

retirement per se. The definition of retirement is not simple or clear for several reasons. Retirement may be a gradual process, not a discrete event [Ichimura and Shimizutani 2012; Shimizutani 2011]. However, many of existing literature rely on dichotomized status of retirement. Often used is the definition in that those who answer they are not currently in formal work force, and do not seek for employment are regarded as retired. Although this approach seems to provide consistent and valid measurement of retirement status, it may not be so clear in case of persons who have more discretion on the degree of labor participation, e.g. those self-employed. Simply asking individual judgment on his / her own retirement status is further problematic because people judge differently what makes “retirement.”

Reasons for retirement decision, especially whether the decision was voluntary and accompanied with alternative choices, will differentially affect the causal association between retirement and health outcomes.[Jokela, Ferrie, Gimeno, et al. 2010] Health concerns can be the main reason for one to decide retirement if he/she thinks health demand to keep labor participation exceeds expected marginal utility obtained from labor wage and social participation. One may have no choice but be forced to retire by lay-off and other external economic shocks, even if he/she wants to stay in paid work status with suitable health stock.[Gallo, Bradley, Siegel, and Kasl 2000] Or, it could be the case that chooses to retire in order to save more time for one’s own leisure or to provide care for dependent members of his/her family. It would be reasonable to assume that different paths to reach retirement decision as listed above could result in different associations with health.

As we overview existing literature on retirement and health so far, one could realize that it still remains to be fully answered what is retirement at all, and how it is related to health in post-retirement population. Among all developed countries, Japan runs in the very front of population ageing, where relatively high labor participation rate in elderly population is a unique phenomenon that invoke questions such as why this is the case in this country and what is a consequence in health and financial status to the population.[Oshio and Oishi 2004; Yashiro and Oshio 1999]

In this discussion paper, we intended to scrutinize limitation and pitfalls in previous studies as mentioned above by making the most use of data in JSTAR. Interviews in JTSR asks current conditions in employment status, types of employment, reasons for retirement, and various measures of health conditions such as functional, cognitive, and mental functions. The supplemental questionnaire scrutinizes social support, social network, and the types and frequency of social

participation, as well as perceived social capital.

In the next section, we begin with descriptive statistics of work status transition from wave 1 to wave 2. Analysis was conducted with stratification by gender because patterns of work status trajectory were distinct between genders. Besides, as we will see shortly, female respondents took homemaker status as an alternative status of retirement. The description of trajectory patterns helps us confirm that retirement is a gradual process, and that the treatment of homemaker status is problematic among females. We next provide another series of descriptive analyses on a various types of health measurement by categories of work status trajectory. As we already expect the distribution of and change in health measures across work status trajectories are diverse according to the mode of health measures, e.g. perceived health status, mental status, physical functions measured by standardized scale, grip strength, and cognitive function. The results strongly suggest that we should better theorize what aspects of health status determines and is determined by which mode of work status transition. Thirdly, participation to types of social network was compared across work status trajectory categories to scrutinize whether social participation and labor participation are endogenously affecting each other. What we found striking was gender difference in the association between leave from work status and participation in social network. Retired male respondents were more likely to have social participation such as voluntary and leisure activities, while being retired or homemakers did not have significant associations with social participation among female cases. The results may suggest that among male cases, the pattern of social participation after retirement may confound health impact of retirement. Finally, we conducted a series of naïve regression analysis of health measures as target variables, regressed on work status and social participations. In this study, we leave further sophisticated modeling of retirement-health association accounting for causal direction and endogenous problems for future research, since our intention here is rather to identify complex and conditional associations among transition patterns of work status, social participation, and types of health measures. Final section provides results summary and their implication for future research on retirement and health in Japan.

## II. Descriptive analysis of transition of work status, social participation, and health in J-STAR population

### II-1. Definition of retirement and work status trajectories between wave 1 and wave 2

J-STAR interview asks first whether the respondent currently participates in labor force,

including tentative leave. If the respondent answers NO, a following question asks whether he/she currently seeks for employment opportunities. If the answer to this question is YES, the respondent is categorized as “unemployment.” If NO, then the respondent is asked to choose the most suitable category to describe his/her current status among “retired”, “homemaker”, “convalescence”, or other.<sup>2</sup>

Table 1-1 shows trajectory of work status between waves 1 and 2 for both genders and all age categories. Tables 1-2 and 1-3 present stratified analysis for male and female respondents. Some caution is required since we have 20-30% loss to follow-up in each category. Gender difference was observed in the attrition rate among retired and homemakers at the time of wave 1; male homemakers and female retirees were likely to drop out of follow-up survey.

In both genders, those with labor participation as full-time, part-time, and self-employed status were most likely to remain in the same category after two years. Striking gender difference was observed in the categories of “other employment,” “unemployment,” “retired,” and “homemakers” at the time of wave 1. Males in other employment or unemployment at wave 1 showed the highest proportion of retirement in wave 2 (24.0% and 29.6%, respectively), followed by part-time workers (10.0%). To the contrary, retirement rate of females are less than 2 % in all categories. Females in other employment were most likely to stay in the same category after two years, and females unemployed at wave 1 were most likely to become homemakers at wave 2 (32.6%). Strange is the finding that 47.4% of females who defined herself as retired at wave 1 returned to homemakers at wave 2. Tables 2-1, 2-2, and 2-3 shows the results limited to those aged 65 or less, overall findings are quite similar with those presented in Tables 1-1, 1-2, and 1-3. Descriptive analysis in Tables 1s and 2s suggests that male respondents make a transit to retirement via other employment, unemployment, and part-time statuses, while female respondents has more flexible use of homemaker status exchangeably with retirement status.

