

Analysis of the Effect of the Elderly's Labor Status on Care Cost at the End of Life

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Abstract

This study quantitatively analyzes the effects of employment patterns at the time of death of the elderly on the utilization of medical care before death using the cohort data from the National Health Insurance Corporation, controlling mortality to obtain more accurate results. Gender was coded as 0 for males and 1 for females, and average monthly household income was taken as a logarithm to approximate a normal distribution. Care cost at the end of life was defined as the sum of the national health insurance contributions and statutory self-contributions. To measure proximity to death, deceased elderly were divided by the period from last hospital visit to death (except any hospital visit at time of death). We distinguished regular workers, irregular workers, self-employed and employers, unpaid family workers, and unemployed. The data used in this study are sample cohort data from the National Health Insurance Corporation. We examined the relationships between variables through 4 models using negative binomial regression. The effects of employment status on health status were analyzed and adjusted for demographic characteristics, socioeconomic status, and proximity to death. As the dependent variable, medical expenses were taken for 1 year before death. In this study, care costs at end of life were higher when children were economically independent and when the respondent was more educated, had high economic level, and had high average monthly household income. In addition, employment security also had a significant impact on care cost at end of life: Irregular workers spent significantly less than regular workers. The fact that care cost at end of life is differentiated according to employment status suggests that individuals' health exists within a social context, which may also constrain it: There is a risk that people's health status will become determined by socioeconomic status.

Keywords

end-of-life care cost, labor status, proximity to death, aging society, elderly

What do we already know about this topic?

Factors of work and worklessness are increasing care costs for older Koreans.

How does your research contribute to the field?

We analyze labor pattern effects on elderly Koreans' medical costs before death. Younger elderly spend more than older elderly as a function of time to death.

What are your research's implications toward theory, practice, or policy?

Working elderly, men, the more educated, and those with higher income also spent more.

Introduction

According to a health-survey-based study on chronic diseases of the elderly in South Korea,¹ 58.2% of respondents aged 65 years or older had chronic diseases. This suggests that the prevalence of chronic diseases in elderly people is very high and supports the prediction that the number of chronic illnesses will increase at an accelerating rate due to the aging of the population.² The problem is that Korea's population is aging very rapidly, even compared with other aging countries;

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the difference between average life expectancy (81 years) and health life expectancy (73 years) is 8 years.^{3,4} Therefore, Korean society needs to come to grips with the growing challenge of maintaining elderly people's health. In addition, baby boomers in Korea, born in 1955-1963 after Korean war, will further inflate the elderly population for decades to come and hence also increase national medical expenditure.

However, previous international and domestic studies have shown that nondemographic causes for increasing medical expenditure are more important than population aging.⁵ Demographic factors account for 10%,⁶ 13.8%,⁷ or 28.7%⁸ of the increase in health expenditure depending on the study.

In general, it appears that the most important factors influencing health status are demographic factors, economic factors, lifestyle factors, and social factors.⁹ In particular, as the national socioeconomic level rises increase in intention to pay for medical services grows.¹⁰ In addition, individual factors such as personality, perception of physical degeneration, loss of social status due to retirement, changes in economic level, and changes in the local environment are all relevant.¹¹ Many researchers have paid particular attention to individual-level socioeconomic factors such as occupation, education, and income.⁹⁻¹²

In this line, the present study focuses on the socioeconomic factor of labor status and employment type. Nonvoluntary irregular workers have lower job and life satisfaction than regular workers, because their conditions—long work hours and few breaks, lower wages, lack of benefits and insufficient health insurance, and so on—negatively affect their overall quality of life, including health.¹³ On the contrary, working time also affects workers' health, and long working hours have negative effects on regular as well as irregular workers. Overall, work's relation to health is paradoxical, as it helps maintain economic stability, socioeconomic status, and psychological well-being, but can also increase risk of health events and death due to stress, harmful working environment, and the difficulty of balancing work and treatment for chronic conditions.¹⁴⁻¹⁶

At the same time, unemployment, retirement, or anxiety about one's work can negatively affect health (just as health status can adversely affect employment patterns). The absence of a medical safety net after retirement in Korea accelerates poverty caused by medical expenses.¹⁷

As a result, elderly Koreans remain in the labor market until relatively late; indeed, the economically active elderly population is rapidly increasing.¹⁸ As of 2013, the rate of elderly Koreans remaining in the labor market was 31.4% of all elderly, much higher than some Organisation for Economic Co-operation and Development (OECD) countries, for example, Norway (7.9%), Germany (5.2%), Italy (3.5%), and Spain (3.4%).¹⁹

