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Trajectories of mental health before and after old-age and disability retirement: a register-based study on purchases of psychotropic drugs

by Mikko Laaksonen, PhD,[1, 2] Niina Metsä-Simola, MSc,[3] Pekka Martikainen, PhD,[3] Olli Pietiläinen, MSc,[1] Ossi Rahkonen, PhD,[1] Raija Gould, PhD,[2] Timo Partonen, PhD,[4] Eero Lahelma PhD [1]

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Objectives Retirement from paid work is a major life event facing increasingly large numbers of people in the coming years. We examined trajectories of mental health five years before and five years after old-age and disability retirement using data on purchases of psychotropic drugs.

Methods The study included all employees from the City of Helsinki, Finland, retiring between 2000–2008 due to old age (N=4456) or disability (N=2549). Purchases of psychotropic drugs were analyzed in 20 3-month intervals before and after retirement using graphical methods and growth curve models.

Results Old-age retirement was unrelated to purchases of psychotropic drugs. Among disability retirees, psychotropic medication tripled before retirement. The average increase was 0.95 [95% confidence interval (95% CI) 0.73–1.16] daily defined doses (DDD) 5–1.5 years before retirement; from 1.5 years until retirement it was 5.68 DDD (95% CI 5.33–6.03) for each 3-month interval. After disability retirement, purchases of antidepressants decreased on average by 0.40 DDD (95% CI 0.57–0.23) for each 3-month interval, those of hypnotics and sedatives increased by 0.30 DDD (95% CI 0.12–0.47), and no changes were seen for other psychotropic drugs. The changes before and after retirement were largest among those who retired due to mental disorders and those whose retirement had been granted as temporary.

Conclusions While no overall decrease in psychotropic medication after retirement was observed, purchases of antidepressants decreased after disability retirement. Long-term trajectories suggest that disability retirement might be prevented if mental health problems were tackled more efficiently earlier in the pre-retirement period.

Key terms disability pension; health trajectory; medication; register data; register linkage; registry.

Retirement from paid work is a major life event facing increasingly large numbers of people in the coming years in various European populations and the US (1). The transition to retirement has profound implications on an individual's daily activities, social relationships, and material living conditions, and may have consequences for health and well-being.

Health status before retirement and anticipation concerning it after retirement are among the most important factors affecting the timing of retirement among ageing employees (2). Early retirement due to disability is common, and in many western countries the proportion of people who continue to work up to their statutory retirement age has been decreasing (3). Mental disorders, particularly depression, have become increasingly prevalent reasons for disability retirement (3, 4).

The evidence on the possible effect of retirement on mental health is inconsistent (5–10). Furthermore, previous studies suffer from methodological drawbacks that make such an effect difficult to demonstrate. Most studies have been cross-sectional or two-wave panel studies comparing retirees to those continuing in employment, and selection out of employment due to poor health is likely to have a profound effect on the results. Studies using designs that can more effectively catch the effect of retirement on mental health and, that of mental health

1 Hjelt Institute, Department of Public Health, University of Helsinki, Helsinki, Finland.
2 Finnish Centre for Pensions, Helsinki, Finland.
3 Population Research Unit, Department of Social Research, University of Helsinki, Finland.
4 National Institute for Health and Welfare (THL), Helsinki, Finland.

Correspondence to: Mikko Laaksonen, Finnish Centre for Pensions, 00065 Eläketurvakeskus, Finland. [E-mail: mikko.laaksonen@etk.fi]

on retirement, are few. Multi-wave panel surveys from the US Health and Retirement Study have reported an increase in mental health problems after retirement (6, 11). French studies based on annually repeated surveys among predominantly old-age retirees found a reduction in depressive symptoms (12) and sleep disturbances (13) around the time of retirement. A Finnish study examining annual changes before and after the year of retirement found that, among old-age retirees and those retiring due to mental illnesses, antidepressant purchases diminished between the year before retirement and the year after retirement (14). Previous studies have mainly concentrated on post-retirement changes in mental health. Furthermore, most of them suffer from sizeable survey non-participation and have not made a clear distinction between statutory retirement at a predefined retirement age and early retirement due to disability.

We examined trajectories of mental health before and after retirement using data on purchases of psychotropic drugs. The availability of longitudinal register-based data provides an excellent opportunity to analyze such trajectories over a period extending from 5 years before to 5 years after retirement in a large sample of both old-age and disability retirees. We separately examined different types of psychotropic drugs and disability retirement types. Any change in medication after retirement is indicative of an effect of retirement on mental health whereas a change before retirement provides evidence of selection into retirement due to mental health problems.