JSTAR also asks whether the respondents are re-hired after compulsory retirement. As Table 3-1 shows, about a half of male respondents who were in full-time employment at wave 1 and have transited to part-time position at wave 2 were re-hired cases. Re-hired cases shared about 22%

---

<sup>2</sup> Ichimura and Shimizutani [2012] further used self-reported work time for formal paid work as a marker of “retirement,” since self-reported status of retirement was inconsistent. We did not take this strategy in this study because we took retirement in a sense broader than “leaving formal labor force.” Caution may be necessary, however, for misclassification of status since some respondents declare “at work” in spite of few hours to work per day.

of those males transiting from part-time to part-time positions. By contrast, only a quarter of female respondents who transited from full-time to part-time positions were re-hired cases. These numbers are in accordance with the findings in Tables 1s and 2s, in that a considerable portion of males make a transit to retirement through non-full time positions rather than directly shift to retirement, while females take a different path to retirement.

JSTAR further asks reasons to be retired for the retired at wave 2. As Table 4-1 presented, the major reason for retirement in both genders was “no choice”; e.g. compulsory retirement at fixed age, and/or retirement due to external economic shock such as lay-off and bankrupt. Following was the concerns about one’s health conditions, of which proportion was larger among those aged 65+, compared to their younger counterparts. In the female respondents aged 65 and less, one third answered they were retired because of their duty for informal care of dependent members in the household. Those retired for enjoying leisure shared only 8-9 % of those aged 65+.

Table 4-2 showed the response to a question asking reasons to be homemakers at wave 2. Male response was excluded because only 8 male respondents were homemakers at wave 2. The results were stratified by age category and homemaker status at wave 1. The major reason for becoming homemakers was their duties for informal care of family members. However, noteworthy is that about a quarter of female respondents who were in workforce at wave 1 and became homemakers at wave 2 answered that they were forced to do so due to compulsory retirement and/or external economic shocks. In addition, about 15% of working females at wave 1 became homemakers because of their health conditions. These numbers suggest that a considerable portion of female cases regard homemaker status as an alternative status of retirement as leaving paid work.

To summarize findings of descriptive analysis in this section,

1. We confirmed that retirement is a gradual process rather than a discrete event of leaving paid work participation.
2. Males and females take a different path to retirement. Among females, homemaker status is flexibly used as an alternative of retirement.
3. We also confirmed that reasons to become retired or homemaker status are diverse.

In the next section, we will scrutinize how a variety of transition of work statuses with different reasons are related to change in various measures of health.

## II-2. Descriptive analysis of work status trajectory and the change in health status

In this section, we turn to our concerns to health status of JSTAR participants and its change according to work status trajectories. At this stage, we intentionally ignore the causal direction between the health and retirement transition, and simply take a closer look at the descriptive statistics in various types of health markers according to work status trajectories between wave 1 and wave 2. In this preliminary analysis, we intend to see how diverse the associations between work status transition and health markers, since we believe inconsistent findings in previous studies could at least partially be attributed to different health markers with heterogeneous mix of status transitions.

Tables 5-1 to 5-8 present the transition of health markers among male respondents who participated in labor force (full-time, part-time, self-employed, and other employment) at wave 1. Left two columns of the tables show health markers among those newly retired between waves, divided by reasons to be retired; “non-choice” were those retired by compulsory retirement or external economic shock such as lay-off, and “health” were those decided to retire with their health concerns.

Table 5-1 shows the proportion of those with limitation in mobility, and Table 5-2 shows the proportion of those with limitation in instrumental activities of daily living (or IADL). These two properties were measured through a standardized battery of questions asking functions that the respondent feels difficulties to conduct. Although the questionnaire measures self-reported perception of difficulties, it is specific to each function clarified in questionnaire items. Thus, the questionnaire is regarded to reflect objectively defined functional limitations although it is based on self-report. As we could see, the proportion of those with functional limitation is lower in those at full-time work both at waves 1 and 2, compared to those who transitioned to non full-time statuses at wave 2, suggesting that the functional limitation at baseline is associated to the likelihood to transition from full time status to non-full time statuses over time. Those transitioned from full-time job at wave 1 to retirement status at wave 2 showed a higher proportion of functional limitation at wave 2, which also seems consistent to health-related selection to be retired.

Table 5-3 shows the results of grip strength, an objectively measured biomarker to reflect physical strength in general. We could see the trend that we observed in IADL and mobility

limitation much more clearly in grip strength trajectories. Those who remained at fulltime status exhibited stronger grip compared to those transiting to non-full time statuses.

Tables 5-4 and 5-5 present a proportion of those who reported difficulties in eyesight and hearing. Since these are based on self-report, we could naturally assume that they are strongly affected by one's demand in hearing and visionary ability in daily life, and susceptible to self-report bias. As the tables show, the proportion of reported limitation is relatively high among those stayed in full-time employment, compared to those transiting to non-full time statuses and retirement, which rather indicates that the self-report of sensory limitation is dependent on one's functional demand to stay in labor force.

In the same line, self-reported health status is the most frequently used measure to reflect one's health status. Although it is known to highly correlate with health prognosis such as mortality,[Idler and Benyamin 1997] it is also susceptible to report bias due to conditions other than health.[Groot 2000] In Table 5-6, the highest proportion of self-reported ill health was observed among those who transited from employment to unemployed. The same trend could be seen in Table 5-7 that exhibits the proportion of depression defined as 16+ points in a battery of the Center for Epidemiological Studies Depression Scales (CES-D). Depression was highly observed among unemployed but also among those with full time jobs. These may suggest that the proportion of self-reported ill health and depression reflect one's external conditions such as socio-economic difficulties and job stresses, rather than internal conditions of health.

