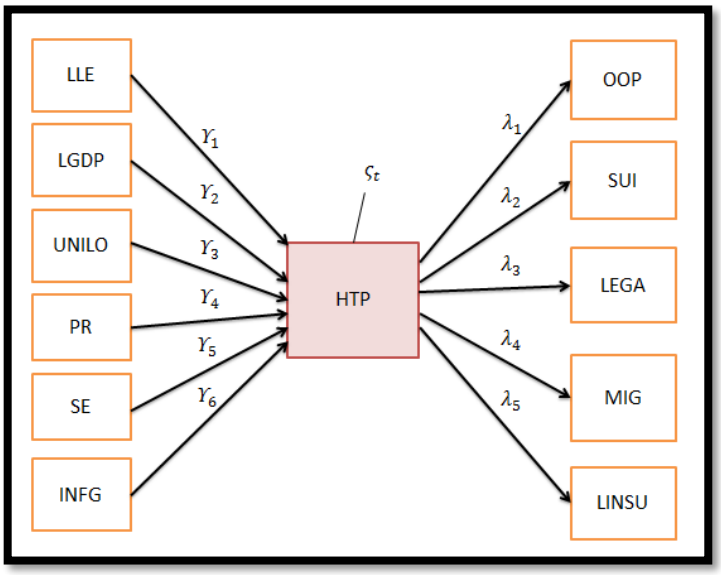

Figure 3. The Structure of MIMIC Model
Source: Research finding.

In the research model, the hidden variable is the health time preference rate (HTP). The variables used in our study are divided into two major categories: Indicator variables and causal variables. The causal variables are LLE (the logarithm of life expectancy), LGDP (logarithm of per capita income), UNILO (unemployment rate), PR (political risk rating), SE (enrollment, tertiary–% gross), INFG (inflation, GDP deflator) and the indicator variables are OOP (out-of-pocket expenditure–% of current health expenditure), SUI (suicide mortality rate–per 100.000 population), LEGA (prosperity index), MIG (migration rate), and LINSU (life insurance premium rate).

The countries studied are several high-income countries according to the World Bank classification, namely Australia, Canada, France, Germany, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, and the United States. The study period is from 2000 to 2019 and the data are collected from the World Bank.

The theoretical relationship between the variables affecting the health time preference rate is as follows:

- The increase in per capita income in a society can decrease the rate of health time preference because the future becomes more important to people (in this case, people will not only care about satisfying their needs in the present and will be more sensitive to thinking about the future), thus increasing the desire to invest in health. Higher per capita income will therefore lead to more accurate assessments of the future and more rational health decisions;
- High inflation in society will increase people's impatience to convert their future income into consumption. Thus, inflation may lead people to pay less

attention to health and invest less in improving it, and people may prefer the present to the future in their mental evaluation;

- Experimental studies of the relationship between unemployment and health-related behaviors show mixed results. For example, a 2014 study by the National Bureau of Health Research in the United States found that unemployment led to a slight increase in physical activity, a moderate decrease in smoking, and a significant decrease in physical activity. Another study from the University of Hugo in Japan of men in their 20s and 40s found that unemployment had no effect on smoking or diet, but did have an effect on physical activity and increased rest. Therefore, it is not possible to express a definite relationship between unemployment and health-related behaviors and, consequently, the time preference rate of health, and it seems that different results will be obtained in the countries studied;
- The relationship between the level of individuals' education and the extent of their attention to health status shows that people in a society who have a higher level of education have a more accurate knowledge of the future and therefore act more rationally when assessing the present and the future. Thus, if the proportion of university graduates in society increases, time preference will decrease;[1]
- If people have more hope about the future life, they will have a lower time preference when evaluating the present and the future. Higher life expectancy that expands life prospects will increase people's attention to health and may lead to higher investment in health;
- Higher community affluence, political and economic stability, and low-risk levels are expected to lead to greater attention to health status. Thus, in a society with higher wealth, lower risk, and greater political and economic stability, the time preference rate for health may be lower.

5. Results

5.1 Stationary Results Table

In order to investigate the stationary of the variables, different tests were performed. The following table shows the results of these tests for each variable. According to the results, all variables are stationary (I(0) or I(1)).

