

**EMPLOYMENT TRAJECTORY AND WELL-BEING OF LATER LIFE IN THE UK: A STUDY USING ELSA DATA AND SEQUENCE ANALYSIS**

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**ABSTRACT**

The aging population problem has grown so significantly around the world these years that it has morphed into a formal field of research that has drawn much attention and popularity. Compounding the aging problem is the fact that the elderly's financial and health well-being are unstable and are influenced by a series of factors. This research aims to discover the relationship between the working trajectories of older people (WHEN THEY ARE YOUNG?) and financial and health well-being (IN THEIR LATER LIFE?). Besides, the study also aims to identify the factors which influence people's working trajectories. The study utilizes the panel data from waves 1 to 9 of The English Longitudinal Study of Ageing (ELSA), covering 2002 to 2019. By employing sequence analysis, the study categorized the working trajectories of the elderly into 5 groups: (1) Early retirement (2) Out of labor and early retirement (3) Self-employed (4) Employed and late retirement (5) Standard retirement. Then, the study used multi-nominal logistic regression to examine how the factors in 2002 determined the trajectories in the following years. The study further assesses how employment trajectories affect the financial well-being and health status of the elderly. Overall, self-employment and employment but late retirement will positively affect the income of older individuals. While being out of labor will generate negative effects on the elderly's health status. The findings of this study have multiple implications for retirement planning, pension systems, and employment policies.

**Keywords:** Ageing population, working trajectory, retirement, elderly, financial well-being, health status.

**1. INTRODUCTION**

**1.1. Global trends in the ageing population**

The aging population in the United States is defined as 'the rising share of the elderly in the overall population' (Lloyd-Sherlock, 2010). This process is taking place at an unprecedented rate as the birth rate decreases and people's life expectancy increases. Because of the decreasing birth rate, there are only a few children a year, which causes a decrease in the share of young people. At the same time, the number of elderly people living longer has increased due to advances in health care and medical technology, as well as improvements in living conditions and finances. With the number of people aged 60 and over rising in countries such as China, Japan, South Korea and the United Kingdom (see table 1 below), ageing has become a global trend that more and more countries are following.

**Table 1. Population aged 60 years or more, selected countries (% of the total population)**

	1950	2000	2025	2050
UK	15.5	20.8	25.8	28.8
Russia	9.2	18.4	24.3	31.7
China	7.5	10	19.6	31.1
Brazil	4.9	8.1	16.5	29.3
Ethiopia	4.8	4.7	5.7	9.6

**1.2. Population ageing in Europe**

It is important to recognize the trend of ageing in the United Kingdom because it will influence the economic growth and social composition of the society. Government and individuals need to prepare for the ageing problem. Population ageing was a predominant trend in twentieth-century Europe and became more intensified in the current century. This phenomenon is mainly caused by four essential reasons: (1) Declining Fertility Rates (2) Increased Life Expectancy (3) Mortality Improvement. European countries have experienced a significant decrease in both the number of deaths and birth rates since the late 19th century. Although most people may consider the decline in mortality as the initial catalyst of the process of ageing, the real factor is the fall in fertility caused the initial shift to the ageing society. In most parts of Europe, the fertility rate continually fell or started to fall, reaching an extreme lowest point in the late 1920s and 1930s. Although the Post War II baby boom increase the birth rate of babies, it did not return to the level of fertility before.

Over the past century and a half, some European countries have experienced population ageing. In England and Wales, for example, the proportion of people aged 65 or over doubled from 5 to 10 per cent between 1901 and 1941 (Grundy, 1997). Table 2.1 presents a summary of fertility and mortality and shows that all regions of Europe now have low fertility.

Also, life expectancy has risen, with most countries reporting averages exceeding 80 years, resulting in a larger elderly demographic. Improvements in healthcare have further reduced mortality rates, especially among older populations, with a majority of deaths now occurring at ages 65 and above. Table 2.2 illustrates the progress made by European countries in the short term in terms of average life expectancy after age 65.

**Table 2.1** Proportion of total population aged 65 and over, total fertility rate, and life expectancy at birth and at age 65, European regions and largest country in each region, 2010 and 2050

	Year	% 65+	TFR	Life expectancy at birth*			Further life expectancy at age 65*		
				Persons	Males	Females	Persons	Males	Females
Eastern Europe	2010	14.0	1.45	70.2	64.8	75.7	15.0	12.6	16.7
	2050	23.3	1.79	75.5	70.9	80.2	17.3	14.6	19.3
Russian Federation	2010	13.1	1.49	67.9	61.7	74.3	14.4	11.6	16.2
	2050	20.5	1.82	73.1	67.4	78.7	16.0	12.5	18.3
Northern Europe	2010	16.5	1.88	80.0	77.6	82.3	19.2	17.6	20.5
	2050	24.3	1.91	85.3	83.3	87.2	22.8	21.4	24.2
United Kingdom	2010	16.6	1.90	80.5	78.5	82.4	19.4	18.1	20.6
	2050	24.7	1.90	85.6	83.9	87.3	23.0	21.8	24.2
Southern Europe	2010	18.1	1.46	80.8	77.9	83.6	19.6	17.6	21.3
	2050	32.7	1.77	86.5	83.8	89.2	23.6	21.4	25.7
Italy	2010	20.3	1.44	82.3	79.5	84.9	20.4	18.4	22.2
	2050	33.0	1.80	87.9	85.2	90.6	24.6	22.4	26.6
Western Europe	2010	18.5	1.65	81.1	78.3	83.7	19.9	18.0	21.6
	2050	28.4	1.84	86.5	83.8	89.1	23.7	21.5	25.8
Germany	2010	20.8	1.39	80.7	78.2	83.1	19.4	17.7	20.9
	2050	32.7	1.65	86.0	83.7	88.3	23.1	21.2	24.9
Europe	2010	16.3	1.56	76.1	72.2	80.0	17.8	16.0	19.3
	2050	26.9	1.81	82.0	78.7	85.3	21.2	19.1	23.0