Finally, Table 5-8 presents the number of word recall as a marker of cognitive function.<sup>3</sup> The interpretation of the measure needs some caution, since the average numbers of word recall improved over waves, which is contra to physiological decline in memory function. This unexpected improvement over time suggests a learning curve effect, as the measurement battery used in wave 2 was similar to wave 1. There was not obvious difference in cognitive function at wave 1 across categories of work status trajectory. It is of note that we could see a decline in recalled word counts over time in retirement categories, which may suggest a negative change in cognitive function among those newly retired.

Tables 6-1 to 6-3 showed the change in limitations in mobility, IADL, and grip strength

---

<sup>3</sup> Ichimura and Shimizutani (2012) using the same set of JSTAR panel data used imputation since a considerable portion of word recall measurement was missing. We again did not use imputation in this research because of potential bias due to learning effect over waves. Again, caution must be paid to selection bias due to missing observation.

among female respondents. Compared to male findings in Tables 5-1, 5-2, and 5-3, there was found a relatively narrower disparity in functions across categories of working status trajectories, except for homemaker status at wave 2 where a larger portion of functional limitation and lower strength of grip measure was consistently observed. Tables 6-4 and 6-5 show the proportion of those complained sensory functional limitations, which shows almost compatible distribution with those in male cases. Tables 6-6 and 6-7 presents self-reported ill health and depression. Unique in female respondents was a higher portion of ill health and depression among those who became a homemaker due to health reasons and for family care giving. About a half of females who used to full-time or part-time workers at wave 1 and newly became a homemaker for these reasons at wave 2 complained ill health and depression. Finally, Table 6-8 shows word recall reflecting cognitive function. Compared to male retirees who showed a clear decline in cognitive functions, female retiree and homemakers showed no such tendency, except for those who became a homemaker due to health reasons.

### II-3. Social participation and work status trajectory

JSTAR asks the respondent whether she/he participates in any social relationship with other than her/his family, relatives, and friends, and in social settings other than workplace. We conducted multiple correspondence analysis, a type of multivariate statistical technique for categorical data, to summarize 8 types of social network participation in the questionnaire into a fewer number of meta-categories. Based on the results, we made three categories of social participations, namely commitment, prestige, and preference-based networks. Commitment network participation reflects activities such as volunteer activities in the community and other commitment to support one's neighborhood. Prestige network participation consists of political and/or religious activities. Finally, preference-based network participation includes sports, leisure, hobby, and learning activities.

Tables 7-1 to 7-3 exhibit the proportion of each category of social network participation by trajectory categories of work status transition for males. Participation to commitment and preference-based networks is more frequently observed compared to that to prestige network. Those who newly became retirees at wave 2 showed an increase in the proportion to join commitment and preference-based networks over waves. We also conducted a logistic regression taking the participation to networks at wave 2 as a target variable, of which results are presented in Table 8-1 for males. Retirement at wave 2, adjusting for age, education, marital status, working status at wave

1, and corresponding network participation at wave 1, was significantly related to the likelihood of joining commitment and preference-based networks at wave 2 (odds ratios 2.143 for commitment network, and 3.016 for preference-based network). Tables 7-4 to 7-6 and Table 8-2 present results of similar analyses for females. The proportions to join network activities were generally lower among females compared to males. For females, retirement and homemaker status at wave 2 did not relate to the likelihood to join social network activities of any kind at wave 2.

#### II-4. Health outcomes, work status trajectory, and social participation; naïve regression analysis

Finally, we conducted a series of naïve regression analysis by taking types of health measures at wave 2 as targeted outcome variables, and by regressing them on work status at waves 1 and 2 as well as on network participation at wave 2, with adjustment for age, educational attainment, marital status, and corresponding health status as of wave 1. Results for males are presented in Table 9, and those for females are in Table 10. Odds ratios for work statuses regard full-time work as a reference category.

For males (Table 9), higher odds ratios for mobility limitation were observed with most of work status categories at wave 2, except for “unemployed,” suggesting those at non-full time work status were more likely to have limitation in mobility compared to their full-time counterparts. Model inclusion of prestige and preference-based network participation slightly improved statistical significance of work status categories, suggesting that network participation confounded the association of work status with mobility limitation. Participation to prestige network showed a significantly low odds ratio for mobility limitation.

None of work status categories showed significant associations with IADL limitations, and the odds ratios were not affected by inclusion of social network participation. Instead, all types of social network participation showed a significantly lower odds ratio for IADL limitation, suggesting that network participation is positively associated with better IADL function, of which causal direction is not clear in this model.

Grip strength and self-reported eye-sight limitation did not show any significant associations with work statuses or network participation. Hearing limitation was significantly more likely in commitment type of social participation, which seems contradictory. Self-reported ill health was more likely reported among retirees, and its statistical significance was improved when

preference-based network participation was included in the model. Preference-based network participation per se showed a significantly lower odds ratio against self-reported ill health. Depression was significantly associated with unemployed status, and marginally with retirement, again their statistical significance was slightly affected by inclusion of preference-based network participation as a confounder. Finally, cognitive function was negatively associated with retirement, and its statistical significance was improved after inclusion of network participation. Prestige network participation was negatively associated with cognitive function, while preference-based one was positively associated with cognitive function.