[1]. Refer to "Does Schooling Affect Health Behavior? Evidence from the Educational Expansion in Western Germany", 2009.

Table 2. Results of the Stationary Test

	Unit Root Test			
	Variable	Test		p-value
HI Countries	LLE	Breitung	I(1)	0.0001
		ADF	I(0)	0
		Perron	I(0)	0.01
	LGDP	Breitung	I(1)	0
		Im-Pesaran-Shin	I(1)	0
		ADF	I(0)	0
		Perron	I(1)	0
	UNILO	Breitung	I(1)	0.0013
		Im-Pesaran-Shin	I(0)	0.003
		ADF	I(0)	0
		Perron	I(1)	0
	PR	Breitung	I(1)	0.0012
		Im-Pesaran-Shin	I(0)	0.0022
		ADF	I(0)	0
		Perron	I(0)	0
	SE	Breitung	I(1)	0
		Im-Pesaran-Shin	I(1)	0.2
		ADF	I(0)	0
		Perron	I(1)	0
	INFG	Breitung	I(1)	0.04
		Im-Pesaran-Shin	I(0)	0
		ADF	I(0)	0
		Perron	I(0)	0
	OPP	Breitung	I(1)	0
		Im-Pesaran-Shin	I(1)	0
		ADF	I(0)	0
		Perron	I(0)	0.02
	SUI	Breitung	I(1)	0.0001
		Im-Pesaran-Shin	I(1)	0
		ADF	I(0)	0.0001
		Perron	I(1)	0
	LEGA	Breitung	I(1)	0
		Im-Pesaran-Shin	I(1)	0
		ADF	I(0)	0.007
		Perron	I(1)	0
	MIG	ADF	I(0)	0.008

	LINSU	Breitung	I(1)	0.0001
		Im-Pesaran-Shin	I(0)	0.02
		ADF	I(0)	0
		Perron	I(1)	0

Source: Research finding.

Although all variables are I(0) or I(1), a cointegration test was performed to ensure that there is a long-term relationship between the variables. The results are shown in the following table. According to the results, the variables are also cointegrated. Thus, the presence of a long-term relationship between the variables is confirmed.

Table 3. Results of the Cointegration Test

Cointegration Test			
Countries group	Test Type	Prob	Result
HI Countries	Kao	0.0042	Cointegrated

Source: Research finding.

5.2 The MIMIC Model

To select the best model, the model is first normalized for all causal variables and the results are shown in the following table.[1] According to the results, the best model in HI countries is the normalization based on the LEGA variable.

[1]. Since there was no specific theoretical basis for selecting the normal variable in this model, we examined all the variables.

Table 4. Results of the MIMIC Model Estimation

	Model	Variables	Coef	p-value
HI Countries	First Model (N:LEGA)	lle	63.77	0
		lgdp	-7.05	0
		unilo	-5.37	0
		pr	-0.06	0.012
		se	-0.24	0
		infg	-0.33	0.546
		opp	0.6	0
		sui	0.06	0.02
		lega	1	///
		mig	0.24	0
		linsu	-0.07	0.002
	Second Model (N:OPP)	lle	114.4	0
		lgdp	-15.35	0
		unilo	-24.89	0
		pr	-0.11	0
		se	-2.01	0
		infg	-33.61	0
		opp	1	///
		sui	0.34	0
		lega	0.46	0
		mig	1.83	///
		linsu	-0.24	0.23
	Third Model (N:linsu)	lle	-34.59	0
		lgdp	1.07	0.053
		unilo	2.36	0
		pr	0.063	0
		se	-0.008	0.781
		infg	0.46	0.059
		opp	-1.06	0
		sui	-0.039	0.54
		lega	-0.218	0

		mig	-0.802	0
		linsu	1	///
	fourth model (N:MIG)	lle	158.08	0
		lgdp	-3.016	0
		unilo	-3.22	0
		pr	0.025	0
		se	-0.152	0
		infg	-3.49	0
		opp	0.94	///
		sui	0.203	0
		lega	0.092	0.002
		mig	1	0.6
		linsu	-0.098	0.002
	fifth model (N:SUI)	lle	55.58	0
		lgdp	-2.1	0.022
		unilo	-3.7	0
		pr	-0.11	0
		se	0.02	0.7
		infg	-0.77	0.05
		opp	0.62	0
		sui	1	///
		lega	0.09	0.001
		mig	0.56	0
		linsu	-0.009	0.74

Source: Research finding.