Methods

Data sources

The study population consisted of all employees from the City of Helsinki who were working on 1 January 2000 and retired by the end of 2008 due to old age (N=4456) or disability (N=2549). The City of Helsinki is the largest single employer in Finland, with nearly 40 000 employees at the beginning of 2000. The mean age of the employees was 41.7 years. Main employment sectors include social and healthcare, education, public transportation, cultural services, environmental and technical maintenance, and public administration.

In Finland, a flexible retirement age of 63–68 years was adopted in the beginning of 2005 (15). It is thus possible to retire at the age of 63, but working thereafter progressively improves one's pension. Older employees may still have a lower retirement age based on earlier agreements, which are more common in the public sector. For those <63 years, a disability pension can be granted if the employee's work ability is reduced due to illness, handicap, or injury for a continuous period of ≥1 year. Most disability pensions are permanent but a temporary disability pension can be granted if recovery is anticipated. A partial disability pension can be granted if the employee can cope with part-time work or lighter tasks than earlier.

Data on retirement events were obtained from a national register of the Finnish Centre for Pensions. These data included the date of retirement, retirement type, principal diagnosis for disability retirement, as well as the date of death if it had occurred after retirement. The data included 4456 old-age retirees [mean age at retirement 61.8, standard deviation (SD) 2.0, years] and 2549 disability retirees [mean age at retirement 53.5 (SD 7.5) years]. We separately examined those who retired due to mental and behavioral disorders [International Classification of Diseases (ICD-10) codes F00–F99, 908 retirement events] and due to other causes (1641 retirement events). We also separated permanent disability retirements (1607 events), temporary disability retirements (467 events), and partial disability retirements (475 events).

Data on purchases of psychotropic drugs from the beginning of 1995 until the end of 2009 were derived from the Social Insurance Institution of Finland's register. Physicians write all prescriptions and information on all prescribed drugs purchased from any pharmacy in the country is forwarded to this register as part of the national drug reimbursement scheme. The data include the date of the purchase, the type of medication [classified according to the World Health Organization Anatomical Therapeutic Chemical (ATC) classification], and the amount of medication in defined daily doses (DDD) (16). We extracted all psycholeptics (ATC codes N05) and psychoanaleptics (N06), except medication for dementia (N06D). We divided the drugs into three large groups, consisting of antidepressants (N06A), hypnotics and sedatives (N05B and N05C), and other psychotropic drugs.

Linkage of the data sources was done using unique personal identification numbers assigned to all Finnish residents. The ethics committees at the University of Helsinki's Department of Public Health and the City of Helsinki Health Authorities approved the study.

Study design

For each of the 7005 retirees, the date of retirement was taken as the reference time point, and the time before and after retirement was divided into 3-month intervals. For all retirees, 20 3-month intervals were formed for both before and after retirement. Complete data on psychotropic medication before retirement were available for all retirees. After retirement, complete data were available for those who had retired before 1 November 2004. For those who retired after that date,

the data became progressively sparser the later the retirement occurred. Furthermore, retirees who died during the follow-up (N=148) were censored from the next interval after which the death had occurred. In the last interval after retirement, data on medication was available for 3421 (49%) of the retirees. Sensitivity analyses (supplementary figure A: http://www.sjweh.fi/data_repository.php) made among those with complete data after retirement showed that the attrition had no influence on the results.

Statistical analysis

We graphically presented the mean amount of drugs purchased over the 3-month intervals [DDD with 95% confidence intervals (95% CI)] centered around retirement. Growth curve models were used to test statistical significance of the changes in psychotropic medication before and after disability retirement (Wald test for linear hypotheses) and to control for the effects of covariates (17). Since growth curve models are formally described as multilevel random-coefficient models with repeated measurements nested within individuals, they account for the within-person clustering of drug purchases (18). For these analyses, the observation time before disability retirement was divided into two broad time bands based on visual inspection of the data: 5–1.5 years before retirement and 1.5–0 years before retirement. This division also roughly corresponds to the Finnish retirement system where the disability retirement application process typically takes about one year. Interactions with gender and socioeconomic position (manual versus non-manual) were included to examine whether the trajectories were different for these variables. Separate analyses were conducted for the retirement type, the type of medication, and disability diagnosis. We adjusted for retirement age and time of retirement in all models. All analyses were conducted using STATA 11 (StataCorp, College Station, TX, USA).