For females (Table 10), none of health measures showed significant associations with work statuses, except for IADL limitation and grip strength. IADL limitation was significantly less likely among part-time and other employment categories, of which direction was opposite to that in males. Inclusion of social network participation did not considerably affect their significance. Network participation per se was marginally associated with less likelihood to have IADL limitation. Grip strength was significantly lower among those with “other employment” status, again inclusion of network participation did not affect the significance of the work status.

### III. Discussion and conclusion

As we observed in descriptive statistics in the previous section, transition of work status in JSTAR participants was diverse and gradual, suggesting that treatment of retirement as a binary variable is problematic. Furthermore, we found striking gender difference in the trajectory path in that homemaker made an alternative to retirement in female cases. The distribution of health measures across work status trajectories were diverse among males, depending on the nature of health measures. Functional limitation in mobility and IADL functions seems related to a higher chance of leaving full-time work among males, while self-reported ill health and depression was more likely observed among unemployed as well as those staying in full-time work. These results suggest that limitation in physical function be a determinant of work status transition, while psychological distress is more susceptible to one’s economic and social difficulties. Then, our selection of health outcomes should be grounded for specific research hypothesis and proper modeling. We may need information regarding physical strain and demand of work which should be diverse across occupational types, if we want to determine the causal relationship between physical function and

work transition decision. If we see the change in mental health, we may need information regarding the change in economic difficulties, as well as stress at work place and at home of the respondents.

Of note in our finding was the decline in cognitive function among male retirees. Due to limitation in measurement comparability between wave 1 and wave 2, however, we have to wait for availability of wave 3 data where a new battery of cognitive function measurement is adopted, before we make a conclusive statement on the association between work status transition and its effect on cognitive function.

Females showed a relatively narrower disparity in functions across work status transition, though newly being homemaker was related to functional decline, suggesting a health-related selection process of leaving formal labor force. However, female homemaker status is rather complicated by their duty for taking care of family, which is reflected in higher portions of depression and self-reported ill health. Thus, analysis of retirement and health among females is expected to be more vulnerable to their duties and time allocation for formal work and for informal care, as well as health conditions, before and after work status transition.

Finally, leaving paid work status was related to the likelihood of participating into social network, and could be a confounder on the association between work status transition and health transition among males in some health measures, while the association between work status transition and social network transition was negligible in females. Analysis for male workers needs to account for the time trade-off between formal and informal social activities of the respondents, as well as change in economic status and social position of the respondent. [Chaix, Isacsson, et al. 2007]

Although these descriptive analyses were of a primitive one in the precision of causal inference and only poorly proof against specification biases, what these numbers tell is not trivial at all. The definition of “retirement” as JSTAR and its global sister surveys adopted actually corresponds to the leave from paid work and respondent’s perception that he/she is retired. How “retirement” in this definition is related to health change should be grounded on a clearer theoretic basis, since leave from paid work does imply a loss of labor income, but is not necessarily accompanied by relief from social responsibility for household economy, or a loss of social participation, either. One may choose to shift from full-time to non-full time work status, taking consideration of loss of income against gain in leisure, health investment, or family care, or simply due to availability of job opportunity. Besides, leaving formal labor force may be good to mental

health, but not necessarily to cognitive function. With the diversity we observed in this study, we should be more specific about the condition of “work status” and the mode of “health” under which we study the association between work status transition and health change. Results of this study also indicate that the policy on work and health in the elderly population should not seek for one-fits-all solution, but rather needs to find a proper segment of targeted population in terms of the nature of work, economic and social needs, and gender roles in the household.

## Reference

- Behncke S. (2012) Does Retirement Trigger Ill Health? *Health Econ.* 21(3):282-300. doi: 10.1002/hec.1712.
- Bound J. (1989) Self-reported vs. Objective Measures of Health in Retirement Model. Working Paper Series, No. 2997, National Bureau of Economic Research (NBER) .
- Bound J, Waidman T. (2007) Estimating the Health Effects of Retirement. Prepared for the 9th Annual Joint Conference of the Retirement Research Consortium “Challenges and Solutions for Retirement Security” August 9-10, 2007. Washington, D.C.
- Coe NB, Zamarro G. (2011) Retirement Effects on Health In Europe. *J Health Econ* 30(1):77-86.
- Chaix B, Isacson SO, Råstam L, Lindström M, Merlo J.(2007) Income change at retirement, neighbourhood-based social support, and ischaemic heart disease: results from the prospective cohort study "Men born in 1914". *Soc Sci Med.* 64(4):818-29.
- Dave D, Rashad I, Spasojevic J.(2006) “The Effects of Retirement on Physical and Mental Health Outcomes,” Working Paper Series, No. 12123, National Bureau of Economic Research (NBER) .
- Fe E. Hollingsworth B. (2011) Estimating the effect of retirement on health via panel discontinuity designs. <http://mpira.ub.uni-muenchen.de/38162/>
- Gallo WT, Bradley EH, Siegel M, Kasl SV. (2000) **Health effects of involuntary job loss among older workers.** *J Gerontol B Psychol Sci Soc Sci.* 55(3):S131-40.
- Groot W.(2000) Adaption and scale of reference bias in self-assessments of quality of life. *J Health Econ* 19:403-420.
- Grossman M.(1972) “On the Concept of Health Capital and the Demand for Health,” *J Politic Econ.* 80 (2); 223-255.
- Gupta ND, Larsen M.(2010) The impact of health on individual retirement plans: self-reported versus diagnostic measures. *Health Econ.* 19(7); 792-813.
- Ichimura H, Shimizutani S. (2012) "Retirement Process in Japan: New Evidence from Japanese Study on Aging and Retirement (JSTAR)" In *Aging in Asia: Findings from New and Emerging Data Initiatives.* Smith JP, Majmundar M, Eds. Panel on Policy Research and Data Needs to Meet the Challenge of Aging in Asia. Committee on Population, Division of Behavioral and Social Sciences and Education. Washington, DC: *The National Academies Press*, 2012, pp.