In the next step, the GOF[1] test is used to confirm the fit of the model. Since the sample size of the model is small, the criterion CFI was used to check the suitability of the model. According to the quantity obtained for this criterion, the suitability of the model is confirmed.

[1]. Goodness of Fit

Table 5. Results of the Model Confirmation Test

Countries	Model	Fit Statistic	Value	Discription
HI	First Model (N:LEGA)	CFI	1	comparative fit index
	Second Model (N:OPP)	CFI	1	comparative fit index
	Third Model (N:linsu)	CFI	1	comparative fit index
	fourth model (N:OPP)	CFI	1	comparative fit index
	fifth model (N:linsu)	CFI	1	comparative fit index

Source: Research finding.

Based on the results of the MIMIC model predicting the hidden variable, the trend of health time preference rate for all the studied countries is presented in the separate graphs.

6. Analysis of the Trend of Health Time Preference Rate

6.1 Australia

The graph of the "out-of-pocket expenditure trend" in Australia shows that it decreased from 2000 to 2019. This downward trend was able to influence the health time preference rate trend during this period, causing it to increase. In fact, the results show that Australians were less concerned about their future health over the period and this reduced their individual investment in health.

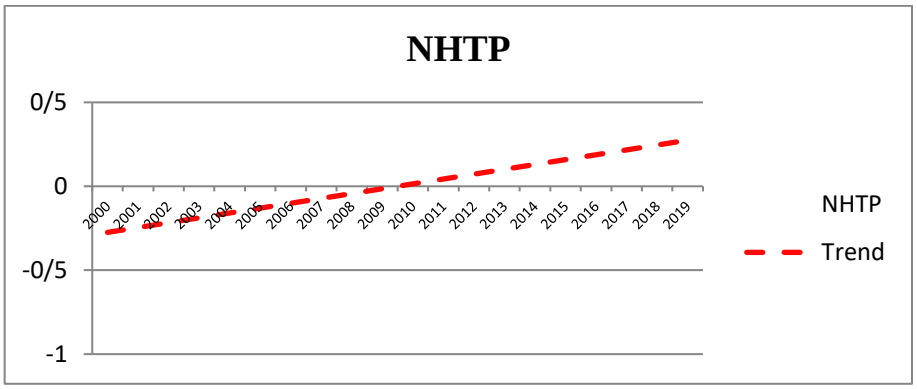

Figure 4. Health Time Preference Rate in Australia
Source: Research finding.

Based on the Australian Bureau of Statistics National Health Survey (NHS) estimates, Australians self-assessed their health less positively as they aged—68%

of those aged 15–24 self-assessed their health as 'excellent' or 'very good', compared with 42% of Australians aged 65 and over (ABS, 2018).[1]

6.2 Canada

In Canada, despite the upward trend in of "the proportion of the population spending more than 25% of household consumption or income on out-of-pocket health care expenditure (%)" and the "proportion of the population spending more than 10% of household consumption or income on out-of-pocket health expenditures (%)" we see a decrease in the out-of-pocket spending, which has also affected the trend in the time preference rate for health and caused an upward trend. This suggests that people's attention to their future health has decreased between 2000 and 2019 in Canada.

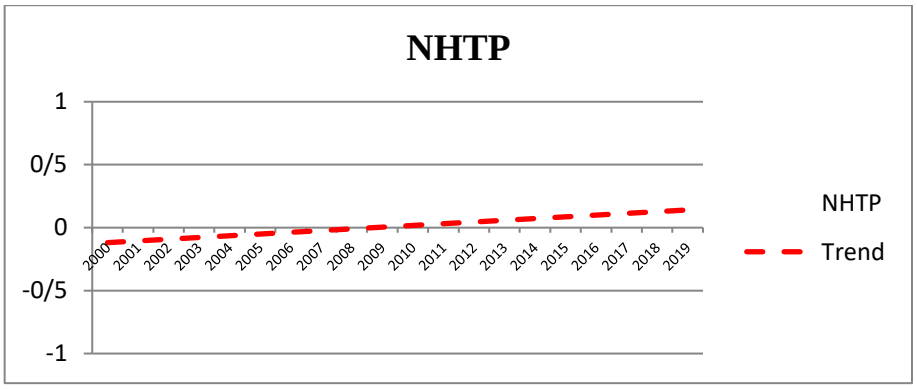

Figure 5. Health Time Preference Rate in Canada
Source: Research finding.