Results

The purchases of psychotropic drugs increased before disability retirement (figure 1, see also table 1). There was a long moderate increase that accelerated approximately 1.5 years before retirement (P for quadratic term <0.001). While the average amount of psychotropic medication 5 years before disability retirement was about 25 DDD over a 3-month interval, during the 3-month interval immediately before the retirement it was nearly 70 DDD. Two and half years after disability retirement, the average purchase of psychotropic drugs was 60 DDD per person during a 3-month interval, remaining at the same level thereafter (P for curvilinear change after retirement <0.001). Among those retiring due to old age, purchases amounted to about 10 DDD per each 3-month interval, with a slow and constant increase towards the later intervals, but no change at the time of the retirement.

Figure 2 shows purchases of psychotropic drugs before and after disability retirement by medication type (see also table 1). Before disability retirement, the purchases of antidepressants increased more rapidly than those of other psychotropic drugs. This concerned both the long-term increase and the more rapid increase 1.5 years before retirement. However, the purchases of hypnotics and sedatives as well as other psychotropic drugs also increased before retirement, with the increase accelerating closer to retirement (P for quadratic term <0.001). After retirement, the trajectories differed by medication type: the purchases of antidepressants decreased, those of hypnotics and sedatives continued to increase, and no changes were observed in other psychotropic drugs.

Among those who retired due to mental and behavioral disorders, the increase in psychotropic medication before retirement was very steep, but steadily decreased after retirement (figure 3, see also table 1). Among those who retired due to other causes, psychotropic medication was considerably lower. However, psychotropic medication nearly tripled during the five years before retirement (P for quadratic term <0.001).

The purchases of psychotropic drugs increased before disability retirement irrespective of the disability retirement type (figure 4, see also table 1). However, the increase was particularly steep among those with temporary disability retirement. In this group, the purchases also decreased most after the retirement (P for curvilinear change <0.001), whereas in the other groups, there was no change after retirement.

Table 1 presents the results from the growth curve models among disability retirees. The average increase in psychotropic medication 5–1.5 years before disability retirement was 0.95 DDD (95% CI 0.73–1.16) per each 3-month interval. From 1.5– 0 years before disability retirement, the increase was 5.68 DDD (95% CI 5.33–6.03) per each 3-month interval. The decrease after disability retirement was not statistically significant (P=0.62). However, if the time after disability retirement were divided into two time bands, psychotropic medication would decrease during the first 2.5 years (P<0.001) and slightly increase thereafter (P<0.001).

The results were similar among women and men (table 1). Larger increases in psychotropic medication before disability retirement was seen in the non-manual socioeconomic group (P for interaction <0.001) and, after retirement, the trends diverged (P=0.04). The increase in psychotropic medication before disability

