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Review Article

Comparison the effects of poor health and low income on early retirement: a systematic review and meta-analysis

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Abstract: The main aim of this study was to estimate the effects of poor health and low income on early retirement. For this purpose systematic review and meta-analysis were conducted. Web of Science, PUBMED and Scopus databases were searched systematically. Finally 17 surveys were added in meta-analysis. These studies were conducted in 13 countries. At the end a Meta regression was done to show the effects of welfare system type on effect sizes of poor health and low income. The results of this study showed that poor health had effect on the risk of early retirement. (Poor health pooled effect sizes: 1.279 CI: (1.15 1.41), low income pooled effect sizes: 1.042 CI: (0.92 1.17), (poor health pooled marginal effects: 0.046 CI: (−0.03 0.12), low income pooled marginal effects: −0.002 CI: (−0.003 0.000). The results of this study showed that association between poor health and early retirement was stronger in comparison with low income and early retirement.

Key words: Early retirement, Income, Poor Health, Systematic Review, Meta-analysis

Introduction

Retirement is not a onetime suddenly decision and is a process which occurs over the time[1)]. Three types of exit from payment works are discussed in the literature. Disability pension, unemployment and early retirement. In disability pension retirement pension is given to the employee due to inability of working because of poor health[2)]. This inability could be temporarily or permanently. In unemployment, the employee exit from work without any continuous payments. Early retirement is a type of retirement that occurs in an age less than the qualified age conducted by government, social security organizations or employers. Early retirees give less money in comparison with normal retirees. Several factors can change the prevalence of early retirement. Health, job satisfaction, age, income, wealth and facing with catastrophic expenditures are some of them[2−4)]. Assume that U_w is utility derived from work which is affected by income (i) and health(h), with the assumption having other variables constant, three conditions may occur for the worker:

$$\begin{cases} U_w(i,h) > 0 & (1) \\ , & \\ U_w(i,h) = 0 & (2) \\ , & \\ U_w(i,h) < 0 & (3) \end{cases}$$

In the first condition, the utility of working is positive for the worker, so he/she like to continue the work. In the second condition he/she is indifferent to select between retirement and working and in the third one, the utility of

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working is negative and he/she decide to be retired. There is a tradeoff between health and income for people and if the positive utility of earning money exceeds the negative utility of poor health, they will continue their work and vice versa.

Health has an important role on exit from labor market. However two systematic reviews showed that the effects of health on early retirement were not significant, but they were effective on exit from paid employment and disability pension[2, 5]. In another review study, authors tested the effects of work conditions and health on early retirement and they found that factors like high job stress and low job satisfaction (which may arise from insufficient income), work pressure, were effective on early retirement were shown as the most important predictors of retirement adjustment[6]. In another review study about retirement behaviors of physicians, ongoing financial obligations and being highly paid were found as factors which delayed retirement planning[7]. According to the literature, our hypothesis is that "both poor health and low income are effective on early retirement".

In many review articles, the effects of health and income on early retirement are tested. But systematic reviews did not compare studies used health and income together as predictors of early retirement and did not test the tradeoff between them. In this study, we pooled studies which added the effects of health and income as effective factors of early retirement in one model. Pooling the results of poor health and low income would help researchers to understand what is the tradeoff between low income and health as effective factors of early retirement? Early retirement is a type of retirement that - in comparison with other types- workers are freer to select between working and retirement so factors like disability and social security laws cannot affect the behavior of workers. So in the present study we wanted to show that between poor health and low income, which one is more effective on early retirement.

Subjects and Methods

Search strategy

A literature search was conducted in Web of Sciences (Social Science Citation Index and Social Science Citation Expanded), Pubmed and Scopus databases in 12 September 2015. The combination of:

((“early-retirement”) AND ((((health [MeSH:NoExp] OR health[tw] OR “well-being”[All Fields] OR “health status”[All Fields] OR “health status”[MeSH:NoExp] OR “physical health”[All Fields]) OR (“mental health”[MeSH] OR “mental health”[All fields]) OR (hospitalization[MeSH] OR (“quality of life”[All Fields]) OR “quality of life”[MeSH] OR (“chronic disease”[MeSH] OR “chronic disease”[All Fields] OR “chronic illness”) OR ADL[all fields] OR “activities of daily living”[tw] OR OR IADL[all fields] OR functional limitation*[All Fields] “instrumental activities of daily living”[all fields] OR “disability”[tiab]))))) OR “ill-health”[All Fields] OR “perceived-health”[All Fields] OR “long-standing illness”[all fields] OR “activities of daily living”[MeSH:NoExp] OR hospitalization[All Fields] OR hospitalization [All Fields]) AND (((((((((income) OR wage) OR pension) OR earning) OR annuity) OR annuities) OR earnings) OR wages)) was used in Pubmed search.