According to statistics of Public Health Agency of Canada, The proportion of Canadians reporting that they felt they had very good or excellent health has not changed (58% in 2003 and 59% in 2014). In addition, the vast majority of Canadians do not meet recommended levels of physical activity with 9 out 10 children and youth not meeting the Canadian Physical Activity Guidelines. At the other hand data adjusted by age and collected from hospitalizations and physicians claims show that the proportion of Canadians 20 years and older with diabetes almost doubled between 2000 and 2011 - up from 6% to 10%. The available statistics can well show the upward trend of the time preference rate of health in the studied years (Public Health Agency of Canada, 2021).

[1]. Australian Bureau of Statistics (ABS). (2017–18). National Health Survey (NHS)

6.3 France

France's health system is based mainly on a social health insurance (SHI) system, with a traditionally strong role for the state. While regional health agencies have played a greater role in managing health care provision at the local level since 2009, SHI and central government have always played a strong role in organising the health system and determining its operating conditions. Over the past two decades, the state has also become more involved in controlling health expenditure funded by the SHI system by setting a national health spending target (WHO, 2022).

Despite the expansion of government health care in France, statistics show that out-of-pocket spending also increased over the period. Thus, these two factors may have an impact on the formation of a downward trend in the time preference rate for health during this period.

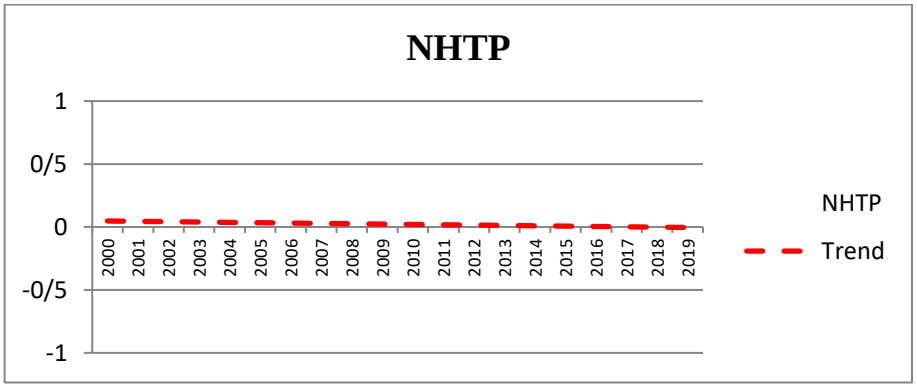

Figure 6. Health Time Preference Rate in France
Source: Research finding.

6.4 Germany

From 2000 to 2019, the graph of "out-of-pocket expenditure trends" in Germany is declining. Government health spending has also increased during this time. In general, the results show that time preference rates for health have increased over this period, suggesting that people are paying less attention to their future health. Despite overall improvements in access and quality of health care in Germany, the gap between the highest and lowest levels has widened from 1990 to 2016.[1]

[1]. Measuring performance on the healthcare access and quality index for 195 countries and territories and selected subnational locations: a systematic analysis from the global burden of disease study 2016.

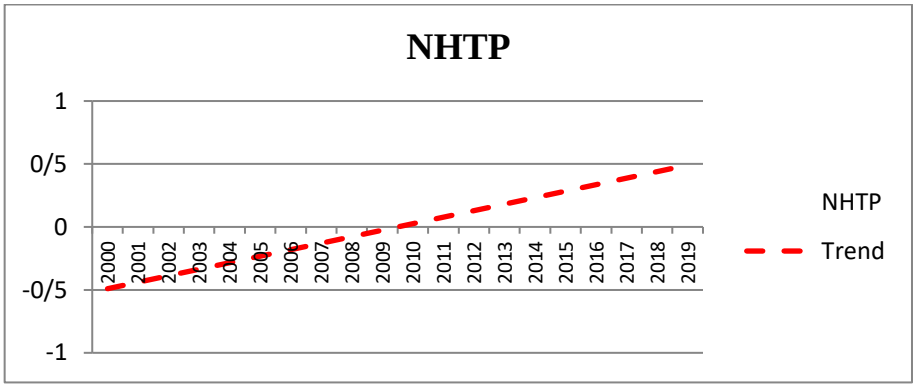

Figure 7. Health Time Preference Rate in Germany
Source: Research finding.

