Balancing Health Literacy and Healthcare Expenditures: Evidence from a Social Security Fund

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ABSTRACT

Background and Objectives: Health literacy is a crucial determinant of health outcomes and healthcare expenditures. Although health literacy is generally viewed as beneficial, its impact on healthcare expenditures, remains complex. This study aimed to 1) assess the status of health literacy and healthcare expenditures among members of a social security fund, 2) examine differences across various sociodemographic groups, and 3) explore the effect of health literacy on healthcare expenditures.

Materials and Methods: Data were collected from members of a social security fund through a health literacy questionnaire in 2022. Participants provided their insurance identification numbers, which were used to retrieve actual healthcare expenditure data from the social security fund's administrative database. This allowed for the linkage of self-reported health literacy data with corresponding expenditure records. Statistical analyses were conducted using parametric and non-parametric correlation tests, ANOVA, Kruskal-Wallis and quantile regression analysis.

Results: The mean and median of health expenditure in the sample was 703 thousand Rials and 257.4 million IRR (equal to 143.3 and 525.3 US$, respectively), with the highest expenditures among individuals with limited disability and those self-assessing their health as poor. Health literacy scores averaged 71.7 (SD±15.1), with higher scores among women, singles, and those with higher education. A quantile regression revealed that self-rated health consistently predicted lower costs, while health literacy was linked to higher spending at median and upper quantiles. Unemployment and student status were associated with significantly reduced costs, especially among higher spenders.

Conclusion: This study underscores the complex relationship between health literacy and healthcare spending. Enhancing health literacy, while beneficial, should be accompanied by strategies to mitigate cost increases, particularly for vulnerable groups such as individuals with mild disabilities. Promoting realistic health perceptions and tailored interventions can optimize healthcare utilization, reduce unnecessary expenses, and ensure the effective allocation of resources within social security systems.

Paper Type: Research Article

Keywords: Disability, Healthcare Expenditure, Health literacy, Socioeconomic Factors, Self-Perceived Health, Iran.

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Introduction

Health is one of the most critical indicators of development and achieving social well-being is impossible without addressing it. Globally, the health sector represents a significant portion of the economy, accounting for approximately 9.9% of the world's gross domestic product (GDP). These expenditures vary across countries depending on their income levels. For instance, in Iran, 8.6% of GDP was allocated to health —higher than the average for Middle Eastern and North African countries (5.8%), but lower than the global average (10.4%) (1). Advancements in medical science have shifted the burden of diseases towards chronic conditions. By preventing premature mortality, these advancements have led to increased utilization of healthcare services, thereby driving up health expenditures. According to the World Health Organization (WHO), non-communicable diseases, largely stemming from unhealthy lifestyles, account for 60% of global deaths (2). Despite this concerning trend, many of these health issues are preventable, highlighting the potential of health literacy (HL) to significantly affects the healthcare expenditures.

Health literacy is defined as a cognitive and social skill that enables individuals to understand and appropriately use health information (3). This skill includes the ability to comprehend, analyze, and make informed decisions in health-related matters (3-6). According to WHO, HL is a crucial factor in maintaining and improving health (7) as it empowers individuals to evaluate health-related information and make better decisions about their well-being (5, 8). Despite the importance, more than half of the population in Iran has inadequate HL, being more pronounced in vulnerable groups (9-11).

Low HL, along with unhealthy lifestyles, contributes to a range of health challenges and leads to increased healthcare expenditures (12). These rising spending are further driven by factors such as population growth, the increasing prevalence of chronic diseases, ageing, and the overuse of medications (13-15). Poor HL is associated with adverse health outcomes, including more frequent hospital admissions and reduced use of preventive services (16, 17).