In the present study, poor health contained all factors which leaded to low level of functional and metabolic efficiency focused on physical health and its indicators. These indicators could be quality of life, work ability, self-perceived poor health and life expectancy[6]. For low income, the definitions were clearer and contained low family income, low personal income, low pension, pension shortages and did not contain wealth of families, because studies has shown that wealth and income had contradictory effects on early retirement. The search strategy was restricted by the time and studies before 2000 were deleted from search results. For web of science database, studies conducted before 2005 were not available. All of the citations and abstracts were added in Endnote software version seven. 272 articles from web of science and 179 and 344 studies were found from PubMed and Scopus databases respectively. 303 titles were duplicate and after deleting them, 492 titles and abstracts were remained.

Inclusion criteria

For systematic evaluation this inclusion criteria was conducted:

1) The article at least must have an income variable. 2) The article at least must have a health variable. 3) A regression model must be conducted in the study with effect size variables of odds ratio, hazard ratio, risk ratio, marginal effect or coefficients and the regression model must include both of health and income as independent variables. 4) The dependent variable of the regression model must be early retirement. 5) The dependent variable must be in binary form: (0 = not early retired, 1 = retired) 6) the article must be written in English. 7) At least one of the distribution indexes (confidence intervals, *p*-values, T-statistics…) for effect sizes must be available. The inclusion criteria for population and study design was free.

From these studies, 71 ones (from PubMed and Scopus) were not in English language and deleted. So 421 studies remained for title evaluation. 307 articles were deleted after reviewing title and abstract. Next, 114 full text of articles were downloaded. From these articles 97 ones did not have two variables of income and health together and did not have the criteria of study. At the end 17 articles remained for meta-analysis[3, 8–23].

Data extraction

An Excel checklist was prepared for data extraction. Data of the name of the first author, title, year of publishing, percentage of females, type of study, sample size, effect sizes and distribution of them, being adjusted by education, marital status and age were extracted from articles. Using a statistical formula, coefficients were conversed to exponential form. Conversion of marginal effects were not possible so the results of marginal effects were pooled separately. Some of the income and health variables were at absolute form and poor health and low income variables were not been used in them. For these variables, the effect sizes were conversed so that higher values meant poor health and lower ones meant being healthy. After conversion, the effect sizes were added in the study. Some of the articles analyzed male and females separately. The effect sizes and distribution of them were added for males and females in these studies separately. If the estimations were done in different models, we used those models which controlled more confounding variables.

Analysis

Random effect estimator was used for pooling the results for low income and poor health. Q Cochrane test and I^2 heterogeneity test was used in this study too. In addition random effect Meta regression was used for two aims: first to show if the different types of income and health variables, health questions and outcome reports were the reason of high heterogeneity? And second to show the effects of welfare state regime on effect sizes. Different types of welfare state regime might have different labor and retirement policies, so the policy interventions might affect incentives of the population. So it is important to find that if the type of welfare state regime has interacted effect on the relationship between health and income on early retirement or not[24, 25]. For this purpose, data of total social expenditures (% of GDP) was used as the indicator of social welfare type of countries. Having more percentages of social expenditures meant that the government pay more attention to social security. Finally, using Meta regression a sensitivity analysis was done to show if the type of health variables or income variables affect scores or not. STATA SE v13.1 was used for estimating the Meta analysis and Meta regression.

Results

Characteristics of studies

In 17 studies added in meta-analysis, poor health, health score, physical activity and being healthy were the main health variable. Income, low income, total family income were income variables. In nine articles OR, HR, RR and coefficients were used as effect size indexes (two articles reported OR, others reported HR or coefficients) and in five others marginal effects were used as index. In 17 articles added in meta-analysis, in 12 articles, education was adjusted in the models and in 14 articles age and in 9 articles marital status and were adjusted. In the Table 1, summary of included studies in meta-analysis is shown. Total sample size of the meta-analysis was 1,150,259 people.