6.5 Netherlands

The Netherlands is the only country which has consistently been among the top three in the total ranking of any European Index the Health Consumer Powerhouse has published since 2005 (Euro Health Consumer Index, 2018). The trend graph of "out-of-pocket expenditure" and "domestic general government health expenditures" in the Netherlands is ascending from 2000 to 2019.[1] Despite increasing in out-of-pocket expenditure, public sources cover a high percentage of health expenditure (with the exception of dental care, and many people have dental coverage through voluntary health insurance) resulting in a lower share of out-of-pocket spending for health care than the EU average (Country Health Profile 2017). These results show that people in the Netherlands are paying more attention to and investing in their future health.

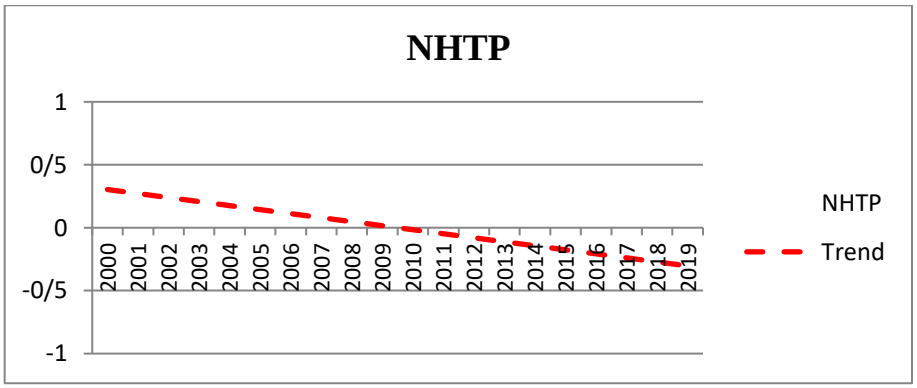

Figure 8. Health Time Preference Rate in Netherlands
Source: Research finding.

[1]. Since the early 2000s, the government has implemented several public health policies aiming to minimize the impact of behavioral risk factors and social determinants of health. Smoking was banned in workplaces in 2004 and in cafés and restaurants in 2008, while alcohol control measures implemented in 2013 focused on reducing alcohol use among teenagers.

6.6 Norway

In Norway, the trend of health time preference rate has a steady slope (almost zero) from 2000 to 2019, while the out-of-pocket expenditure graph has a decreasing trend. In addition to these variables, we also see an increase in government spending on health over this period. It appears that the increase in government spending on health over this period somehow offset the decrease in out-of-pocket spending, preventing the upward trend in the time preference rate for health.

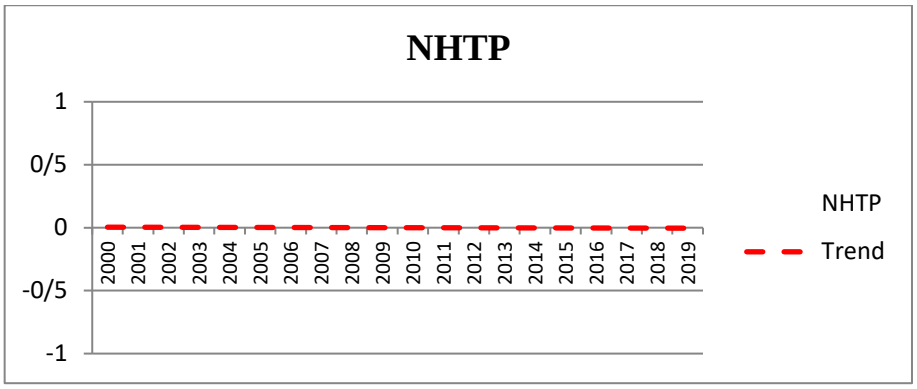

Figure 9. Health Time Preference Rate in Norway
Source: Research finding.