HL has an ambiguous impact on healthcare expenditures, with studies suggesting both cost-reducing and cost-increasing effects. On one hand, individuals with low HL often incur significantly higher healthcare costs than those with adequate HL due to poorer health management. For example, veterans with inadequate HL generated higher average per-patient costs, with a three-year difference of $143 million in the Veterans Health Administration (18). Similarly, older adults with low HL incurred $3,892 more annually in health expenditures (16). In the United States, low HL has been linked to more than $73 billion in excess annual healthcare costs (19), while in China, inadequate HL has contributed to higher out-of-pocket payments, particularly among vulnerable groups such as rural residents, women, and older adults and older adults (20). In contrast, higher HL can also lead to increased service utilization—such as more frequent physician visits, emergency room use, and hospital admissions—by enhancing individuals' awareness and access to care, thereby potentially raising costs(21-23). Additionally,

some studies have also reported no significant association between healthcare expenditures and health literacy (24-26), highlighting the ambiguity in this relationship. Given this mixed evidence, it remains unclear whether HL predominantly increases or decreases healthcare expenditures. While it may reduce costs by encouraging preventive behaviors and better self-care, it can also lead to greater use of healthcare services. Therefore, understanding of how HL relates to specific components of healthcare costs— such as outpatient, inpatient, or medication expenditures— can offer critical insights for policymakers. This is particularly relevant in countries like Iran, where rising healthcare costs and limited public resources highlight the need for strategic planning (27). As advancements in information access continue to shape health behaviors, preparing insurance systems and health infrastructure for the potential economic impacts of HL becomes increasingly important. Based on this, the present study aims to explore the relationship between HL and healthcare expenditures a relatively socioeconomically homogeneous community.

Materials and Methods

This cross-sectional study was conducted in 2022, using data from members of a social security fund in Tehran. This population was relatively homogenous in terms of socioeconomic status, providing a unique advantage in controlling for the confounding effects of socioeconomic disparities. The fund, which granted permission for data use under the condition of anonymity, served as the primary source of information. The expenditure data obtained from this fund exclusively reflected the amounts paid by the insurance organization and did not include out-of-pocket payments made by the individuals. The study employed a combination of survey data (on health literacy and socio-demographic data) and secondary data (on healthcare expenditures).

Participants were selected through multi-stage sampling across urban areas and the fund's administrative centers providing insurance services. First, all centers offering in-person services in Tehran were identified and categorized into northern, central, and southern zones based on the level of regional development. Then, two centers were randomly selected from each zone. At each selected center, individuals visiting for financial or other administrative purposes were approached, and eligible participants were selected systematically. Inclusion criteria included being 18–65 years old, fully consenting to participation, and the ability to communicate. Individuals with incomplete responses or who were unresponsive were excluded. Since the need for administrative services was entirely random, and participants visited the centers for routine non-medical purposes, the study population was considered free from selection bias.

Based on pilot data, the variance of the key variable (healthcare expenditure) was calculated and used to estimate the required sample size according to the standard formula $n = (Z^2 \times \delta^2) / d^2$, where Z is the standard normal value corresponding to a 95% confidence level (1.96), δ is the standard deviation (38,500 thousands IRR), and d (equal to 10% of standard deviation) is the acceptable margin of error. Based on these parameters, the required sample size was

estimated to be 385 individuals. To account for potential incomplete or missing responses, a 10% increase was applied, resulting in a final sample size of 424 individuals.

Data collection consisted of two key components: healthcare expenditures, extracted from social security records, and HL, assessed using the validated and reliable Adult Health Literacy Questionnaire by Montazeri et al. (28). In addition, self-rated health was measured using a single-item 10-point scale. While this scale was used as a continuous variable in the regression models, it was also grouped into five two-point categories for descriptive classification. Disability levels were categorized based on predefined percentage thresholds commonly used in administrative health records. This study included several statistical analyses to examine the relationships and differences between variables. Initially, independent t-tests, Wilcoxon rank-sum text, ANOVA and Kruskal-Wallis test were employed to assess between-group differences. Based on the skewed nature of healthcare expenditure data, the quantile regression was applied to investigate the combined effects of multiple predictors on healthcare expenditures.

In this research, all ethical considerations were strictly followed. Prior to data collection, informed consent was obtained from all participants, and they were assured that their personal information would be kept confidential. Additionally, the research proposal and all its stages were reviewed and approved by the Ethics Committee, ensuring all ethical principles were adhered to in accordance with international standards. Participants were also given the option to withdraw from the study at any stage without any negative consequences.