\*Average values over periods 2010–2015 and 2050–2055, respectively.

Source: data from United Nations World Population Prospects: The 2012 Revision, [https://esa.un.org/unpd/wpp/publications/Files/WPP2012\\_HIGHLIGHTS.pdf](https://esa.un.org/unpd/wpp/publications/Files/WPP2012_HIGHLIGHTS.pdf), accessed 01 Dec. 2016, New York: United Nations, Copyright © 2013 United Nations.

**Table 2.2** Further life expectancy at age 65, European regions and largest country in each region, 1970, 1990, and 2010

Period	Eastern Europe	Russian Federation	Northern Europe	United Kingdom	Southern Europe	Italy	Western Europe	Germany	Europe
1970–1975	14.1	14.1	14.6	14.4	14.6	15.0	14.4	13.9	14.4
1990–1995	14.1	14.0	16.3	16.3	17.0	17.5	17.1	16.5	15.7
2010–2015	15.0	14.4	19.2	19.4	19.6	20.4	19.9	19.4	17.8

Source: data from United Nations World Population Prospects: The 2012 Revision, [https://esa.un.org/unpd/wpp/publications/Files/WPP2012\\_HIGHLIGHTS.pdf](https://esa.un.org/unpd/wpp/publications/Files/WPP2012_HIGHLIGHTS.pdf), accessed 01 Dec. 2016, New York: United Nations, Copyright © 2013 United Nations.

### 1.3. Economic and social challenges faced by older people

In the context of ageing, retirement for older people carries significant health risks, including high healthcare costs, relationship breakdown and dependence on pensions. All these factors are relevant to the working trajectories of individuals due to the fact that working trajectories will greatly influence one’s health status and economic status. In order to maintain the well-being of older individuals, specific actions need to be taken. Therefore, if we want to know how to solve these problems, we need to identify the relevance of employment trajectories in determining financial well-being in later life.

### 1.4. Research questions

The aim of this study is to identify how the work experience of older people in the UK is related to their economic well-being. It is essential to understand how employment history impacts

financial security in older age. This can benefit future relevant policymaking and decisions, retirement planning, pension systems, and employment policies.

## 2. LITERATURE REVIEW

With the economic growth of many nations, the improvements in retirement system, and the expansion of national pension system, people tend to retire earlier in the 19th century. (Burtless & Quinn, 2002) However, the introduction of the 401 (K) pension system in the United States and the stock market crash of 2000 have shrunk many seniors' pensions. In addition, the general Social Security retirement age was increased from 65 to 66, which caused many people to work longer, which is known as “delayed retirement” (Cahill et al., 2006). Due to the derived satisfaction from working and social relationships in the workplace and the lower risk of having inadequate incomes when they are older (Burtless & Quinn, 2002), the elderly choose to be late retirement. Unemployment is only one reason why older workers are withdrawn from the labor force due to disability, unemployment, or premature retirement, which is somewhat dependent on eligibility and disability and pension payments (Stading, 2005).

Income and savings are essential for the financial well-being of the elderly because these two components will directly influence their later life in retirement. Income is a significant predictor of the elderly's life satisfaction (Didino et al., 2016). Those seniors who can afford to shop and save money have higher average scores on life satisfaction than others (Papi & Cheraghi, 2021). Adequate income supports the elderly to cover the expenses of housing, healthcare, and daily costs (Hurd, 1989). Similarly, savings serve as a safety net to buffer pre-retirement income or consumption shocks (Browning & Lusardi, 1996). De Nardi et al. showed a model of self-paying health care expenditures based on age and lifetime income (DeNardi et al., 2010). Among all the expenses, medical expenses rise very fast with the growth of age and will eventually become a luxury for older people. Therefore, this kind of uncertainty of medical expenditure increases the aggregate saving rates (Chamon & Prasad, 2008). Employment, as a direct source of income and savings, is especially important for older people. Those without stable employment are more reliant on welfare, pensions, or family support, leading to greater financial insecurity. Conversely, the longer an elderly person works, the more savings they are likely to have, and so the better off they will be financially.