It should be noted that the health care system in Norway provides universal access to a broad benefits package. Annual cost-sharing ceilings protect patients from high health spending, and these were lowered and simplified in 2021. Cost-sharing exemptions apply for priority services and vulnerable populations. (Country Health Profile, 2021).

6.7 Sweden

Sweden is perceived as the most health-conscious country in the world. This is according to data from the 2018 Best Countries Ranking, a characterization of 80 countries based on a survey of more than 21,000 people from four regions. The trend chart of time preference rates for health in Sweden also shows that people are adjusting their current behaviors to achieve health benefits in the future. A significant issue is the descending trend in out-of-pocket expenditure[1], while government health spending has increased over the same period, which may indicate the importance of health to the government.

[1]. Some 14 % of health spending in Sweden is funded out of pocket – slightly lower than the EU average (15 %) (OECD report, Sweden: Country Health Profile, 2021).

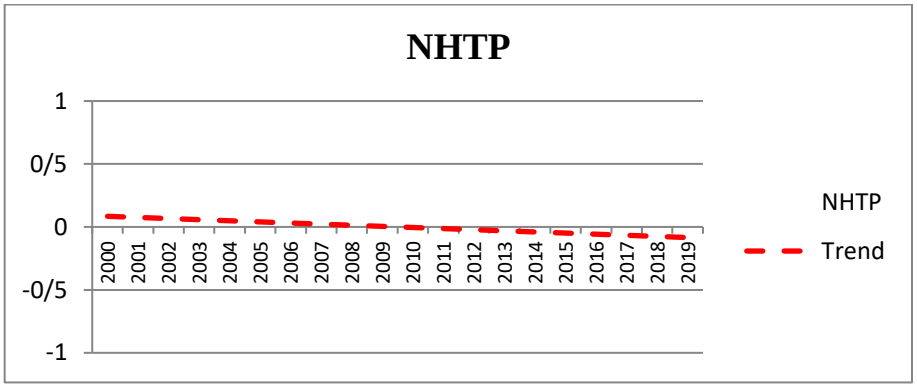

Figure 10. Health Time Preference Rate in Sweden
Source: Research finding.

In Sweden, groups with a higher education or high income have a healthier diet than groups with lower socioeconomic status. In addition, Physical activity varies in different groups. Adults with college or university education have a higher level of activity and spend fewer sedentary hours than those with compulsory education. Many behavioral risk factors in Sweden are more common among people with lower education or income (Country Health Profile, 2021)

6.8 Switzerland

In the Switzerland health system, the direct financial burden faced by households is high. Out-of-pocket payments for health account for 28% of health spending in Switzerland (compared to the OECD average of 20%), and made up the highest share of total household consumption in the OECD (5.3%).[1] However, the trend in out-of-pocket expenditure has been descending from 2000 to 2019, indicating a reduction in the burden of health care costs on individuals. Government health care spending has also increased over this period. The ratio between health expenditure and the gross domestic product (GDP) has increased by 2.6 percentage points since 1995, reaching 11.2% in 2018. This value places Switzerland in the group of European countries with the highest ratio (Health at a Glance, 2017).

From 2000 to 2019, the trend in time preference rates for health in Switzerland shows a downward trend, indicating that people are adjusting their current behavior to achieve health benefits in the future. Based on the results of "Swiss Health Survey 2017" 76% of the population were physically active in 2017, i.e. 14 percentage points more than in 2002. In addition, from 2002 to 2017, the percentage of people who stated that they have sufficient and very good activity has had an upward trend.[2]

[1]. Health at a Glance 2017: OECD Indicators
[2]. Swiss Health Survey 2017: health and gender, FSO