Results

In the sample of 424 participants, 62.03% were male, and the largest group were employed individuals, comprising 50.94% of the sample. Regarding marital status, 77. 83% were married, 18.63% were single, and 3.54% were divorced or widowed. The most common level of education among the participants was a bachelor's degree,, reported by 41.75% of the participants. Additionally, 95.28% reported no disabilities, while 4.72% had some form of disability. Self-assessed health status showed that 41.04% rated their health as moderate or high (Table 1).

The average healthcare expenditures were 70.2 million Iranian Rials-IRR. This amount is approximately equal to 143.3 US dollars, based on the average official exchange rate for 2022 (1 USD = 490,000 IRR) as reported by the Central Bank of Iran. The median expenditure was 257.4 million IRR (approximately 525.3 US$).

Prior to conducting the main analyses, the distribution of the study variables was examined. The results indicated that health expenditures—including total expenditure as well as outpatient and inpatient subcategories—did not follow a normal distribution. However, the null hypothesis of normality for health literacy could not be rejected at the 95% confidence level. Given the non-normal distribution of the expenditure variables, non-parametric statistical tests were applied to assess the differences in health expenditures among socio-demographic subgroups. As shown in Table 1, no statistically significant differences

in health expenditures were observed across gender (p = 0.060), education level (p = 0.086), or disability status (p = 0.277).

These findings suggest that, health spending does not vary meaningfully by these characteristics. In contrast, significant differences in health expenditures were found across marital status (p = 0.039), occupational status (p < 0.001), and self-rated health (p = 0.012).

Table 1. Healthcare expenditure among different socio-demographic groups (Numbers in Million IRR)

Variable	Category	Frequency (Percent)	Median	Inter-Quartile Range	Min	Max	Test	Statistic	P-value
			Numbers in Million IRR						
Gender	Female	263 (62)	318.4	505.2	0.05	959.3	Wilcoxon rank-sum	-1.88	0.060
	Male	161 (38)	224.6	549.6	2.2	1541.8			
Marital Status	Single	79 (19)	150.1	509.7	1.0	662.3	Kruskal-Wallis	6.51	0.038
	Married	330 (77)	260.7	530.7	0.05	1541.8			
	Divorced/Widowed	15 (4)	336.6	355.9	5.7	239.6			
Education Level	Below Bachelor's	159 (38)	326.1	650.0	0.6	34.1	Kruskal-Wallis	4.91	0.086
	Bachelor's	177 (41)	235.0	522.2	0.05	42.2			
	Above Bachelor's	88 (21)	238.5	317.2	0.2	19.9			
Employment Status	Retired	135 (32)	417.9	907.0	2.2	15.4	Kruskal-Wallis	29.83	<0.001
	Unemployed	11 (3)	5.5	2.2	3.0	264.0			
	Housewife	58 (14)	398.4	487.5	1.3	959.3			
	Student	4 (1)	4.2	1.9	2.8	6.50			
	Employed	216 (50)	214.5	344.4	0.05	662.3			
Disability Level	No Disability	404 (95)	253.0	502.1	0.05	1541.8	Kruskal-Wallis	3.86	0.276
	Mild	11 (3)	412.1	802.5	2.1	469.5			
	Moderate	3 (1)	150.4	297.5	9.6	463.3			
	Severe	6 (1)	505.8	120.6	0.8	174.6			
Self-Rated Health	Very Low	11 (3)	308.2	579.0	0.2	1541.8	Kruskal-Wallis	12.89	0.012
	Low	39 (9)	488.5	126.2	1.8	1061.4			
	Moderate	44 (10)	286.6	554.2	0.05	539.8			
	High	128 (31)	231.6	447.8	0.3	662.3			
	Very High	202 (47)	181.9	344.0	0.4	166.5			

Married individuals, as well as those who were employed or retired, exhibited higher health expenditures. Furthermore, individuals reporting better self-rated health tended to have greater spending. These findings underscore the disparities in healthcare spending among groups categorized by key demographic and health-related variables.