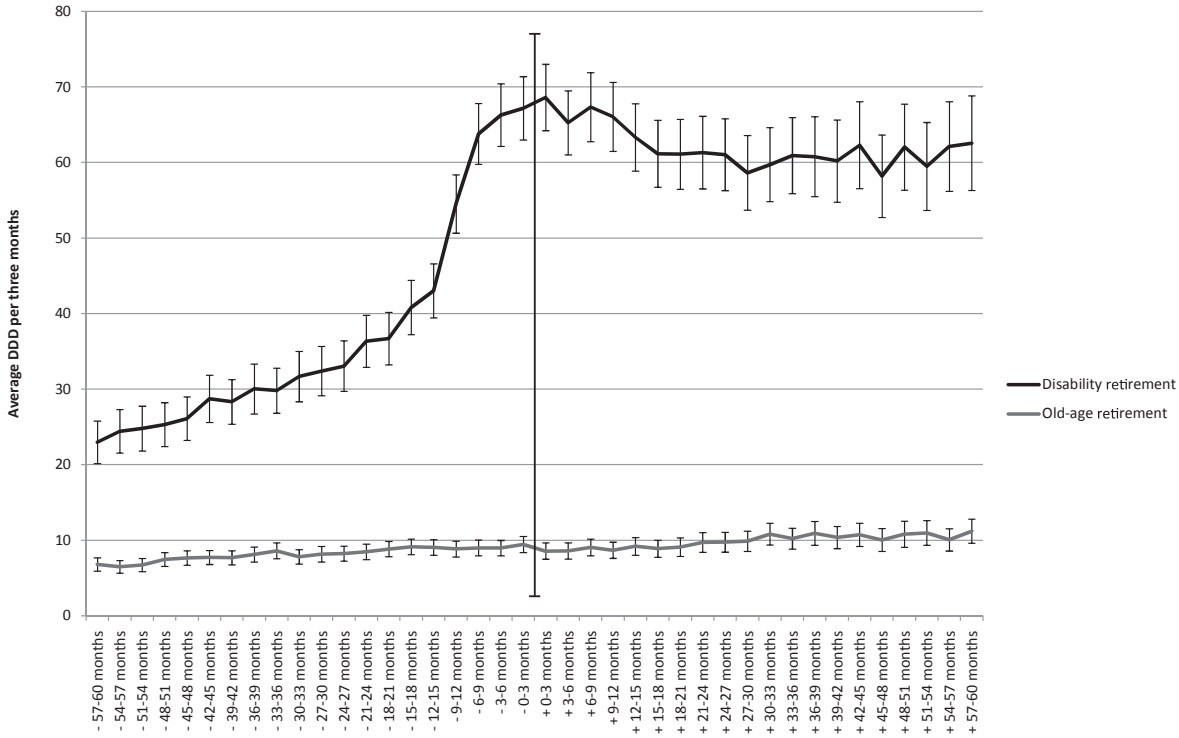

Figure 1. Purchases of psychotropic drugs before and after retirement, by retirement type. Each retiree was followed-up for a period from five years before retirement until five years after retirement. The vertical line indicates the time of the retirement.

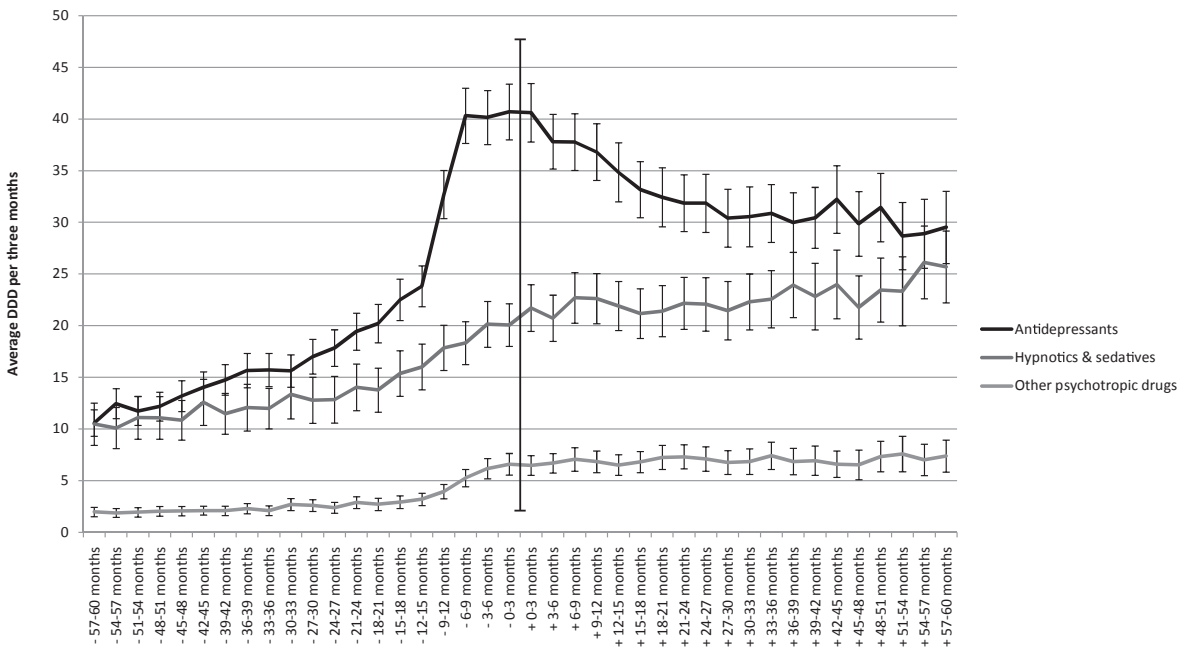

Figure 2. Purchases of psychotropic drugs before and after disability retirement, by medication type. Each retiree was followed-up for a period from five years before retirement until five years after retirement. The vertical line indicates the time of the retirement.