173-204.

- Idler EL, Benyamini Y.(1997). Self-rated health and mortality: A review of twenty-seven community studies. *J Health Soc Behave* 38:21-37.
- Leopold L, Engelhardt H. (2013) Education and physical health trajectories in old age. Evidence from the Survey of Health, Ageing and Retirement in Europe (SHARE). *Int J Public Health*. 58(1):23-31. doi: 10.1007/s00038-012-0399-0.
- Lindeboom M. Lindegaard H. (2010) The Impact of Early Retirement on Health Available at SSRN: <http://ssrn.com/abstract=1672025> or <http://dx.doi.org/10.2139/ssrn.1672025>.
- Jokela M, Ferrie JE, Gimeno D, Chandola T, Shipley MJ, Head J, Vahtera J, Westerlund H, Marmot MG, Kivimäki M. (2010) From midlife to early old age: Health trajectories associated with Retirement. *Epidemiology*. 21(3): 284–290. doi:10.1097/EDE.0b013e3181d61f53.
- Mein G, Martikainen P, Hemingway H, Stansfeld S, Marmot M.(2003) Is retirement good or bad for mental and physical health functioning? Whitehall II longitudinal study of civil servants. *J Epidemiol Community Health*. 57:46–49.
- Mein G, Higgs P, Ferrie J, Stansfeld SA.(1998) Paradigms of retirement: the importance of health and ageing in the Whitehall II study. *Soc Sci Med*. 47(4):535-45.
- Mojon-Azzi S, Sousa-Poza A, Widmer R. (2007) The effect of retirement on health: a panel analysis using data from the Swiss Household Panel. *SWISS MED WKLY*. 137:581–585.
- Moon JR, Glymour MM, Subramanian SV, Avendaño M, Kawachi I.(2012) Transition to retirement and risk of cardiovascular disease: prospective analysis of the US health and retirement study. *Soc Sci Med*. 75(3):526-30. doi: 10.1016/j.socscimed.2012.04.004.
- Oshio, T. and A. Oishi. 2004. "Social security and retirement in Japan: an evaluation using micro-data," *Social Security Programs and Retirement around the World*, edited by J. Gruber and D. Wise, The University of Chicago Press, 399-460.
- Shimizutani S.(2011) "A New Anatomy of the Retirement Process in Japan," *Japan and the World Economy*. 23(3); 141-152.
- Siegrist J, Wahrendorf M, von dem Knesebeck O, Jürges H, Börsch-Supan A. (2007) Quality of work, well-being, and intended early retirement of older employees: baseline results from the SHARE Study. *Eur J Public Health*. 17(1):62-8.

- Sirven N, Debrand T.(2008) Social participation and healthy ageing: an international comparison using SHARE data. *Soc Sci Med.* 67(12):2017-26. doi: 10.1016/j.socscimed.2008.09.056.
- Sjo"sten NM, Kivima"ki M, Singh-Manoux A, et al.(2012) Change in physical activity and weight in relation to retirement: the French GAZEL Cohort Study. *BMJ Open.* 2:e000522. doi:10.1136/bmjopen-2011-000522
- Sugisawa A, Sugisawa H, Nakatani Y, Shibata H. (1997) Effect of retirement on mental health and social well-being among elderly Japanese. *Nippon Koshu Eisei Zasshi (Japanese Journal of Public Health).* 44, 123-130.
- Westerlund H, Vahtera J, Ferrie JE, Singh-Manoux A, Pentti J, Melchior M, Leineweber C, Jokela M, Siegrist J, Goldberg M, Zins M, Kivima"ki M. (2010) Effect of retirement on major chronic conditions and fatigue: French GAZEL occupational cohort study. *BMJ.* 341:c6149 doi:10.1136/bmj.c6149.
- Yashiro, N. and T. Oshio 1999. "Social Security and Retirement in Japan," in *Social Security and Retirement around the World*, edited by J. Gruber and D. Wise, University of Chicago Press, pp. 239-267.
- Zins M, Gue'guen A, Kivimaki M, Singh-Manoux A, Leclerc A, et al. (2011) Effect of Retirement on Alcohol Consumption: Longitudinal Evidence from the French Gazel Cohort Study. *PLoS ONE.* 6(10): e26531. doi:10.1371/journal.pone.0026531.