According to Table 2, the average HL score across the sample is 71.7 (SD = 19.9). Based on the cut-off points of the scale (Insufficient: Less than 50; Not quite sufficient: 50-66; Sufficient: 66 to 84; Excellent: 84-100) (28), the sample HL was sufficient. Analysis reveals significant group differences across demographic variables. Divorced/widowed individuals score the highest among marital groups, with an average of 74.1 (SD = 11.1). Education levels significantly influence HL, with postgraduate individuals achieving the highest scores (mean= 79.9, SD=14.2). Gender, employment status and disability level did not bring significant differences in

health literacy score. Self-rated health strongly differentiates scores; individuals with “very high” self-rated health achieve the highest average (mean=76.0, SD=13.4), while those rating their health as “very low” report the lowest scores.

Table 2. Health literacy among different socio-demographic groups

Variable	Category	Mean	SD	Min	Max	Test	Statistic	P-value
Gender	Female	72.9	16.2	21.9	100	Independent Two-Sample t-test	-0.53	0.59
	Male	71.0	14.4	27.3	100			
Marital Status	Single	73.9	14.8	21.9	100	One-Way ANOVA (F)	4.08	0.01
	Married	71.1	15.3	27.3	100			
	Divorced/Widowed	74.1	11.1	51.5	96.2			
Education Level	Below Bachelor's	67.2	15.0	21.9	98.5	One-Way ANOVA (F)	6.55	0.001
	Bachelor's	71.7	14.0	30.3	100			
	Above Bachelor's	79.9	14.2	36.4	100			
Employment Status	Retired	69.6	13.9	40.9	100	One-Way ANOVA (F)	1.34	0.255
	Unemployed	74.3	13.7	56.8	100			
	Homemaker	70.5	16.8	34.8	100			
	Student	81.4	5.0	76.5	87.9			
	Employed	73.1	15.4	21.9	100			
Disability Level	No Disability	71.6	15.2	21.9	100	One-Way ANOVA (F)	0.33	0.80
	Mild	71.7	10.3	59.8	88.6			
	Moderate	76.3	20,7	53.8	94.7			
	Severe	80.6	17.2	56.8	100			
Self-Rated Health	Very Low	56.9	16.2	27.3	81.1	One-Way ANOVA (F)	3.93	0.003
	Low	62.3	15.8	30.3	94.7			
	Average	70.5	16.1	21.9	100			
	High	69.6	14.6	34.8	100			
	Very High	76.0	13.4	36.4	100			
Health Literacy		71.7	15.1	21.9	100			

To investigate the impact of predictor variables on healthcare expenditures and considering the skewed distribution of healthcare expenditures, quantile regression was employed to provide a more comprehensive understanding of the relationship between explanatory variables and different points of the cost distribution. Unlike ordinary least squares regression, which estimates the mean effect, quantile regression allows for the identification of heterogeneous effects across the lower (25th), median (50th), and upper (75th) quantiles of the outcome variable. This approach is particularly useful in health economics, where cost data are typically right-skewed and influenced by outliers or high-cost cases.

The results from the 25th quantile (q25) show that self-rated health (SRH) has a statistically significant and negative association with total costs (β=–0.233, $p<0.01$), indicating that individuals who perceive their health more positively tend to incur lower healthcare expenditures at the lower end of the cost distribution. In addition, female respondents were found to have significantly higher costs compared to males (β=0.604, $p<0.05$). Furthermore, being unemployed is associated with a significant

reduction in healthcare costs at this quantile (β=–1.020, p<0.01), suggesting that unemployment may limit access to services or reflect reduced utilization due to economic constraints (Table 3).

At the median (q50), health literacy (HL) emerges as a statistically significant predictor of increased healthcare costs (β=0.009, p<0.05). This suggests that individuals with higher health literacy levels are more likely to engage with the health system, leading to greater expenditures at the central point of the cost distribution. Again, self-rated health maintains a significant negative relationship with cost (β=–0.155, p<0.01), reinforcing the inverse link between perceived health and expenditures. Being unemployed (β=–1.435, p<0.001) and being a student (β=–1.376, p<0.01) are both associated with significantly lower costs, which may reflect lower healthcare use or reduced financial capacity to access services.