In addition to financial benefits, work positively affects the physical and mental health of older adults. Although working later in life can sometimes create stress, in most cases, continued employment improves physical and mental well-being (Gallo, Bradley, Siegel, & Kasl, 2000). Participation and engagement in the labor force prevents the decline of physical functioning and mental health in older adults (Wickrama et al., 2013). As individuals become older, they will be more satisfied with their jobs because they expect less from their roles and become more accustomed to them (Clark et al., 1996). Employment can increase the elderly's social interactions and keep a sense of purpose. Older people are more motivated in jobs that can strengthen their sense of identity. While as individuals age, the interest in getting rewards for good performance and achievement decreases, older people are more willing to get affirmation of their identity and protect their self-concept (Kanfer & Ackerman, 2004). Also, if individuals accomplish their later career goals, they will be detachment from their jobs and thus stay in the workplace longer (Kooij, De Lange, Jansen, & Dijkers, 2008). In addition, work helps to alleviate loneliness and isolation at work (Ozcelik & Barsade, 2018). People work, not only because of the monetary rewards, but also because of their need to develop interpersonal and social relationships (Gouldner, 1954).

Mayo, 1949) So, some elderly people stay in their jobs until they are old enough to keep in touch with others. In addition, paid work brings earnings and financial benefits, which include health care, which is essential to maintain the physical and quality of life of the elderly (Wickrama et al., 2013).

Other factors also have an impact on the health of the elderly. Chang et al. (2019) examined the relationship between living space and mental health among the elderly in China, with a focus on the influence of source of income. The study showed that elderly people with families or living in institutions had higher PWB than those who lived alone. However, children and state support for children had a negative impact on family parent-child relationships relative to financial independence. Yang et al. (2014) studied the mental health and well-being of elderly women in China. Using data from the 2010 "Third Round" of the Social Status Survey of Women, the researchers analyzed their vulnerabilities, abilities, and health needs. The findings indicated that factors such as current exercise, participation in leisure activities, close relationships with neighbors, and better overall health were associated with positive mental health in older women. The report also points out that there are inequalities between men and women in areas such as economic status, living conditions and participation in social activities, and that there is a need to develop social policies that will facilitate access to resources and support networks for more elderly women. Based on these results, this project will provide new ideas and approaches to women's mental health in China.

Dush et al. (2008) examined the correlation between couples' well-being and mental health. The study included (1) identifying the pathways of differences in couples' well-being, (2) exploring the mechanisms of interaction between the dimensions of couples' well-being, and (3) exploring the mechanisms of the role of couples' well-being on individuals' overall well-being and depression. The results of the study showed that couples' happiness went through three stages: low, medium, and higher. Initial happiness was associated with the factors mentioned above and with different demographics and mindsets. The researchers found that those individuals who were on a happy trajectory experienced a decrease in both life happiness and depression over time. These findings suggest that marital happiness is an important factor in overall life satisfaction and mental health among older adults.

While much research has explored the link between employment status and well-being at specific time points, the effects of employment are cumulative. However, the implication of employment is accumulative and therefore we should focus on the period of experience of employment rather than at a certain time point. Furthermore, the dynamic change in employment status is more influential on an individual's well-being than static status. The project proposes to answer the following scientific question: what are the effects of different work trajectories on the income, psychological and physical aspects of older people in England?

### **3.METHOD**

#### **3.1. Data and samples**

We utilized information from waves 1 to 9 of the England Ageing Tracking Survey (ELSA) 2002-2019 (2002-2019). The England Ageing Tracking Study (ELSA) follows a representative sample of people aged 50 years and over in England. The study is based on respondents taking part in the Health Survey for England (HSE), of which 1,391 people aged 50-100 years are the study population. The study started in 2002, having nine waves of completed data and a tenth wave is being collected currently. Computer-assisted interviews and self-completion questionnaires were

used to evaluate the biological indicators once every 4 years and then followed up by caregivers. (Steptoe et al., 2012), collected health, economic, and psychological from the same individuals; by repeated measurements of lifestyle habits and social relationships, researchers were able to study the dynamics of aging. (Rogers et al., 2016)

After data cleaning, there were 1956 participants, which included 827 males and 1129 females over 50 years old. The assignment series is based on the time unit of year and based on this, a method of assigning the five assignment states is proposed. In a given year, each respondent is assigned one job state, which is combined into a continuous job track.

### 3.2. Sequence analysis

In recent decades, the availability and sequential analysis of panel data (Abbott 1995, Abbott and Hrycak), 1990. Cornwell 2015) is an important addition to the theory of working orbits. (Zhou, 2023) Time-series data not only provide methodological support for the evolutionary and evolutionary laws of biological processes, but also accurately portray various types of non-specification and divergence in biological processes and are therefore of great scientific importance. (Aisenbrey & Fasang, 2010)

A sequence is defined as an ordered list of elements in which the elements may be specific (e.g., a job or a marriage), physical (e.g., DNA, proteins, enzymes, etc.), or activities (e.g., a dance or a bird chirping). The positioning of these units is defined and arranged in a somewhat different natural order. (Brzinsky-Fay et al., 2006)

To test out underlying possible relationships between work trajectories and the well-being of the elderly, this study applied sequence analysis and regression modeling. First, the job pathways were categorized using sequential analysis techniques. Individuals' employment status at each time point was categorized into 5 employment statuses including "retired", "employed", "self-employed", "unemployed", and "out-of-labor force". In this study, the time point was each year during the period between 2002 and 2018 instead of individuals' age. After determining the job order, the distances between the job orders were obtained by comparing the individual job orders using a best-fit algorithm. Finally, through K-means clustering methods and based on the distance calculated and their similarity, the samples were divided into 5 clusters of work sequences.