However, there is a major confounding variable in the relationship between age and rising medical costs. That is the mortality. Older people spend more on medical expenses because their mortality increases with getting old. Recently, almost all of elderly people die at hospitals and their care

cost at the end of life get increased due to increasing dead people quantitatively. This is called the red-herring effect, and to avoid it, the degree of death proximity should be controlled.²⁰ According to one study that undertakes to do so,²¹ the higher the age of death, the lower the care cost at the end of life. Therefore, when considering medical expenses for the whole lifecycle, medical expenses just before death should be highlighted as an important factor in determining elderly people's medical expenses.

This study quantitatively analyzes the effects of employment patterns at the time of death of the elderly on the utilization of medical care before death using the cohort data from the National Health Insurance Corporation (NHIC).

Methods

The data used in this study are sample cohort data from the NHIC, representative of all health insurance subscribers and beneficiaries. They are linked to personal information including sociodemographic information, medical history and medication records, as well as bills to and health examination records held by the NHICs. Deaths among people aged 65 years or older were extracted and analyzed using the data of 2011-2013, the most recent 3 years of the cohort data. Demographic variables, including gender, age (65 to 69, 70 to 74, 75 to 79, 80 to 84, and 85 years and above), marriage status and total family members, and socioeconomic factors including educational background, household ownership, ownership of real estate (0 is nonowner, 1 is owner), and monthly household income were included, with total health expenditure till death.

Gender was coded as 0 for males and 1 for females, and average monthly household income was taken as a logarithm to approximate a normal distribution. Care cost at the end of life, the dependent variable, was defined as the sum of the national health insurance contributions and statutory self-contributions (out of pocket money). To measure proximity to death, deceased elderly were divided by the period from last hospital visit to death (except any hospital visit at time of death), again taken as a logarithm. For type of employment at time of death, we distinguished regular workers, irregular workers, self-employed and employers, unpaid family workers, and unemployed.

Negative binomial regression was performed. Overdispersion is likely to occur due to fluctuations in data, a problem in performing bifurcation analysis through logistic regression analysis.²² In the present study, negative binomial analysis was conducted because the dependent variable, medical expenditure, had a nonnegative integer value, which caused concern over this type of overspreading.^{23,24} The effects of employment status on health status were analyzed and adjusted for demographic characteristics, socioeconomic status, and proximity to death. As the dependent variable, medical expenses were taken for 1 year before death.

This study examined the relationships between variables through 4 models. Model 1 measures the effect of labor

status as an independent variable on care cost at end of life without any control variables. Model 2 measures the effects of labor status as an independent variable and demographic characteristics as a control variable. In model 3, socioeconomic status was added to model 2 as a control variable. In it, we measured the effects of education level and household income on care cost at the end of life. Finally, model 4 examined the results controlling proximity to death. It measures the tendency to spend on care at end of life according to labor status.

Results

Table 1 shows the general characteristics of the deceased elderly population analyzed. There were 258 (42.4%) males and 351 (57.6%) females. Average age of the deceased was 75.9 years old, with about 35% aged 65 to 74 years old; 65% of the elderly older than 75 years old had died. The total number of household members was 3.8 ± 2.17 . About 298 (48.9%) of the respondents were householders (who represent their family); that is, about 50% of elderly still have children who have not yet become independent.

About 60% of the respondents were found to be living without spouses because of divorce or bereavement. About 83% had a high school graduate or lower education level. About 75% owned real estate. About 30% were retirees, about 33% were irregular workers, and about 20% were employed at the time of death. As for proximity to death, the most frequent period between time of death and last visit to the hospital was found to be 0 to 2 months. The number of patients who visited the hospital for 1 year was 19 (3.12%). Respondents with high proximity to death are expected to include many persons who died while in long-term care.

Table 2 shows quantitatively how much care costs at end of life are based on employment patterns. Retirees spend the largest amount of cost among them. And the second group is the business owners. The third group is similar with the second one. The unpaid family worker spends the least amount of cost.

Table 3 shows the negative binomial regression analysis of effects of demographic characteristics, socioeconomic status, proximity to death, and employment status on care cost at end of life.