In the upper quantile (q75), the associations largely mirror the patterns observed in lower quantiles, though the magnitude of effects shifts. Health literacy remains positively associated with cost and reaches statistical significance (β=0.009, p<0.05), indicating that even among higher spenders, correlates with increased utilization. The negative association of self-rated health with costs also persists (β=–0.190, p<0.05), consistent with earlier findings. Notably, the effects of unemployment (β=–1.634, p<0.01) and student status (β=–1.484, p<0.001) are both stronger at the upper end of the distribution, suggesting that lack of income or reduced engagement with the formal healthcare system leads to even greater differences in expenditure among high-cost individuals.

Pairwise Wald tests showed that the effect of health literacy on healthcare expenditures differed significantly between the 25th and 50th quantiles ($\chi^2(1)=4.71$, p=0.034), and between the 25th and 75th quantiles ($\chi^2(1)=5.42$, p=0.020), indicating a varying influence of health literacy across expenditure levels. The distribution of residuals across the 25th, 50th, and 75th quantiles was generally centered around zero, with no major asymmetry or excessive outliers, suggesting an appropriate fit of the quantile regression models (Figure 1).

The results highlight the differentiated role of self-perceived health, employment status, and health literacy across the cost spectrum. Particularly, self-rated health consistently predicts lower costs across all quantiles, while unemployment is associated with markedly lower expenditures, especially at the upper end of the distribution. The role of health literacy, in contrast, is most evident at and above the median, implying that informed individuals may access more services, potentially leading to higher costs.

Discussion

In this study, we aimed to explore the relationship between health literacy and healthcare expenditures among a socioeconomically homogeneous population in Iran. No significant gender differences in HL were found, aligning with studies by Toci et al. (29), Tavousi et al. (11) and Chen et al. (30). However, some research has reported higher HL among women (31, 32).

Single individuals exhibited better HL compared to married individuals (11, 33).

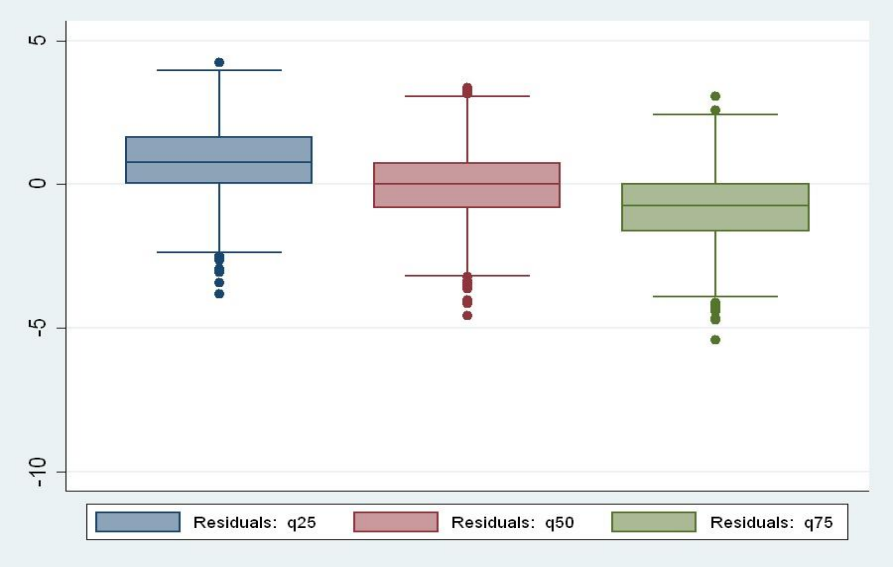

Figure 1. The distribution of residuals across the quantiles

Table 3. Quantile regression model for identifying predictors of healthcare expenditures (dependent variable: Logarithm of healthcare expenditures)