### 3.3. Models

For the second step of analysis, the study utilizes multi-nominal logistic regression to assess the factors in 2002 that determine the trajectories in the following years. The formulate of a multinomial logistic regression is as follows.

$$\frac{P_j(Y_{c_1})}{P_j(Y_{c_0})} = e^{\beta_{0j} + \beta_{1j}X_1 + \dots + \beta_{pj}X_p}$$

$$\log\left(\frac{P_j(X)}{P_j(X)}\right) = \beta_{0j} + \beta_{1j}X_1 + \dots + \beta_{pj}X_p$$

In the formulate,  $Y_{c0}$  is the baseline category while  $Y_{c1}$  indicates the rest categories other than the baseline category. In this research, the empirical model is as follows:

$$\log\left(\frac{P(\text{Type} = \text{early retirement})}{P(\text{Type} = \text{standard retirement})}\right) \\ = \beta_{0j} + \beta_{1j}age + \beta_{2j}ethn + \beta_{3j}sex + \beta_{4j}edu + \beta_{5j}fjob + \beta_{6j}nchildren \\ + \beta_{7j}health$$

‘Type’ in this multi-nominal logistic regression is the types of working trajectory: (1) Early retirement (2) Out of labor and early retirement (3) Self-employed (4) Employed and late retirement (5) Standard employment trajectories. We assumed the Standard employment trajectories as the baseline of the regression and compared the other four types of working trajectory with it, aiming to discover what factors will influence the working trajectory of participants.

For the third part of analysis, the study uses linear regression to analyze how employment trajectories affect financial status in 2018 and how employment trajectories affect health status in 2018. Also, the study utilizes multi-nominal logistic regression to find out whether employment trajectories contribute to the health status better or worse than that in 2002.

The linear model is as follows:

$$Y = a + \beta X$$

$$Y_i = \beta X_i + \varepsilon_i$$

$$Y_i = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_n X_n + \varepsilon_i$$

The empirical models testing financial well-being are as follow:

$$saving2018 = a + \beta_1 Type + \beta_2 age + \beta_3 sex + \beta_4 ethn + \beta_5 typ + \beta_6 grandchildren$$

$$+ \beta_7 saving + \beta_8 fjob + \beta_9 edu + \beta_{10} couple + \beta_{11} lonely + \beta_{12} frds + \beta_{13} spts + \varepsilon_i$$

$$empinc2018 = a + \beta_1 Type + \beta_2 age + \beta_3 sex + \beta_4 ethn + \beta_5 typ + \beta_6 grandchildren$$

$$+ \beta_7 saving + \beta_8 fjob + \beta_9 edu + \beta_{10} couple + \beta_{11} lonely + \beta_{12} frds + \beta_{13} spts + \varepsilon_i$$

$$seinc2018 = a + \beta_1 Type + \beta_2 age + \beta_3 sex + \beta_4 ethn + \beta_5 typ + \beta_6 grandchildren$$

$$+ \beta_7 saving + \beta_8 fjob + \beta_9 edu + \beta_{10} couple + \beta_{11} lonely + \beta_{12} frds + \beta_{13} spts + \varepsilon_i$$

The dependent variables are measured by the variables of income and savings. In the first equation, saving is the total saving in 2018. In the second equation, empinc is the respondent total net employment income in. In the third equation, seinc is the respondent total net self-employment income. The variable of interest is the working trajectories, which is indicated by the ‘Type’ in the empirical model. To control for factors affect older people’s financial well-being, I have the covariates of father’s job when respondents were 14, the feeling of loneliness, whether have friends, and whether did sports. For the demographic covariates, I included the sex, age, ethnicity and highest educational level in the model.

In the health status model, health status was measured by self-reported health status. It was categorized into 5 levels: 1 is "Poor", 2 is "Fair", 3 is "Good", 4 is "Very good", and 5 is "Excellent".

$$health = a + \beta_1 age + \beta_2 sex + \beta_3 ethn + \beta_4 type + \beta_5 grandchildren + \beta_6 saving + \beta_7 fjob + \beta_8 edu + \beta_9 couple + \beta_{10} lonely + \beta_{11} frds + \beta_{12} spts + \varepsilon_i$$

In this equation, health is the self-reported health status of participants. Linear regression estimates the correlations of the variables above with the health status of the participants. For the covariates, I used the same covariates as in the model testing financial well-being.

In the health change model, the dependent variable is generated using health status 2018 minus health status 2002. It was then coded as a three-category variable: 1 is "Worse than before", 2 is "Same as before", 3 is "Better than before". In this study, multiple nominal logistic regression analysis was used to investigate the association of each variable with health changes.

$$\log\left(\frac{P(type = worse\ than\ before)}{P(type = better\ than\ before)}\right) = \beta_{0j} + \beta_{1j} age + \beta_{2j} ethn + \beta_{3j} sex + \beta_{4j} edu + \beta_{5j} fjob + \beta_{6j} nchildren + \beta_{7j} health + \beta_{8j} grandchildren + \beta_{9j} couple + \beta_{10j} type + \beta_{11j} saving + \beta_{12j} lonely + \beta_{13j} frds + \beta_{14j} spts$$

We set the third type of health change “Better than before” as the baseline for the multi-nominal logistic regression and compared it with the other two types. The main independent variable for the three models was the employment track group. The covariates are age, sex, father’s job when participants were fourteen, ethnicity, education qualifications, types of work trajectories, whether they have grandchildren, and whether they have a couple. Among these covariates, except for saving and age, are binary variables, while others are categorical.