Table 1-1; Trajectory of work status (all, both genders)

		Wave 2 status										
		N	full-time	part-time	self-employed	other employment	unemployment	retired	home-maker	other status	lost to follow	total (%)
Wave 1	full-time	768	53.0	10.7	3.1	1.2	2.6	3.5	1.4	1.2	23.3	100
	part-time	669	5.4	55.5	2.4	1.8	2.2	5.1	4.0	1.4	22.3	100
	self-employed	529	3.4	3.6	60.1	2.5	0.4	4.5	1.3	2.1	22.1	100
	other employment	234	5.6	6.8	9.4	44.4	1.3	3.0	8.6	2.6	18.4	100
	unemployed	113	5.3	23.0	0.9	0.9	3.5	15.0	19.5	0.9	31.0	100
	retired	470	0.2	3.0	1.3	0.2	0.6	65.5	4.7	5.7	18.7	100
	homemaker	856	0.1	2.2	0.4	1.4	0.2	2.3	66.9	3.9	22.6	100
	other status	189	0.0	1.1	0.5	1.1	1.1	18.5	16.4	26.5	34.9	100

Table 1-2; Trajectory of work status (all male)

		Wave 2 status										
		N	full-time	part-time	self-employed	other employment	unemployment	retired	home-maker	other status	lost to follow	total (%)
Wave 1	full-time	599	53.1	11.7	3.3	0.3	3.0	4.2	0.0	1.2	23.2	100
	part-time	290	7.6	52.1	4.5	1.4	2.1	10.0	0.7	1.7	20.0	100
	self-employed	443	4.1	3.6	61.6	1.1	0.5	5.0	0.2	2.3	21.7	100
	other employment	25	4.0	4.0	20.0	12.0	8.0	24.0	4.0	0.0	24.0	100
	unemployed	54	7.4	18.5	1.9	1.9	3.7	29.6	1.9	1.9	33.3	100
	retired	412	0.2	3.2	1.5	0.2	0.5	71.1	0.7	5.1	17.5	100
	homemaker	8	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	50.0	100
	other status	95	0.0	2.1	1.1	1.1	0.0	32.6	0.0	29.5	33.7	100

Table 1-3; Trajectory of work status (all female)

		Wave 2 status										
		N	full-time	part-time	self-employed	other employment	unemployment	retired	home-maker	other status	lost to follow	total (%)
Wave 1	full-time	169	52.0	7.1	2.6	3.3	1.3	1.3	5.8	1.3	25.3	100
	part-time	378	4.2	59.0	1.0	1.6	2.6	0.7	6.5	1.0	23.5	100
	self-employed	86	0.0	1.7	62.7	5.1	0.0	1.7	5.1	1.7	22.0	100
	other employment	209	6.7	7.4	5.9	45.9	0.7	0.7	8.2	3.0	21.5	100
	unemployed	59	4.7	27.9	0.0	0.0	2.3	2.3	32.6	0.0	30.2	100
	retired	58	0.0	0.0	0.0	0.0	5.3	10.5	47.4	10.5	26.3	100
	homemaker	848	0.3	4.5	0.0	2.4	0.3	0.3	66.5	2.1	23.7	100
	other status	94	0.0	0.0	0.0	0.0	3.6	0.0	39.3	17.9	39.3	100

Table 2-1; Trajectory of work status, age<=65, in labor market at wave1, both genders

		Wave 2 status										
		N	full-time	part-time	self-employed	other employment	unemployment	retired	home-maker	other status	lost to follow	total (%)
Wave 1	full-time	702	54.7	10.4	2.4	0.9	2.7	2.7	1.3	1.0	23.9	100
	part-time	477	6.5	55.9	2.7	1.5	3.0	3.0	4.4	1.1	21.9	100
	self-employed	335	4.5	3.0	63.3	1.5	0.6	1.5	0.9	1.2	23.6	100
	other employment	144	6.3	6.9	8.3	44.4	0.7	1.4	7.6	2.8	21.5	100
	unemployed	75	8.0	25.3	0.0	1.3	4.0	9.3	18.7	0.0	33.3	100

Table 2-2; Trajectory of work status, age<=65, in labor market at wave1, male

		Wave 2 status										
		N	full-time	part-time	self-employed	other employment	unemployment	retired	home-maker	other status	lost to follow	total (%)
Wave 1	full-time	548	55.5	11.3	2.4	0.2	3.1	3.1	0.0	0.9	23.5	100
	part-time	167	10.8	50.3	6.0	1.2	3.6	7.2	0.6	1.2	19.2	100
	self-employed	276	5.4	3.3	63.4	0.7	0.7	1.5	0.0	1.1	23.9	100
	other employment	9	0.0	0.0	44.4	22.2	0.0	11.1	0.0	0.0	22.2	100
	unemployed	32	12.5	21.9	0.0	3.1	6.3	18.8	0.0	0.0	37.5	100

Table 2-3; Trajectory of work status, age<=65, in labor market at wave1, female

		Wave 2 status										
		N	full-time	part-time	self-employed	other employment	unemployment	retired	home-maker	other status	lost to follow	total (%)
Wave 1	full-time	154	52.0	7.1	2.6	3.3	1.3	1.3	5.8	1.3	25.3	100
	part-time	307	4.2	59.0	1.0	1.6	2.6	0.7	6.5	1.0	23.5	100
	self-employed	59	0.0	1.7	62.7	5.1	0.0	1.7	5.1	1.7	22.0	100
	other employment	135	6.7	7.4	5.9	45.9	0.7	0.7	8.2	3.0	21.5	100
	unemployed	43	4.7	27.9	0.0	0.0	2.3	2.3	32.6	0.0	30.2	100

Table 3-1; Trajectory of work status, age<=65, proportion of being re-hired, male

		Wave 2 status			
		full-time	part-time	self-employed	other employment
Wave 1	full-time	0.056	0.516	0.077	0.000
	part-time	0.167	0.226	0.000	0.000
	self-employed	0.067	0.000	0.006	0.000
	other employment	0.000	0.000	0.250	0.000

Table 3-2; Trajectory of work status, age<=65, proportion of being re-hired, female