Quartile	Variables	Coefficients	P-value	95% CI	
q 25	Constant	16.128	0.000	14.025	18.231
	Health Literacy	0.008	0.212	-0.004	0.020
	Self-rated Health	-0.232	0.001	-0.364	-0.101
	Age	0.011	0.467	-0.018	0.040
	Gender (Male)				
	Female	0.603	0.011	0.140	1.067
	Employment Status (Employed)				
	Retired	0.238	0.464	-0.400	0.877
	Housewife	0.339	0.505	-0.659	1.338
	Unemployed	-1.020	0.003	-1.684	-0.355
	Student	-1.190	0.086	-2.549	0.168
	Education Level (Below Bachelor's)				
	Bachelor's Degree	-0.267	0.354	-0.833	0.298
	Above Bachelor's Degree	-0.038	0.932	-0.921	0.844
	Disability Level (None)				
	Mild	-0.327	0.543	-1.387	0.731
	Moderate	2.823	0.135	-0.880	6.526
	Severe	-0.898	0.590	-4.175	2.379
q 50	Constant	16.652	0.000	15.075	18.229
	Health Literacy	0.009	0.041	0.001	0.018
	Self-rated Health	-0.155	0.004	-0.262	-0.048
	Age	0.003	0.767	-0.021	0.029
	Gender (Male)				
	Female	0.240	0.124	-0.065	0.546
	Employment Status (Employed)				
	Retired	0.350	0.197	-0.182	0.884
	Housewife	0.347	0.286	-0.291	0.987
	Unemployed	-1.434	0.000	-2.183	-0.685

Quartile	Variables	Coefficients	P-value	95% CI	
	Student	-1.376	0.002	-2.236	-0.516
	Education Level (Below Bachelor's)				
	Bachelor's Degree	-0.039	0.843	-0.426	0.348
	Above Bachelor's Degree	0.016	0.957	-0.592	0.625
	Disability Level (None)				
	Mild	-0.526	0.489	-2.022	0.968
	Moderate	1.896	0.155	-0.722	4.515
	Severe	-1.162	0.338	-3.544	1.220
q 75	Constant	17.512	0.000	15.734	19.289
	Health Literacy	0.008	0.049	0.001	0.017
	Self-rated Health	-0.190	0.015	-0.342	-0.037
	Age	0.010	0.411	-0.013	0.033
	Gender (Male)				
	Female	0.045	0.848	-0.420	0.511
	Employment Status (Employed)				
	Retired	0.363	0.230	-0.231	0.959
	Housewife	0.245	0.503	-0.473	0.964
	Unemployed	-1.634	0.009	-2.864	-0.403
	Student	-1.483	0.000	-2.157	-0.810
	Education Level (Below Bachelor's)				
	Bachelor's Degree	0.111	0.645	-0.361	0.583
	Above Bachelor's Degree	-0.248	0.223	-0.647	0.151
	Disability Level (None)				
	Mild	0.037	0.948	-1.080	1.154
	Moderate	0.972	0.010	1.706	0.238
	Severe	-0.642	0.364	-2.032	0.748

In bivariate analysis, higher HL scores were observed among individuals with higher educational attainment. These results align with prior research, such as Tehrani et al. (34), and N'Goran et al. (35) which also identified education as a strong correlate of HL. Disability status also played a role, with those experiencing mild disabilities achieving the highest HL scores, and those with moderate disabilities the lowest. Similarly, Sultal et al. (36) highlighted the influence of age, education, and income on HL, though the HL levels in their sample were lower compared to the current study. Zolfaghari et al.(37) established significant correlations between HL and variables like age, gender, and marital status, although they observed the highest correlation between HL and age, which diverges from this study's findings. These findings underscore the importance of considering cultural, social, and structural factors unique to each society when interpreting health literacy (HL) levels. Therefore, understanding these specific contexts is essential for accurately interpreting results and designing effective interventions to improve HL.