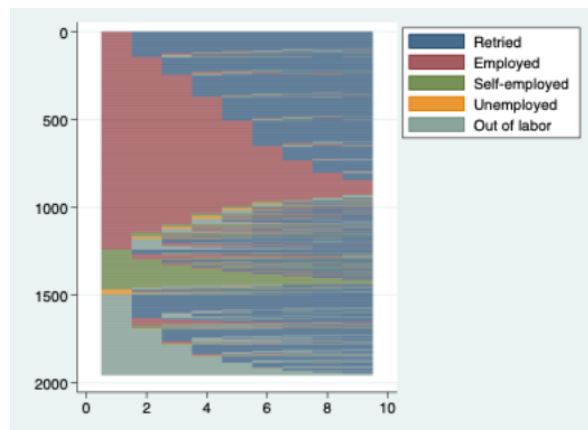
**4. RESULT**

**4.1. Work trajectories**

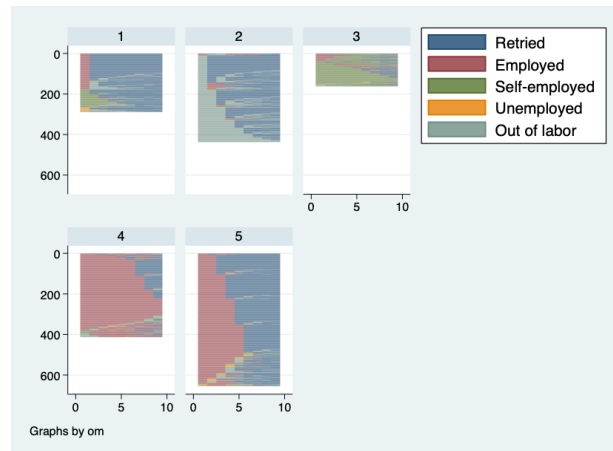
First, the five assignment states were analyzed for each time period in the sequence of assignment years to identify their typical assignment paths; this study was conducted from 2002 to 2018, and the work of each subject was recorded from year 16 to 2002. Figure 1 gives a sequential assignment matrix for the full sample. In this matrix, the horizontal axis is the work year series, which represents the labor situation at each point in time over a 16-year period. The vertical axis represents the samples collected, and each row represents the trajectory of one person's operation. Finally, a graph with some reference value for subsequent studies is given.

On this basis, the job trajectories are classified into multiple categories of work trajectories by the similarity of the chronological order using cluster analysis. The sequence analysis identified five types of employment trajectories between 2002 and 2018: (1) Early retirement (2) Out of labor and early retirement (3) Self-employed (4) Employed and late retirement (5) Standard retirement. Now, the four defined working trajectories will be referred to as Trajectories 1, 2, 3, 4, and 5 for the moment.

It is clear in the figure that the most prevalent type of working trajectory is trajectory 5 ‘Standard Retirement’ type, which is composed of 33.49% of the sample of this study, and the most uncommon working trajectory is trajectory 3 ‘Self-employed’, which is composed of 8.28% of the sample. This result indicates that most people in England are wage earners instead of self-employed, and they will work until the normal retirement age around 66 years old. For self-employed individuals, similar with late retirement individuals, they worked almost all the time from 2002 to 2018 and some of them retired at the point around 2009. It represents the work trajectory of most of the elderly in the study who retired at the middle of the period between 2002 and 2018. Type 1 consists of most of the early retirement and therefore is termed as ‘Early Retirement’ trajectory. Members of the type 2 are who were out of labor at the beginning of this period and then transferred to the retired status. For trajectory 3, members were self-employed, and they tend to retire later than others. Last, trajectory 4 represents individuals who retired in a late stage, where around half of the members belonging to this type were retired by the end of 2018.



**Figure 1** Overall distribution of work trajectories



**Figure 2** Five typical work trajectories

#### 4.2. Determinants of work trajectories

Table 1 displays the factors that influence the types of work trajectories, and trajectory 5 ‘Standard Retirement’ serves as the baseline of the comparison. First, age is a significant predictor across different working trajectories. Studies have shown that older people are more inclined to retire early, leave the workforce, or retire early. However, they are less likely to be late retirement. During the period between 2002 and 2018, age was one of the key determinants of work trajectory, but my results reveal impacts from more indicators than just age. On the other hand, gender, specifically being female, shows mixed results. If the participant is a woman, they are prone to be a member of the ‘Out of Labor’ type, but not a member of the ‘Self-employed’ type, with a significant level of 0.1%. While ethnicity alone is not a strong determinant of working trajectory. In contrast, education level plays an essential role in shaping the elderly's work trajectory. Compared with having no education qualification, if individuals have an education level of NVQ4 or NVQ5 or degree equivalent with this, or NVQ3 or GCE A Level education qualification, they are less likely to be out of labor then retire and late retirement. If they have an education level of higher education below degree, or NVQ2 or GCE O Level or equivalent, or are studying abroad, there is less possibility that they will be out of labor and retire. Additionally, the participants’ father’s job at fourteen will not directly influence the working trajectory of the individual. Family structure, specifically the number of children, is also important. If there are more than three children, then the chances of unemployment increase, and retirement is delayed. Ultimately, when a person is in better health, he is more inclined to be self-employed and delay retirement. However, the possibility of being out of labor decreases. Overall, this analysis highlights that age, gender, and health are three of the most important factors that will affect individual’s working trajectory.