Table 1. Average change in the purchases of psychotropic drugs in daily defined doses (DDD) per one 3-month interval with 95% confidence intervals (95% CI) among disability retirees before and after retirement.

	Average change (DDD) in purchased psychotropic drugs					
	5–1.5 years before retirement		1.5–0 years before retirement		After retirement (0–5 years)	
	Mean	95% CI	Mean	95% CI	Mean	95% CI
Overall [a]	0.95	0.73–1.16	5.68	5.33–6.03	-0.07	-0.35– 0.21
By gender [a]						
Male	0.64	0.16–1.13	5.92	5.20–6.63	-0.05	-0.74– 0.65
Female	1.02	0.78–1.26	5.61	5.21–6.01	-0.08	-0.38– 0.22
By social class [b]						
Manual	0.41	0.08–0.74	4.04	3.53–4.56	0.42	0.01– 0.84
Non-manual	1.15	0.88–1.42	6.29	5.84–6.73	-0.25	-0.61– 0.10
By medicine type [c]						
Antidepressants	0.63	0.49–0.77	3.95	3.71–4.20	-0.40	-0.57–-0.23
Hypnotics & sedatives	0.28	0.16–0.41	1.08	0.87–1.28	0.30	0.12– 0.47
Other psychotropic drugs	0.04	-0.01–0.08	0.65	0.57–0.72	0.04	-0.04– 0.12
By reason for disability retirement [c]						
Mental and behavioural disorders	1.90	1.41–2.40	12.4	11.6–13.2	-0.92	-1.58–-0.26
Other diseases	0.42	0.26–0.58	1.95	1.67–2.23	0.41	0.19– 0.62
By disability retirement type [c]						
Permanent	0.95	0.69–1.22	4.83	4.40–5.27	-0.12	-0.45–0.22
Temporary	1.23	0.65–1.80	10.37	9.43–11.32	-0.21	-1.15–0.72
Partial	0.65	0.21–1.09	3.94	3.23–4.65	0.27	-0.21–0.75

[a] Adjusted for retirement year and age at retirement.
[b] Adjusted for retirement year, age at retirement, and gender.
[c] Adjusted for retirement year, age at retirement, gender, and social class.

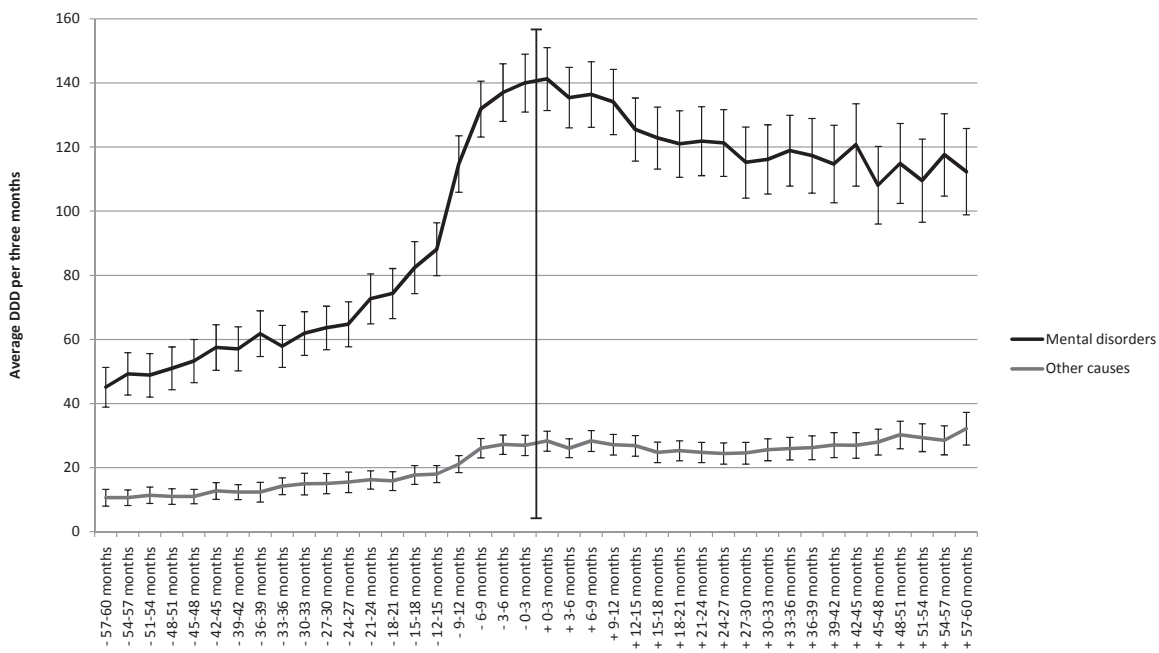

Figure 3. Purchases of psychotropic drugs before and after disability retirement, by retirement diagnosis. Each retiree was followed-up for a period from five years before retirement until five years after retirement. The vertical line indicates the time of the retirement.