From 17 articles, ten articles were conducted after 2010, four studies were done in the United States and others were done in United Kingdom (n=2), Denmark (n=3), Netherlands (n=2), Australia (n=2) Norway, Belgium, Chile, and some Europe countries. Furthermore from these 17 studies, only two studies (Reitzes *et al.* and Jousten *et al.*) were cross sectional.

Results of pooling effect sizes

As indicated before, marginal effect results could not be pooled with Odds ratios, hazard ratios, risk ratios and coefficients. So they were pooled separately. Because of high heterogeneity, all of the meta-analyses were done by random effect estimator. In the Table 2, pooled results of health effect sizes are shown. Pooled result for poor health in the first ten studies was 1.279 (OR) while it was 0.046 for studies used marginal effect as effect sizes. The results have shown that both poor health had positive effect on early retirement. I^2 test of heterogeneity was also estimated in two effect sizes. It was 88.1% in ratio studies and 97.8% for marginal effect studies.

In the Fig. 1, poor health effect sizes, weight of each study and confidence intervals are shown too. Form these studies, in three studies poor health and early retirement had inverse relationship. In others, direct relationships were found. The effect sizes of poor health varied between 0.975 and 1.785 and it varied between −0.0786 and 0.190 for marginal effect studies.

In Table 2, the results of pooling low income are shown.

Table 1. Characteristics of studies added in to the Meta analysis

1st author	Comparison	Country	Sample size	Health determinant	Income determinant	Adjustment
(Strumpf, 2010)[8]	Early retired vs workers	United States	219,450	Health poor	Household income	Edu/age/mar*
(Sell *et al.*, 2009)[9]	Risk of early retirement vs employees	Denmark	8,664	Ability to work	Monthly wages	Edu/age
(Schuring *et al.*, 2013)[10]	Early retirement in more than 45 yr old vs employees	Netherlands	93,917	Poor health	Low income	Edu/age/mar
(Robroek *et al.*, 2013)[11]	exit from paid employment vs employees	Europe	13,311	Less than good health	Low income	No adjustments
(Rice *et al.*, 2011)[12]	Early work exit vs workers	United Kingdom	1,693	Poor health symptoms	Low income	Edu/age
(Olesen *et al.*, 2012)[23]	Early retirement vs employees	Australia	2,803	Physical functioning	Household income	Age
(Damman *et al.*, 2011)[13]	Early retirement behavior or not	Netherlands	1,678	Severe health problems	Pension shortage	Edu/age/mar
(Ruiz-Tagle and Tapia, 2011)[35]	Early retired or not	Chile	134,934	Life expectancy	Monetary income	Edu/age/mar
(Reitzes and Mutran, 2004)[14]	Retirement(early) or not	United States	376	Poor health	Income	Edu/mar
(McGarry, 2004)[15]	Early exit from full time work vs workers	United States	5,498	Poor health	Earning	Age
(Jousten and Lefebvre, 2013)[16]	Early retirement vs employees	Belgium	655	Fair health	Life time wage	Edu/age/mar
(Datta Gupta and Larsen, 2007)[17]	Early retirement vs employees	Denmark	643,335	Acute health	Low Salary	Edu/age
(Dahl *et al.*, 2000)[18]	Early out of labor force vs labor force participants	Norway	10,512	Health	Income	Edu/age
(Conley and Thompson, 2013)[19]	Early retired vs other employees	United States	5,000	Acute health shock	Total family income	Mar
(Blundell *et al.*, 2002)[20]	Early exit from work vs workers	United Kingdom	1,998	Health score	Pension	Edu/age/mar
(Taylor *et al.*, 2014)[21]	Early retirement of baby boomers vs working baby boomers	Australia	897	Poor health	Low income	Edu/age
(Friis *et al.*, 2007)[22]	Early retirement of nurses vs other nurses	Denmark	5,538	Poor health	Low income	Marr/age

Pooled effect sizes for the relationship between low income and early retirement was positive, but not significant (OR = 1.042), and it was negative and insignificant for marginal effect studies too (−0.002). In Fig. 2, the results are shown in meta-figure. In eleven studies, negative relationships were found and in others there were positive relationships. Low income effect sizes were varied between 0.55 and 1.552 and they varied between −0.009 and 0.005 for marginal effect studies. Heterogeneity I^2 test for ratio data was 89.1% and 67.5% for marginal effect respectively.

Consider the results of first and second figure together, it could be indicated that the relationship for poor health was positive. All of these relationships were positive except Reitz *et al.*, and Dahl *et al.*[14, 18]. One of these studies did not have significant effect size[14]. Results of low income had broader range and had more variations. In some studies the low income coefficient was positive and in others it was negative. These associations were not significant in six studies[12, 16, 17, 19, 21].