**Table 1. Multi-nominal logistic regression on working trajectory**

	Early retirement		Out of labor and early retirement		Self-employed		Employed and late retirement	
RespondentAge	0.121***	-	0.129***	-	-0.038	-0.021	-0.170***	-
		0.02		0.01				0.02
Female	-0.094	-	1.292***	-	-0.840***	-0.192	-0.137	-
		0.15		0.16				0.14
white	-0.922	-0.5	-0.45	-0.5	0.866	-1.064	-0.737	-
								0.48
NVQ4/NVQ5/Degree or equiv	-0.09	-	-1.035***	-	0.078	-0.299	-0.599**	-
		0.24		0.24				0.23
Higher ed below degree	0.031	-	-0.470*	-	0.247	-0.324	0	-
		0.26		0.23				0.24
NVQ3/GCE A Level equiv	-0.154	-	-0.984***	-	-0.217	-0.369	-0.837**	-
		0.29		0.29				0.28
NVQ2/GCE O Level equiv	0.184	-	-0.551**	-0.2	0.085	-0.305	-0.036	-
		0.23						0.21
NVQ1/CSE other grade equiv	0.381	-	-0.446	-	-0.81	-0.781	0.196	-0.4
		0.39		0.39				
Foreign/other	-0.082	-	-0.775**	-	0.178	-0.437	0.302	-
		0.32		0.27				0.29
Low-paid jobs	-0.289	-	-0.362	-	13.307	-	-0.32	-
		0.52		0.45		455.85		0.43
Skilled jobs	-0.096	-	-0.613	-	13.472	-	-0.347	-
		0.48		0.43		455.85		0.41
Managerial jobs	0.06	-	-0.146	-0.5	13.758	-	-0.374	-
		0.55				455.85		0.48
Running own business	0.034	-	0.368	-0.5	14.158	-	0.193	-
		0.56				455.85		0.48
Other	-0.351	-0.5	-0.246	-	13.346	-	-0.367	-
				0.44		455.85		0.42
One to three children	-0.188	-	-0.368*	-	-0.2	-0.21	-0.361*	-
		0.19		0.18				0.16
Over three children	0.362	-	0.055	-	-0.176	-0.363	-0.043	-
		0.26		0.25				0.26
self reported health: HSE version	-0.172	-0.1	-0.888***	-	0.457***	-0.138	0.331***	-0.1
				0.09				
Constant	-5.986***	-	-4.332***	-	-14.711	-	9.007***	-
		1.09		1.01		455.85		1.09

**4.3. Work trajectories and well-being of aging population**

The next section of analysis is the linear regression analysis of the financial status of individuals, and the results are performed in Table 2. First, working trajectories will generate effects on an individual’s savings and income. Although compared with early retirement, being out of labor and standard retirement will not affect an individual’s savings and income. Yet, if individuals are self-employed, their self-employed income and total income will increase significantly. Also, late retirement boosts individuals’ employment income and total income. Besides, if individuals are older, their employment income and total income will be less likely to be high. On the other hand, ethnicity, the father’s job when an individual was fourteen, and whether to have grandchildren will not influence individuals’ savings and income. Education level doesn’t play a vital role in influencing individuals’ savings and income. Only having an education level of NVQ4 or NVQ5 or equivalent degree will increase the savings of individuals. At the same time, if one’s marital status is single, he or she will be more likely to have more savings compared with others who have

a spouse. Also, this result is aligned with the results of other studies mentioned in the literature review. Individuals who work for a long time of being self-employed will earn more income.