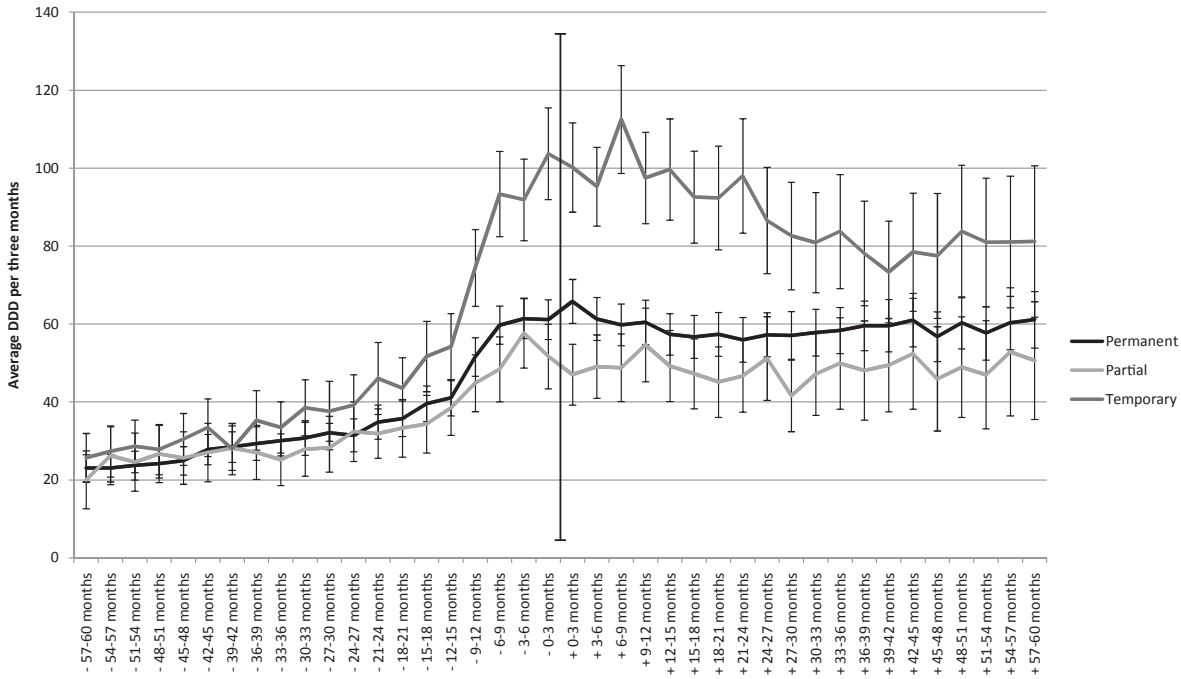

Figure 4. Purchases of psychotropic drugs before and after retirement, by disability retirement type. Each retiree was followed-up for a period from five years before retirement until five years after retirement. The vertical line indicates the time of the retirement.

retirement was mainly driven by antidepressants. For antidepressants, there was a statistically significant decrease after retirement (P<0.001), whereas the purchases of hypnotics and sedatives increased (P =0.001), and no change was observed in other psychotropic drugs (P=0.32). These analyses also substantiate the huge preretirement increase in psychotropic medication among those who retired due to mental disorders and those with temporary disability retirement (P <0.001) and the more moderate decrease thereafter.

Discussion

This study showed that retirement is differently associated with psychotropic medication depending on whether it is statutory old-age retirement or disability retirement. Old-age retirement was unrelated to purchases of psychotropic drugs. Among disability retirees, psychotropic medication increased before retirement. However, changes after disability retirement depended on medication type. While the purchases of antidepressants decreased, those of hypnotics and sedatives increased, and no changes were seen in other psychotropic drugs. The changes were largest among those who retired due to mental disorders and those with temporary disability retirement, but notable increases were seen also in the other groups during the 5 years preceding retirement. The results were similar among women and men, but bigger changes before and after disability retirement were observed among non-manual employees.