Results of Meta regression

In the Table 3, the results of Meta regression of poor health are shown. As shown in the table, no significant differences were found between type of health variable (health variable or poor health variable) and effect sizes. In addition, not significant differences were found between type of health questions (self-report health or objective health) and effect sizes. So the type of effect sizes and questions could not be the reason for heterogeneity. The relationship between total social security expenditures and health effect size was significant at 90% confidence interval, indicated that by increase in the percentage of social security expenditures, the relationship between poor health and early retirement would be stronger.

In the Table 4 meta-regression results for low income are shown. In this Meta regression no significant differ-

Table 2. Meta table for poor health and low income in studies using effect sizes and marginal effects

Poor health					Low income				
Studies first author	Health effect size	weight	CI-lower	CI-upper	Studies first author	income effect size	Weight	CI-lower	CI-upper
Studies used OR, HR, RR and coefficient as effect size					Studies used OR, HR, RR and coefficient as effect size				
Damman	1.2712	8.11	1.00	1.55	Damman	0.644	9.66	1.36	1.75
McGarry	1.0854	12.25	1.02	1.15	McGarry	1.08004	12.30	1.02	1.14
Olesen	1.38	11.71	1.27	1.49	Olesen	1.07527	12.37	1.02	1.13
Olesen-women	1.25	6.01	0.87	1.63	Olesen-women	1.11111	11.04	0.98	1.25
Reitzes	0.97531	12.34	0.91	1.04	Reitzes	1.07681	1.74	0.20	1.95
Rice	1.71	6.52	1.36	2.06	Rice	0.74	5.36	0.33	1.15
Robroek	1.17	8.56	0.92	1.42	Robroek	1.03	10.30	0.86	1.20
Schuring	1.2	10.60	1.04	1.36	Schuring	0.55	8.11	0.29	0.81
Sell	1.78571	7.27	1.47	2.01	Sell	0.908	12.16	0.72	0.88
Taylor	1.36	5.28	0.93	1.79	Taylor	0.9803	6.92	0.66	1.30
Friis	1.281	11.35	1.16	1.40	Friis	1.29	10.04	1.11	1.47
Pooled results	1.279	100	1.15	1.41	Pooled results	1.042	100	0.92	1.17
I^2 test for heterogeneity = 88.10%					I^2 test for heterogeneity = 89.10%				
Cochrane Q = 84.22 *p*-value = 0.000					Cochrane Q = 92.14 *p*-value = 0.000				
Tau^2 between study variance = 0.0348					Tau^2 between study variance = 0.0315				
Studies used marginal effect as effect size					Studies used marginal effect as effect size				
Conley	0.121	9.16	−0.07	0.31	Conley	−0.009	4.775	−0.02	0.00
Dahl	−0.0786	20.77	−0.10	−0.06	Dahl	−0.0028	34.294	−0.0032	−0.0024
Dahl-women	−0.049	21.007	−0.06	−0.04	Dahl-women	−0.0038	8.828	−0.01	0.00
Datta Gupta	0.073	20.99	0.06	0.09	Datta Gupta	0.005	7.011	−0.0001	0.01
Jousten	0.19	10.44	0.02	0.36	Jousten	−0.002	3.436	−0.01	0.01
Strumpf	0.1515	17.625	0.08	0.22	Strumpf	−0.0002	41.653	−0.0003	−0.00001
Pooled results	0.046	100	−0.03	0.12	Pooled results	−0.002	100	−0.003	−0.001
I^2 test for heterogeneity = 97.80%					I^2 test for heterogeneity = 67.50%				
Cochrane Q = 232.53 *p*-value = 0.000					Cochrane Q = 15.39 *p*-value = 0.009				
Tau^2 between study variance = 0.007					Tau^2 between study variance = 0				