**Table 2. Linear regression on financial status**

	Savings		Employment income		Self-employment income		Total income	
Employment trajectories (ref. early retirement)								
om=2	1329.19	-9970.06	-1.39	-6.15	2.46	-12.39	1.06	-13.59
om=3	25862.406*	-12889.63	11.88	-7.95	135.229***	-16.02	147.103***	17.57
om=4	959.62	10541.29	71.556***	-6.50	19.51	-13.10	91.068***	14.37
om=5	10078.27	-9226.28	-4.30	-5.69	0.50	-11.47	-3.80	12.58
Age	433.02	-571.58	-1.714***	-0.35	0.02	-0.71	-1.691*	-0.78
Gender (ref. male)								
Female	4094.47	-6294.03	0.35	-3.88	-6.61	-7.82	-6.26	-8.58
Father's position at 14 yrs (ref. no job)								
Low-paid jobs	-17877.76	19349.64	-13.14	-11.94	12.14	-24.05	-1.00	26.37
Skilled jobs	-18504.01	18251.87	-7.34	-11.26	9.42	-22.69	2.08	24.88
Managerial jobs	18738.63	21092.02	-3.18	-13.01	-3.59	-26.22	-6.76	28.75
Running own business	-2953.34	20914.44	-0.47	-12.90	10.95	-26.00	10.48	28.51
Other	-35802.34	18849.76	-7.47	-11.63	2.01	-23.43	-5.46	25.69
Ethnicity (ref. non-white)								
white	38840.69	19979.68	-19.46	-12.33	0.74	-24.84	-18.72	27.23
Educational qualification (ref. no education)								
NVQ4/NVQ5/Degree or equiv	70690.206***	-9506.89	2.94	-5.87	0.66	-11.82	3.60	12.96
Higher ed below degree	11678.12	-9984.97	-3.87	-6.16	26.457*	-12.41	22.58	13.61
NVQ3/GCE A Level equiv	15386.56	11658.87	16.018*	-7.19	-2.11	-14.49	13.90	15.89
NVQ2/GCE O Level equiv	3647.13	-8782.74	-3.74	-5.42	-4.93	-10.92	-8.67	11.97
NVQ1/CSE other grade equiv	6214.99	16507.76	-5.79	-10.18	2.27	-20.52	-3.52	22.50
Foreign/other	-1012.00	12020.66	-3.34	-7.42	2.86	-14.94	-0.47	16.38
Take care of grandchildren (ref. no)								
Yes	9205.36	-6090.36	-3.80	-3.76	-4.27	-7.57	-8.08	-8.30
Marital status (ref. married)								
Cohabit	-30682.165*	14565.74	17.712*	-8.99	-0.47	-18.11	17.24	19.85
Neither	40399.546***	-6867.30	2.32	-4.24	-5.93	-8.54	-3.62	-9.36
Constant	-372.73	50339.21	155.834***	-31.05	-5.30	-62.58	150.532*	68.61
Observations	1930		1930		1930		1930	
Adjusted R <sup>2</sup>	0.082		0.163		0.049		0.09	

AIC	50858.912	22330.28	25034.85	25390.28
Standard errors in parentheses				
* $p < 0.05$ , ** $p < 0.01$ , *** $p < 0.001$				

In Table 3 linear regressions for sanitation are shown. Looking at the working trajectories, we can find that if individuals retire very late, they are likely to have worse health status. Also, having grandchildren and being a woman can help individuals to be healthier than those who are not taking care of children and males. Females have a significant difference of 0.1%, the most important factor for an individual's physical health. A p-value of 0.001 implies that the probability of observing an excellent result is 1/1000. However, savings, age, father's job when the participant was fourteen, marital status, and whether to have friends will have no effect on the individual's health status. In addition, if individuals have an education level of NVQ4 or NVQ5 or NVQ3 or GCE A Level or NVQ2 or GCE O Level, their health status will be better than others. Not feeling lonely and exercising regularly will have positive effects on health status. The p-value of feeling lonely is smaller than 0.1%, which is very significant. Especially for doing sports, its coefficient of linear regression is close to 1, which means exercise is strongly related to one's health status. The result of the linear regression on health status reinforces the conclusion of the previous study which states that employment will have positive effects on the older worker's health status. Because they have a strong and healthy body, they can work until a late stage of life. However, out of labor individuals who usually stay at home will have a well health status too.

**Table 3. Linear regression on health status**

	self-reported health: HRS version	
Out of labor and early retirement	-0.198*	(0.082)
Self-employed	0.156	(0.105)
Employed and late retirement	0.222**	(0.085)
Standard employment	0.059	(0.075)
Yes	0.143**	(0.049)
BU total savings - summary var	0.000	(0.000)
RespondentAge	0.003	(0.005)
Female	0.211***	(0.051)
Low-paid jobs	0.247	(0.155)
Skilled jobs	0.322*	(0.145)
Managerial jobs	0.239	(0.167)
Running own business	0.137	(0.166)
Other	0.129	(0.150)
white	0.115	(0.174)
NVQ4/NVQ5/Degree or equiv	0.376***	(0.079)
Higher ed below degree	0.104	(0.082)
NVQ3/GCE A Level equiv	0.282**	(0.094)
NVQ2/GCE O Level equiv	0.212**	(0.072)
NVQ1/CSE other grade equiv	0.093	(0.138)
Foreign/other	0.104	(0.096)
Cohabit	-0.012	(0.118)
Neither	0.029	(0.057)
No	0.385***	(0.086)
No	-0.161	(0.099)
one to three times a month	0.529***	(0.089)
once a week	0.488***	(0.082)

... more than once a week	0.594***	(0.062)
Constant	1.624***	(0.428)
Observations	1770	
Adjusted R <sup>2</sup>	0.165	
AIC	4979.285	

Standard errors in parentheses

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

## 5. CONCLUSIONS & DISCUSSION

Overall, this study explores the employment trajectory and well-being of later Life in the UK using ELSA Data and sequence analysis. The study categorized the working trajectories of 1956 elderly over 50 years old into five categories: 'Early retirement', 'Out of labor and early retirement', 'Self-employed', 'Employed and late retirement', and 'Standard retirement'. Through different models, the study analyzes how distinct variables affect the working trajectories and how working trajectories influence the financial status and health status of the elderly.

Age, gender, education level, number of children, and health status all contribute to the process of shaping working trajectories for individuals. This study used retirement time and the position of the elderly to categorize older people's working trajectories.