		Wave 2 status			
		full-time	part-time	self-employed	other employment
Wave 1	full-time	0.100	0.273	0.000	0.000
	part-time	0.077	0.044	0.000	0.000
	self-employed	0.000	0.000	0.000	0.000
	other employment	0.000	0.000	0.000	0.016

Table 4-1 Reasons to be retired, by age and sex

	Male		Female	
	age<=65	age 65+	age<=65	age 65+
N	95	332	10	36
Choice	0.084	0.030	0.000	0.000
No choice	0.695	0.569	0.400	0.444
Leisure	0.053	0.099	0.000	0.083
Health	0.084	0.139	0.100	0.139
Pension	0.053	0.054	0.100	0.028
Family care	0.042	0.006	0.300	0.083

No choice = compulsory retirement or other external shock (e.g. lay off)

Table 4-2 Reasons to be homemaker, female, by homemaker status at wave 1

	Homemaker at wave 1		No homemaker at wave 1	
	age<=65	age 65+	age<=65	age 65+
N	224	349	77	55
Choice	0.013	0.009	0.052	0.055
No choice	0.094	0.155	0.234	0.218
Leisure	0.165	0.238	0.091	0.145
Health	0.076	0.083	0.143	0.145
Pension	0.067	0.158	0.039	0.091
Family care	0.598	0.467	0.403	0.255

No choice = compulsory retirement or other external shock (e.g. lay off)

Table 5-1; proportion of mobility limitation by work status trajectories; male

		full-time at wave2	part-time at wave2	self- employed at wave2	other employment at wave2	unemployed at wave2	retired at wave2	retire nonchoice	retire health
full-time at wave1	N	317	70	20	2	18	25	14	4
	wave1	0.025	0.057	0.050	0.000	0.056	0.080	0.071	0.000
	wave2	0.016	0.100	0.050	0.500	0.056	0.040	0.071	0.000
part-time at wave1	N	22	151	13	5	6	29	20	3
	wave1	0.045	0.106	0.000	0.200	0.000	0.069	0.050	0.333
	wave2	0.045	0.066	0.154	0.600	0.167	0.000	0.000	0.000
self-employed at wave1	N	18	16	272	5	2	22	3	8
	wave1	0.167	0.000	0.063	0.200	0.000	0.182	0.000	0.375
	wave2	0.056	0.063	0.103	0.200	0.000	0.227	0.333	0.500
other employment at wave1	N	1	1	5	3	2	6	2	3
	wave1	1.000	1.000	0.400	0.000	0.000	0.000	0.000	0.000
	wave2	0.000	0.000	0.400	0.000	0.000	0.167	0.000	0.333

Table 5-2; proportion of IADL limitation by work status trajectories; male

		full-time at wave2	part-time at wave2	self- employed at wave2	other employment at wave2	unemployed at wave2	retired at wave2	retire nonchoice	retire health
full-time at wave1	N	290	66	17	2	18	24	14	4
	wave1	0.379	0.379	0.471	0.500	0.333	0.375	0.571	0.250
	wave2	0.341	0.394	0.294	0.500	0.333	0.458	0.500	0.750
part-time at wave1	N	21	138	13	5	6	28	19	3
	wave1	0.429	0.428	0.077	0.600	0.333	0.357	0.316	0.333
	wave2	0.524	0.406	0.538	0.600	0.500	0.286	0.263	0.333
self-employed at wave1	N	14	15	249	3	2	19	3	7
	wave1	0.429	0.600	0.382	0.667	1.000	0.632	0.333	0.857
	wave2	0.357	0.533	0.382	0.667	0.000	0.421	0.000	0.571
other employment at wave1	N	1	1	5	2	2	6	2	3
	wave1	1.000	1.000	0.200	0.000	0.000	0.000	0.000	0.000
	wave2	1.000	0.000	0.600	0.000	0.000	0.333	0.000	0.333

Table 5-3; mean grip by work status trajectories; male

		full-time at wave2	part-time at wave2	self- employed at wave2	other employment at wave2	unemployed at wave2	retired at wave2	retire nonchoice	retire health
full-time at wave1	N	238	58	15	2	15	21	11	3
	wave1	39.2	37.2	39.3	37.0	34.7	36.8	36.6	36.7
	wave2	37.9	35.0	35.9	38.0	32.7	34.0	34.2	33.0
part-time at wave1	N	15	125	9	4	4	22	15	2
	wave1	38.3	35.4	37.1	25.5	36.8	32.5	31.9	36.5
	wave2	38.1	34.0	41.1	24.4	35.0	32.0	33.1	25.5
self-employed at wave1	N	13	14	218	5	2	17	2	5
	wave1	39.0	35.3	36.7	30.0	34.5	33.1	35.5	25.8
	wave2	37.5	32.7	35.1	31.4	29.0	33.4	34.0	30.0
other employment at wave1	N		1	3	2	2	6	2	3
	wave1		29.0	38.7	41.0	36.0	33.8	30.5	34.3
	wave2		27.0	35.0	37.5	37.0	32.8	29.0	35.0