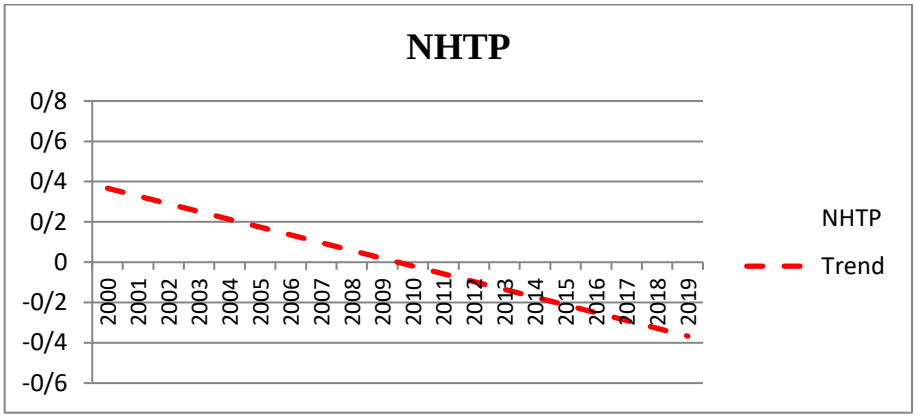

Figure 11. Health Time Preference Rate in Switzerland
Source: Research finding.

6.9 United Kingdom

From 2000 to 2019, the trend of the health time preference rate in the UK is constant (close to zero), while the out-of-pocket expenditure graph is increasing. In addition to these two variables, we also see an increase in government health spending over this period. The results show that despite the change in health expenditures (out-of-pocket expenditures & government spending), individual health preferences have remained unchanged and their attitudes towards health have not changed significantly. This could be due to the structure of the health care system in the UK.

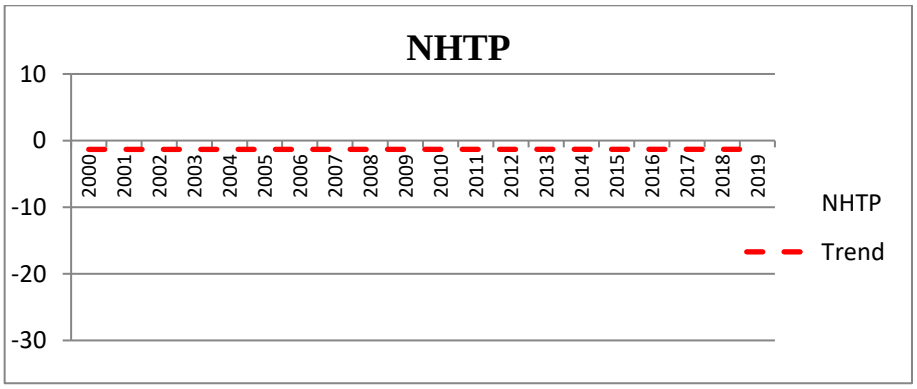

Figure 12. Health Time Preference Rate in United Kingdom
Source: Research finding.

According to the World Health Organization, government funding covers 85% of healthcare expenditure in the UK. The remaining 15% is covered by private sector. Since the 1980s, total healthcare expenditure as a percentage of GDP has in general trended up. (Country Health Profile, 2019).

It should be noted that the United Kingdom spends considerably more on preventive services than other countries, yet there has been little progress in reducing preventable mortality since 2011. In addition, Health expenditure is

considerably lower than similarly wealthy countries such as Germany (EUR 4 300 per capita, 11.2 % GDP) and France (EUR 3 626, 11.3 %). This level of spending has been relatively stable over time, but it has not kept pace with growing demand for health services (Country Health Profile, 2019).

6.10 United States

The trend graph of time preference rates for health in the United States shows that people are adjusting their current behavior to achieve the health benefits in the future. The trend of out-of-pocket expenditures was decreasing during this period, while the trend of government health spending was increasing[1], which may represent the importance of health-related issues to the government.

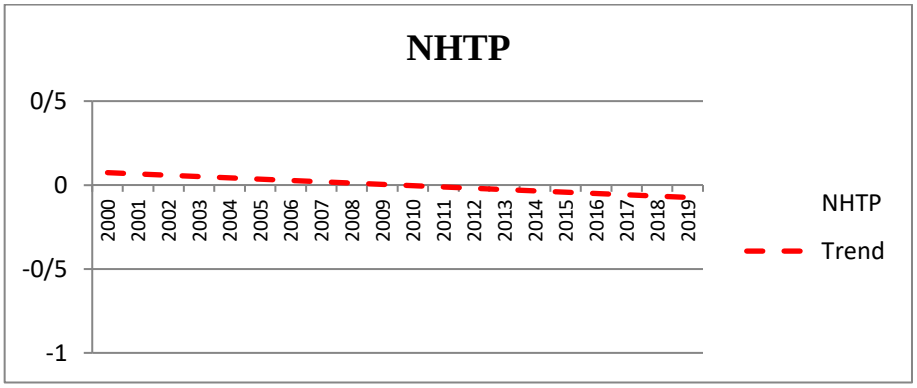

Figure 13. Health Time Preference Rate in United States
Source: Research finding.