Model 1 measures the effect of labor status as an independent variable on care cost at end of life without any control variables. With retirees' deaths as a reference group, it is shown that elderly people engaged in regular employment have significantly more medical expenditure. In addition, self-employed and employers also used medical expenses more than retirees, but the value was almost 0, so it was very small compared with regular employees. Model 2 measures the effects of labor status as an independent variable and demographic characteristics as a control variable. Among the demographic characteristics, being male, relatively young elderly, nonhouseholder, and currently married all made care

Table 1. General Characteristics of Respondents.

	Mean or n	SE or %
Gender		
Male	258	42.40
Female	351	57.60
Age group		
65-69	74	12.15
70-74	139	22.82
75-79	178	29.23
80-84	114	18.72
85 and above	104	17.08
Total household members	3.8	2.17
Householder	298	48.93
Marriage status		
Married	189	31.00
Unmarried	51	8.40
Divorced/widowed	369	60.60
Education level		
College and above	103	16.90
High school	287	47.10
Middle school and below	219	36.00
Real estate	457	75.00
Monthly household income (unit: \$)	2789	524.50
Labor status		
Regular	129	21.18
Irregular	198	32.51
Business owner	65	10.67
Unpaid family worker	32	5.25
Retirees	185	30.38
Proximity to death		
0 month	89	14.61
1 month	97	15.93
2 month	94	15.44
3 month	84	13.79
4 month	62	10.18
5 month	38	6.24
6 month	32	5.25
7 month	29	4.76
8 month	22	3.61
9 month	20	3.28
10 month	21	3.45
11 month	19	3.12
Care cost at end of life (unit: \$10)	1249	827.91

Table 2. Care Cost at End of Life by Employment Patterns.

	M (unit: \$10)	SD
Labor status		
Regular	274.3	87.2
Irregular	174.1	30.6
Business owner	293.7	141.7
Unpaid family worker	99.5	67.2
Retirees	409.1	277.2

Table 3. Negative Binomial Regression Analysis for Care Cost at End of Life.

	Model 1	Model 2	Model 3	Model 4
Independence variable				
Labor status				
Regular	.186**	.102**	.142*	-.029**
Irregular	.156	.009	-.063	-.218*
Owner	.002**	.021*	-.138	-.097
Unpaid family worker	.016*	-.111	-.098	-.113
Retirees (ref.)	—	—	—	—
Control variables				
Demographic characteristics				
Gender (ref.: Male)	—	-.124*	-.104	-.121*
Age group				
65-69 year	—	.314*	.218**	.197**
70-74 year	—	.227**	.199*	.201*
75-79 year	—	.197*	.226	.040
80-84 year	—	-.214	-.031	-.046*
More than 85 year (ref.)	—	—	—	—
Total household member (ref.: 1)	—	-.131	.299	.001
Householder	—	.186*	.097*	.111*
Marriage status				
Married (ref.)	—	—	—	—
Unmarried	—	-.132	-.155	-.031
Divorce/bereavement	—	-.013**	-.117*	-.014**
Socioeconomic status				
Education level				
College and more (ref.)	—	—	—	—
High school	—	—	-.137**	-.198**
Middle school and below	—	—	-.167**	-.109**
Real estate	—	—	.117*	.097**
Monthly household income	—	—	.006*	.011**
Proximity to death	—	—	—	-.029**
Constant	-4.019** (.002)	-3.976* (.688)	-3.218 (.198)	-3.002 (.107)
Pseudo R ²	0.148	0.168	0.167	0.201

Note. Values in parentheses represent standard deviation.

* $P < .01$. ** $P < .001$.

cost at end of life significantly higher. On the contrary, the total number of people in a household had little effect on medical expenses, nor did being 80 years old or older at end of life. Model 2 identifies the impact of demographic and socioeconomic status on care costs at end of life, showing significant effects of age, gender, separation/divorce/bereavement, education, possession of real estate, and family income, but not number of household's members. In model 3, socioeconomic status was added to model 2 as a control variable. In it, the lower the education level and household income, the less spending on care at the end of life. In addition, the independent variables were not statistically significant except for being a regular employee, which increased care cost compared with regular employees in model 2. In addition, younger elderly spent more at end of life than older elderly, as did those who were not householders or presently married, similar to the trend of model 2.

Finally, model 4 examined the results controlling proximity to death. There was a change in tendency to spend on care at end of life according to labor status, with less care cost for the employed than previously. Irregular workers with unstable job security used about 10 times less care cost at end of life than regular workers. In addition, in model 4, unlike other models, medical expenses differed significantly according to gender, as men spent more than women; also, old elderly spent even less relative to young elderly. This model also used found care costs at end of life for householders, the married, the more educated, and those with higher household income. According to these results, elderly people are likely to experience unmet medical need without social safety net. As reflected by its medical expenses during 1 year before death, the income level is not high in the group, which is staying in the labor market, as compared with the elderly who are entering stable retirement. Therefore, along with the

employment safety aspect, the linkage between the social safety net, various welfare services, and use of lifelong medical care considering quality of life is necessary.