The reason why working trajectory 5 Standard retirement is the most common among the elderly might be the traditional retirement age norm. Most people are more willing to follow the social patterns and conventional life structure. They will remain in a stable job until they reach the standard retirement age. In England, the state pension age is currently 66 years old for both men and women. (State Pension Age Changes and Retirement Age Increases | Age UK, n.d.) Therefore, the United Kingdom government encourages people to work until 66 years old and then retire. Also, maybe the health status when people reach 66 years old will no longer be able to support them to keep working.

Next, the result of this study indicates the factors influence the working trajectories of individuals. There are four main factors: age, gender, education level, and health status. First, it is clear that the older you are, the earlier you retire or the less involved you are in the workforce; however, the less likely you are to delay retirement. As age goes on, people's health status, reactivity, and memory ability will decrease, which causes them to no longer be suitable for both intellectual and physical work. Compared with males, females are generally more likely to have the trajectories of out of labor but less likely to be self-employed. Men have more stable employment trajectories than women, but women were stereotyped as being at home taking care of children and living. Stereotypes address roles and occupations that men are usually placed in the workplace while women in home (Ward & Grower, 2020). According to Social Role Theory, women are usually the main caregivers at home to take care of young children and aging parents (Vogel, Wester, Heesacker, & Madon, 2003). Consequently, women tend to have fewer opportunities than men in the labor market. As for education level, if individuals have a qualification above NVQ1 or CSE or equivalent degree, their possibility of being out of labor and late retirement is low. Because having an education qualification represents one has the basic skills required in work and proves their ability to study. The employment quality increases with educational level rising. At the same time, being educated can help them to find a job quickly after they are fired. Finally, the health status of individuals is essential for their working trajectories. Having a good health status is the basis for working. People who have poor health status will probably be out of labor because they cannot afford the pressure of working. Individuals who have serious illnesses will suffer from pain

for a long time, so they can only rest. However, people who have a strong body can better be self-employed and retire late. Running a business by oneself is not an easy thing. It requires the continuous efforts of the boss, concerned about the company's dynamics, and timely detection of the company's capabilities. Besides, people who can retire late must have physical power that is superior to normal people.

Results also suggest working trajectories affect the financial status and health status of people over 50 years old. For economic status, if individuals are self-employed, their savings, self-employed income, and total income will all likely be high. This may be due to the fact that self-employed people are more satisfied with their jobs and are more motivated to work or earn money (Hundley, 2001). Therefore, the self-employed can earn more as compared to others. Also, self-employed individuals have more rights to control the stock of the company. As the business grows in value, the company will bring the boss significant assets that greatly improve self-employed individuals' financial well-being. On the other hand, a study in Retirement Behavior of the Self-Employed in the United Kingdom (Parker & Rougier, 2007) suggests that it may be the case that the self-employed will not receive pensions, benefits, sick leave, or welfare benefits provided by their employers or the government, and that this is largely at their own expense. They have the same desire to save for retirement as wage earners because they must ensure they have enough amount of savings to support their retirement (Joulfaian, 2017). Therefore, self-employed will work harder to earn money and save money for future later life. While late-retirement individuals are more likely to have more employed income and total income because their working time is long. For others who are in 'Standard retirement' and 'Early retirement', late retirement allows individuals to continue earning a stable income and accumulate wealth. In some cases, the longer individuals work, the higher the salary they can get. For example, some jobs require in-depth insights, and experience will need individuals who have worked for a long time in that industry. They can move to higher positions as they become older because their value is continuously increasing which results in higher employed income and total income.

Work trajectories also influence health status of the elderly. Table 3's results show that out-of-labor older individuals are less healthy than people in the group of 'Standard retirement'. Additionally, the study compared health in 2002 to 2018 and found that there was a large gap in health between the two; the Minutemen were in worse health. It might be because those who are out of labour do not have pressure from work and thus their health. They do not need to deal with numerous deadlines and workplace conflicts which successfully help them to avoid anxiety, depression, and health problems caused by long hours of sitting or dangerous physical activity.. On the other hand, late retirement individuals' continuous physical and mental activities help them to maintain a healthy life. For instance, some work requires frequent movement, which can help individuals reduce the risks of having obesity and heart or spinal problems. Similarly, people who are healthier will choose to work longer if their bodies can afford it. Therefore, late retirement individuals might originally have better health status than ordinary people.

## 6. LIMITATIONS

Both the Age UK Tracking Survey (ELSA) data and the chronological analysis of the data have their shortcomings, and in particular there is a lack of understanding of their influencing factors and generalizations. Although sequence analysis can identify the pattern and transitions over time and it is descriptive, it cannot accurately identify the causal relationships between events. This method follows the order of events in life but ignores potential factors and external influences that may cause these changes. For example, changes in the employment situation may be caused by

health issues, but we cannot say there are no additional variables, such as pre-existing health problems.

Also, generalizations are another limitation because ELSA data is a sample that only represents the older population from England. The results of these data may not be generalizable to other populations because they might have different work conditions or cultural backgrounds, such as different retirement ages or work systems. This limits the ability to apply findings universally across different regions or groups.

In addition, missing or unanswered data in ELSA can create bias, especially some participants might drop out during the study. This will reduce the stability and credibility of the conclusions. Finally, while sequence analysis can categorize different complex life trajectories into several conclusive categories, this method can overlook the unique nature of individual experiences. Additionally, the sequence is analyzed according to the unit of the year, which has some limitations in analyzing the effects of age.

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