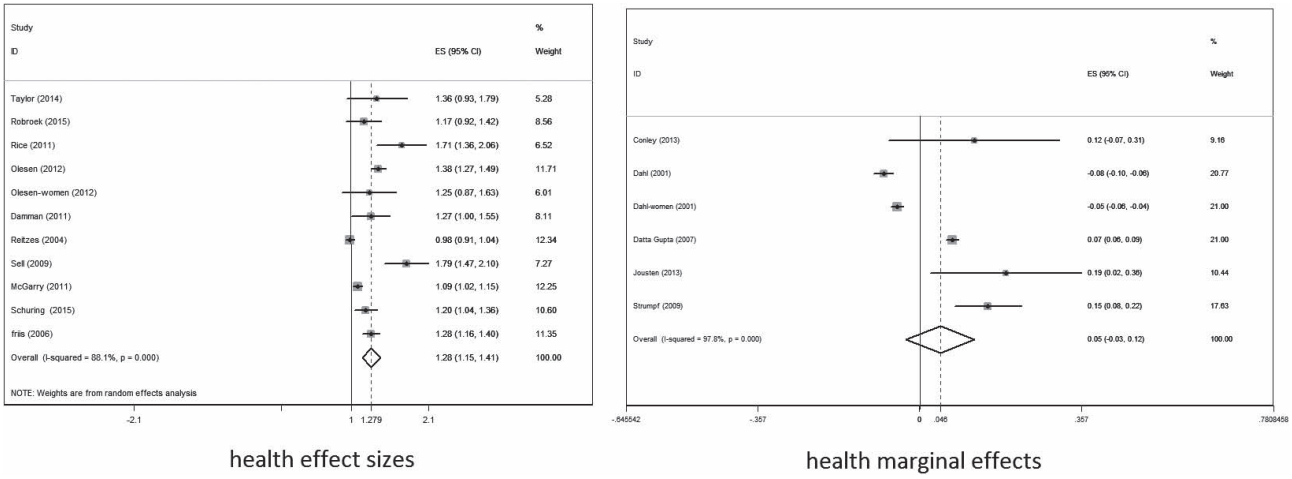

Fig. 1. Meta figure for poor health in studies using OR, HR, RR, coefficient and marginal effect as effect size variable.

ences were found between income variable (income or low income) and effect sizes. The relationship between total social security expenditures and income was not significant so no relationships were found between welfare state type and income effect size.

Discussion

This study showed that poor health increased the likelihood of early retirement. The association between poor

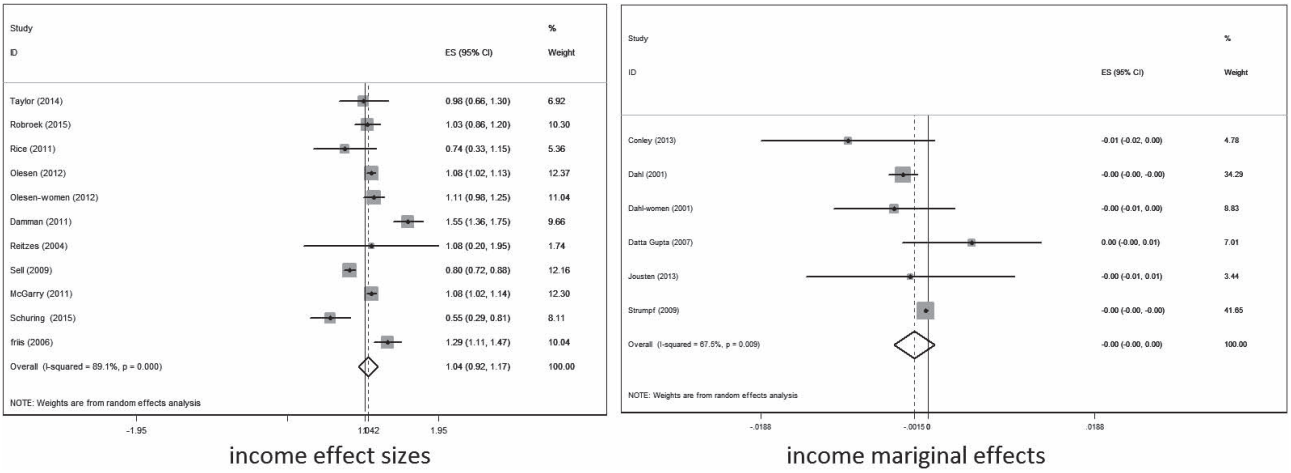

Fig. 2. Meta figure for low income in studies using OR, HR, RR, coefficient and marginal effect as effect size variable.