Discussion

According to the negative binomial regression analysis using the cohort data of the NHIC, care cost at the end of life was lower in the currently employed elderly than in the unemployed elderly, especially for irregular workers, who might experience higher rates of stress and illness, be less able to work, and have less ready funds.^{15,16} In addition, there are cases where economic power is reduced due to illness; in these cases, unemployment does not actively improve the health level.¹⁷ As reflected by its medical expenses during 1 year before death, the income level is not high in the group, which is staying in the labor market, as compared with the elderly who are entering stable retirement. In Korea, the stability of labor of elderly is decreased and have relatively low income compared with retirees' pensions. Therefore, it can be interpreted that there is a difference in the level of use of medical expenses.²⁵

In this study, care costs at end of life were higher when children were economically independent and when the respondent was more educated, had high economic level, and had high average monthly household income. In addition, employment security also had a significant impact on care cost at end of life: Irregular workers spent significantly less than regular workers. This can be understood in relation to the medical safety net. Korea is known for its broad health coverage blind spot among OECD countries²⁶—especially, due to the burden of medical expenditure or catastrophic health expenditure, it tends not to be actively treated compared with the group whose rights are secured through the major social insurance.²⁷⁻²⁹ Therefore, the quality and quantity of public health care should be ensured so that elderly people can use adequate medical services without financial burden.

Gender, age, and marital status showed relatively high predictive power for care costs at end of life—especially gender, as men spent much more than women. This can be interpreted in part as a result of the inequalities in the use of medical expenses between men and women. In particular, it is similar to a study showing that the intention to use intensive care unit for the treatment of serious diseases such as cancer was rather higher in elderly men.^{30,31} This is because of gender differences in the aggressiveness of men and women in terms of attacking the cause of the disease; women tend more to actively refuse treatment and refuse cardiopulmonary resuscitation.³¹ These characteristics support the results of our study, in which care cost at end of life is reduced in the older elderly population, above 80 years of age, compared with the younger elderly population. In the case of the younger elderly, their own willingness and that of their families to maximize the possibility of recovery from chronic

health issues through aggressive treatment before death is high, while in older elderly it decreases.

In this study, death proximity was included as a control variable to more accurately measure the increase in care cost at end of life and was found to have a significant effect on costs. Compared with the model that did not consider death proximity (model 3), in model 4, care costs at end of life for regular workers decreased compared with the retirees, indicating an interaction between employment status and death proximity. In other words, when compared with the retirees, the elderly in full-time employment reduced care cost at the end of life. This indicates that if death proximity is the same, unemployed elderly are more likely to spend before death.

Most studies show that population aging increases the care cost. However, as also demonstrated in previous studies,^{32,33} this study has shown that growing health care costs are not simply due to the phenomenon of aging, but due to increased time to death. As life expectancy increases and healthy lifespan does not, younger elderly people spend more on health care in the hope of living longer in good health, whereas older elderly have less hope of that, as they are more likely to be close to death, and spend less. Thus, this study provides quantitative evidence that retired elderly people are likely to experience unmet medical need given the inadequate social safety net. Therefore, along with the employment safety aspect, it is important to reduce gap in coverage through linkage between the social safety net, various welfare services, and use of lifelong medical care considering quality of life.

The fact that care cost at end of life is differentiated according to employment status suggests that individuals' health exists within a social context, which may also constrain it: There is a risk that people's health status will become determined by socioeconomic status. In the case of irregular workers, long hours, lack of security, high stress, and lack of insurance eligibility and social safety net (including missing out on regular health checkups at work) may increase the likelihood of health problems; nonetheless, due to various socioeconomic factors, there is a tendency for these people to abandon active treatment.

There are still no clinical guidelines on the consent of stakeholders regarding end-of-life care in Korea. Therefore, there is no tool to measure what amount of medical resources should be put in at time of death or what kind of condition the end of life is. It is necessary for stakeholders to exchange opinions and seek consensus on whether excessive asymmetry of information between medical personnel and patients is causing undue medical resources to be inserted meaningfully and the necessary resources to be concentrated in the right place.

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