Findings highlight the importance of carefully considering the distributional characteristics of healthcare expenditure data when analyzing their determinants. Healthcare spending is often skewed, and its relationship with key variables such as health literacy may vary at different points in the

expenditure distribution. The quantile regression results reveal that health literacy is positively associated with healthcare expenditures at higher quantiles of the cost distribution. This means that people who already spend more on healthcare and have higher HL might be more likely to use additional services, such as preventive or specialized care. This finding stands in contrast to studies such as Hauon et al. (18) and Sorensen et al. (38), which reported a link between low HL and increased healthcare spending. However, it is consistent with the notion that informed individuals may engage more proactively with healthcare systems, leading to increased utilization and short-term costs (22, 23, 39). Importantly, while higher HL may initially raise expenditures due to greater service use, it could ultimately lead to improved health outcomes and lower long-term costs (40). Improving health literacy has been linked to better management of chronic diseases, healthier behaviors, and greater use of preventive care, which can reduce hospitalizations and readmissions (41, 42). Interventions on patient HL programs have shown success in lowering readmission rates (43, 44).

Self-rated health demonstrated a significant negative association with healthcare expenditures, underscoring the critical role of perceived health in influencing healthcare utilization. Individuals who perceive their health positively incur lower costs, consistent with previous research identifying self-assessed health as a strong predictor of healthcare utilization (45, 46). People's views of their own health can shape how they use healthcare, so improving these perceptions may help reduce costs and improve system efficiency.

Our findings on demographic variables revealed several patterns. While age and gender were not significant predictors, employment status showed nuanced effects. Interestingly, the effects of being unemployed or identified as a student are more evident among individuals with higher healthcare expenditures. Although all participants were insured, it is possible that the insurance coverage was not in their own name but rather extended through a household head. This form of indirect coverage may result in less active or autonomous use of healthcare services, contributing to wider differences in spending among those with greater healthcare needs (47, 48). Employment-based differences highlight the need for targeted interventions aimed at high-risk groups to manage healthcare expenditures effectively.

Disability level emerged as a significant determinant, with moderate disability levels associated with higher expenditures at top of the expenditures distribution. Individuals with moderate or managed levels of disability spent more on healthcare compared to those without disabilities. These findings are consistent with previous studies, such as those by Mitra et al. (49) and a study in Korea (50), which reported that individuals with disabilities face substantially higher medical costs compared to those without disabilities. Our results suggests that the relationship between disability and healthcare spending is not uniform across all spending levels. Previous studies have typically examined this association using models that assume a single, average effect, potentially overlooking

meaningful variations across the cost spectrum (16, 18, 21). By using quantile regression, our study adds a new layer of insight to the literature—demonstrating that the link between disability and healthcare expenditure may vary significantly depending on the level of spending.

Comparisons with prior research also revealed discrepancies. For instance, while our findings did not identify significant effects of education on healthcare expenditures, previous studies have shown that higher education levels are associated with reduced healthcare expenditures, likely due to improved health behaviors and decision-making (48, 51, 52). Additionally, while Razavi Moghaddam et al. observed higher healthcare expenditures among men, our study found no significant gender differences, a result that warrants further exploration to identify contextual factors affecting gendered healthcare spending (53).

Study Limitations and Strengths: A key limitation of this study is that preventive healthcare expenditures, often paid out-of-pocket, as well as some expenditures not covered by insurance, were not in the insurance database and therefore were not included in the expenditure analysis.

Conclusion

Given the limited financial resources and the rising healthcare expenditures in recent years, failure to manage and address the root causes of these expenses could lead to significant challenges for the Social Security Fund in fulfilling the essential health needs of its insured members. Strengthening health literacy through clear, accessible education and promoting healthier lifestyles are practical strategies to prevent disease and reduce long-term costs. Particular attention should be given to low-literacy groups, including those with lower education and individuals who are divorced or widowed, through targeted messaging and support programs. As discussed earlier, self-rated health and employment status show clear links with expenditure levels, highlighting the need to support both individual awareness and social determinants of health. Furthermore, with an aging population and the increasing prevalence of chronic and latent diseases, investing in early identification, patient education, and regular follow-up can support healthier aging and help the fund contain future costs.

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Declaration: The authors used ChatGPT, to assist with the English translation of the manuscript. The final text was thoroughly reviewed and edited by the authors to ensure accuracy, clarity, and alignment with the original intent.

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