The United States spends more on healthcare than any other OECD country, both as a proportion of GDP (16.9%) and per person (USD 10 586). Spending is expected to increase with healthcare as a proportion of GDP forecast to reach 20% by 2030. Nevertheless, 88% of the population rate their health positively (Health at a Glance, 2019). This may confirm the declining trend in time preference rates for health in the United States in recent years.

7. Conclusion

Economic decisions and behaviors are partly determined by people's preferences (Sen, 1973). Traditional economic theory assumes that individual preferences are fixed (Stigler and Becker, 1977), whereas there is empirical evidence that they can change (Cen, 2021). Based on the available empirical evidence, this study

[1]. At the beginning of the 20th century, the U.S. population was characterized by a low standard of living, poor hygiene, and poor nutrition; communicable diseases and acute conditions were major causes of most premature deaths. Over the course of the century, public health measures such as improved sanitation and drinking water treatment led to a dramatic decrease in deaths due to infectious diseases and a marked increase in life expectancy (Health at a Glance, 2021: OECD Indicators).

examines the trend of changes in health time preference rates in a set of high-income countries. Due to the latent nature of the time preference variable, the MIMIC model was developed and analyzed to predict the trend of this variable.

The results show that from 2000 to 2019, the trend in the time preference rate for health declined in France, Sweden, the Netherlands, Switzerland, and the United States. This trend was also increasing in Australia, Canada, and Germany and almost constant in Norway and the United Kingdom. These results were obtained in a situation where domestic government health spending (as a % of GDP) has always increased in the years studied, while out-of-pocket spending as a (% of current health spending) showed different trends in the different countries (the ratio of out-of-pocket spending increased only in France, the Netherlands and the United Kingdom and decreased in the other countries).

On the other hand, the intensity of changes in the time preference rate of health has been different in the countries under study, so that the range of changes in the time preference rate is larger in Germany, the Netherlands, and Switzerland than in other countries and is smallest in Norway and the United Kingdom. It should be noted that the Netherlands and Switzerland have achieved the best results in improving population attitudes toward health. The health policies implemented in these two countries during the study period have also shown a high level of attention to public health.

According to the results, despite the developments in the health sector in the countries studied (which are among the high-income countries), people's attitude to live healthier in the future has not improved in all these countries in recent years. The fact that people tend to abandon risky behaviors in the present in order to live healthier lives in the future suggests a positive change in people's outlook on the future. This issue becomes even more important when considering that, according to the World Health Organization, the highest mortality rate in recent years in these countries is due to diseases associated with risky behaviors. Therefore, government and private sector attention to the importance of people's health and a comprehensive plan to improve their attitudes toward healthy living in the future can achieve great results in socioeconomic areas by creating a healthy generation.

It should be mentioned that in a doctoral dissertation titled "The rate of time preference for health in Iran and its trend in selected countries," this research has been undertaken for a number of developing nations, including Iran. The results indicated that the rate of time preference for health in Iran has exhibited a substantial decrease trend from 2000 to 2019. Ischemic heart disease, which belongs to the group of non-communicable diseases, was the leading cause of mortality in Iran throughout the years under study. The second leading cause of death is road injuries. According to the report of the World Health Organization "The Islamic Republic of Iran has made remarkable great in the health sector over

the previous two decades, with significant improvements in a variety of health indices". While some health indicators such as childhood immunization have improved, other indicators significantly, others, such as the infant mortality rate, are still far from meeting the Millennium Development Goals. The results of the changes in time preference rates for health in Iran also suggest that the collective attitude has shifted in recent years with the changes in the Iranian health care system to avoid risky behaviors in order to lead a healthier life in the future. Despite the fact that Iran's achievements in the field of health have lagged behind those of other industrialized nations in recent years, the Iranian population's collective attitude toward those nations has become more focused on living a healthier life in the future.

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