Table5-4; proportion of eye-sight limitation by work status trajectories; male

		full-time at wave2	part-time at wave2	self-employed at wave2	other employment at wave2	unemployed at wave2	retired at wave2	retire nonchoice	retire health
full-time at wave1	N	317	70	20	2	18	25	14	4
	wave1	0.104	0.100	0.100	0.500	0.056	0.160	0.143	0.000
	wave2	0.091	0.071	0.100	0.000	0.111	0.080	0.071	0.000
part-time at wave1	N	22	151	13	5	6	29	20	3
	wave1	0.000	0.106	0.154	0.200	0.167	0.069	0.100	0.000
	wave2	0.091	0.099	0.077	0.000	0.333	0.103	0.050	0.333
self-employed at wave1	N	18	16	272	5	2	22	3	8
	wave1	0.000	0.125	0.088	0.200	0.000	0.136	0.333	0.000
	wave2	0.056	0.063	0.088	0.000	0.000	0.091	0.333	0.000
other employment at wave1	N	1	1	5	3	2	6	2	3
	wave1	0.000	0.000	0.400	0.000	0.500	0.000	0.000	0.000
	wave2	0.000	0.000	0.400	0.000	0.500	0.167	0.000	0.000

Table5-5; proportion of hearing limitation by work status trajectories; male

		full-time at wave2	part-time at wave2	self-employed at wave2	other employment at wave2	unemployed at wave2	retired at wave2	retire nonchoice	retire health
full-time at wave1	N	317	70	20	2	18	25	14	4
	wave1	0.060	0.143	0.150	0.000	0.056	0.200	0.286	0.250
	wave2	0.072	0.086	0.150	0.000	0.056	0.160	0.214	0.250
part-time at wave1	N	22	151	13	5	6	29	20	3
	wave1	0.000	0.113	0.077	0.200	0.000	0.069	0.050	0.333
	wave2	0.091	0.099	0.308	0.000	0.167	0.207	0.200	0.667
self-employed at wave1	N	18	16	272	5	2	22	3	8
	wave1	0.111	0.188	0.081	0.000	0.000	0.182	0.333	0.125
	wave2	0.056	0.063	0.103	0.000	0.000	0.182	0.333	0.000
other employment at wave1	N	1	1	5	3	2	6	2	3
	wave1	1.000	0.000	0.000	0.333	0.000	0.500	0.000	1.000
	wave2	0.000	0.000	0.200	0.000	0.500	0.333	0.000	0.667

Table5-6; proportion of self-reported ill health by work status trajectories; male

		full-time at wave2	part-time at wave2	self-employed at wave2	other employment at wave2	unemployed at wave2	retired at wave2	retire nonchoice	retire health
full-time at wave1	N	317	70	20	2	18	25	14	4
	wave1	0.394	0.443	0.450	0.000	0.722	0.480	0.571	0.250
	wave2	0.478	0.571	0.400	0.500	0.556	0.440	0.500	0.500
part-time at wave1	N	22	151	13	5	6	29	20	3
	wave1	0.364	0.510	0.538	0.600	0.667	0.310	0.300	0.000
	wave2	0.545	0.510	0.385	0.400	0.833	0.655	0.550	1.000
self-employed at wave1	N	18	16	272	5	2	22	3	8
	wave1	0.222	0.563	0.438	0.600	0.500	0.500	1.000	0.250
	wave2	0.500	0.313	0.474	0.400	0.000	0.545	1.000	0.375
other employment at wave1	N	1	1	5	3	2	6	2	3
	wave1	0.000	1.000	0.600	0.000	1.000	0.500	0.000	0.667
	wave2	0.000	1.000	0.800	0.333	1.000	0.833	1.000	1.000

Table5-7; proportion of depression by work status trajectories; male

		full-time at wave2	part-time at wave2	self- employed at wave2	other employment at wave2	unemployed at wave2	retired at wave2	retire nonchoice	retire health
full-time at wave1	N	283	67	17	2	18	22	12	4
	wave1	0.152	0.194	0.059	0.000	0.278	0.091	0.167	0.000
	wave2	0.152	0.134	0.000	0.000	0.389	0.273	0.083	0.750
part-time at wave1	N	19	130	10	5	6	27	18	3
	wave1	0.053	0.092	0.100	0.400	0.167	0.037	0.056	0.000
	wave2	0.105	0.092	0.000	0.400	0.333	0.148	0.167	0.333
self-employed at wave1	N	13	15	240	2	2	17	3	5
	wave1	0.077	0.200	0.108	0.000	0.000	0.059	0.000	0.000
	wave2	0.154	0.133	0.146	0.000	0.000	0.176	0.333	0.000
other employment at wave1	N	1	1	4	2	1	4	1	3
	wave1	0.000	1.000	0.000	0.500	1.000	0.000	0.000	0.000
	wave2	0.000	1.000	0.250	0.500	0.000	0.250	0.000	0.333

Table5-8; mean number of initial word recall by work status trajectories; male

		full-time at wave2	part-time at wave2	self- employed at wave2	other employment at wave2	unemployed at wave2	retired at wave2	retire nonchoice	retire health
full-time at wave1	N	217	50	15	2	13	15	8	2
	wave1	5.3	5.2	5.3	3.0	5.0	5.3	5.5	6.0
	wave2	5.7	5.7	5.5	5.0	5.1	4.7	5.1	3.5
part-time at wave1	N	16	108	7	4	4	21	14	2
	wave1	5.2	5.1	4.4	4.3	5.0	4.8	4.6	6.0
	wave2	5.4	5.4	5.4	5.0	5.5	4.5	4.5	4.5
self-employed at wave1	N	17	12	186	4	1	19	3	6
	wave1	4.6	5.3	4.7	5.5	2.0	4.4	4.3	4.0
	wave2	5.0	5.5	5.2	3.5	3.0	4.3	5.3	3.3
other employment at wave1	N			4	3	1	6	2	3
	wave1			4.5	6.3	5.0	4.7	4.0	5.3
	wave2			4.5	6.3	4.0	6.0	6.0	6.7