Table 3. Meta regression to show the relationship between type of health questions, health variables (poor health or health status) and total social security expenditures with effect sizes of poor health and early retirement

Variable	Coefficient	Standard error	t-statistics	*p*-value
Marginal or effect size	1.220225	0.1038703	11.75	0.000
Type of health question	0.1569361	0.1076848	1.46	0.173
Type of health variable	−0.0856014	0.101903	−0.84	0.419
Total social security expenditure	0.0233943	0.0119434	1.96	0.076
Constant variable	−0.4946984	0.3023295	−1.64	0.130

Table 4. Meta regression to show the relationship between type of income questions, income variables (low income or income) and total social security expenditures with effect sizes of low income and early retirement

Variable	Coefficient	Standard error	t-statistics	*p*-value
Marginal or effect size	0.996044	0.061357	16.23	0.000
Low income variable	0.00019	0.001044	0.18	0.859
Total social security expenditure	−0.06541	0.09462	−0.69	0.503
Constant variable	0.0596	0.096303	0.62	0.548

health and early retirement was stronger in comparison with low income and early retirement. Factors affecting early retirement might be depended to welfare state regime. For example Wan der Wel *et al.* found that the probability of exit from labor market was lower in Scandinavian countries[26]. The results of Meta-regression confirmed that the effect size of poor health on early retirement is bigger in countries with higher percentage of total social security expenditures. The Meta regression results showed no significant differences between type of poor health variable (self-perceived questions or objective poor health conditions) and effect sizes. So the type of poor health variables could not be the reason for differences in poor health effect sizes. The relationship between low income and early retirement was more Heterogeneous. For example, in Chile, in order to be eligible for being early retired, people must belong to the pension system at least for five yr and the pooled retirement deductions must be more than 62% of income earned in past ten yr. So in such condition being early retired is very hard if the person faced with poor health. In some cases, for increasing their income after retirement, people try to show themselves disabled to receive disability pensions which is higher than early retirement pension. They malinger themselves like a disabled pension and try to convince social security organizations that we are disabled[27–29].

The results of Meta-regression for low income showed that welfare state regime types could not be the reason for

heterogeneous effect sizes. In addition, type of income variable did not change the effect sizes. The ambiguous effects of low income on early retirement may rise from the contradictory effect of income on early retirement due to Backward Bending Curve of labor supply[30]. Under backward bending curve, the relationship between income and labor supply is highly related to the level of income. By increase in income, labor supply will increase beyond a certain level of income, after that, by increase in income, labor supply would decrease. This condition occurs because of labor-leisure trade off in going to work[30, 31]. Because of contradictory effects of income and labor supply for poor and rich, the labor supply models must be estimated for poor and rich separately[30, 32]. In a model estimated without separation, specify bias is inevitable[33]. However a low effect size of income was derived from the underestimating of the effects of low socioeconomic status because of underrepresentation of people with low socioeconomic status[10]. Previous systematic studies, reviewed the effects of poor health on early retirement. Authors did not analysis the effects of low income in these studies. In a Meta-analysis done by Robroek *et al.*, they analyzed the effects of lack of physical activity on exit from paid work. Three studies were pooled in this meta-analysis and authors found that lack of physical activity did not have any significant effect on early retirement. M van Rijn *et al.* in their study, assessed the effects of poor health on early retirement. They found that poor health increase risk of early retirement[2]. Van der berg *et al.* in another study assessed the effects of health and work conditions on early retirement. They found that poor health and work conditions (psychosocial and physical work load) affected early retirement, while the effects of poor health was stronger[34].

Early retirement is a phenomena that have burdens on societies, social security organizations and employers. Findings of this study showed that the effects of poor health in increasing early retirement is higher than low income. Labor market policy makers must notice to the health of workers for decreasing early retirement. However the results of this study showed that policy making for labor market is depended to the type of welfare system. Using health policy decisions for decreasing early retirement are more predictable in comparison with economic policies. Health promotion interventions and occupational health programs are some of the efforts to decrease early retirement. As the results of this study, they are more effective than financial interventions.

This study had some limitations. First, this study was restricted only to English studies. Second, we pooled longitudinal studies in to cross sectional ones. Longitudinal studies effect size shows causality between dependent and explanatory variables and it is not reliable for cross sectional studies. Third, high heterogeneities showed that the results were not consistent.

Conclusion

In this study we compared low income and poor health as effective factors of early retirement. We found that low income did not have any strong effect on early retirement in the presence of poor health. Furthermore effects of poor health on early retirement was stronger in comparison with low income and depended to welfare state regime of the country. Labor market policy makers must do more implementations to increase health of workers. For future studies, it is suggested to test the effects of welfare state regime on the decision of poor health and low income people for other types of retirement.

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