Interpretation of the findings

Our most striking finding was the steep increase in the purchases of psychotropic drugs before disability retirement. Among disability retirees, the level of psychotropic medication was high already 5 years before the retirement, and approximately 1.5 years before the retirement there was an accelerating increase. This increase is consistent with selection into retirement of those with worsening mental health. Nevertheless, there are also other reasons that could contribute to the increase in medication before disability retirement. Disability retirement is normally preceded by a period of 300 sickness absence days when the possibilities for medical and vocational rehabilitation are examined (4). Psychotropic medication could be increased during this period of intensified treatment and rehabilitation. The finding that the preretirement increase in medication was largest among those with temporary disability retirement supports this interpretation, as such individuals meet the

most active rehabilitation measures. Furthermore, the retirement process itself can be strenuous and exhausting leading to increased use of psychotropic medication.

Since those who retired due to disability had elevated use of psychotropic medication already 5 years before their retirement, our findings also suggest that for most employees, mental health problems do not lead to a rapid retirement. Thus disability retirement events might be prevented if mental health problems were tackled at an earlier stage. A British study showed that those who eventually retired due to health problems had poorer mental functioning already in their 40s (19). The long-term trajectories before disability retirement imply that people with some history of mental health problems may keep working if their situation is not aggravated. A Finnish study showed that even though the use of antidepressants has increased and the clinical practice guidelines for depression have been improved, a large proportion of those retiring due to mental health problems are still sub-optimally treated (20). Unfortunately, we are not aware of the measures of rehabilitation, occupational health precautions or adaptation of work tasks that may have been taken in order to facilitate staying at work.

Overall, no changes were seen in psychotropic medication after disability retirement but the development differed by medication type. The purchases of antidepressants decreased. This is consistent with the hypothesis that relieving work-related stress may lead to improved mental health after retirement (21). Moreover, with retirement, one's life situation profoundly changes, and – if managing everyday life becomes easier – symptoms of illness may alleviate and become less disturbing. After 2.5 years, the post-retirement decrease leveled off and antidepressant medication remained at a considerably higher level than it had been prior to retirement. The leveling off may reflect adaptation to new circumstances over time as people reassess their changed life situation and get accustomed to their new roles and everyday routines (22). The development is also consistent with the usual course of illness for depressive disorders that includes remission with successful treatment but reoccurrence, if there is no maintenance treatment, within some years (23). Such course may have taken place during the follow-up after intensive treatment preceding disability retirement.

In contrast to antidepressants, the purchases of hypnotics and sedatives continued to increase after disability retirement although at a slightly slower pace than before. This finding is somewhat unexpected, as similar factors that explained the decrease in antidepressants could be assumed to hold for hypnotics and sedatives as well. Furthermore, sleep problems such as feeling tired after non-refreshing sleep (24) may relate to waking up early in the morning, which could be expected to be less disturbing after retirement, if not depressed. One possible reason for the continuing increase is that hypnotics and sedatives tend to cause tolerance and subsequent dependence that are likely to impede cessation of medication and result in increasing dosage (25).

After disability retirement, the purchases of other psychotropic drugs remained at a constant level. These drugs are normally used to treat more severe mental disorders (ie, with psychotic symptoms) than those in the other two classes. It is thus reasonable that once such problems emerge, they do not get resolved so easily. Just before retirement, the purchases of other psychotropic drugs increased to a whole new level, suggesting that the early retirement system is, at least to some degree, able to recognize disabling health problems. According to clinical practice guidelines (26), these drugs are an option for augmenting antidepressant medication that might also partly explain the increase.

The decrease in psychotropic medication following retirement was restricted to those retiring due to mental disorders and those with temporary disability retirement. These results also agree with the finding that the post-retirement decrease was seen for antidepressants but not other drugs. Since depression is a major cause for disability retirement due to mental disorders (4, 15), antidepressants are likely to be predominant among those who retire due to mental disorders whereas hypnotics and sedatives may be more common among those retiring due to other causes. Furthermore, since disability retirement due to mental disorders is often granted as temporary, it is reasonable that the changes were strongest in this group. The post-retirement decrease in medication may also reflect successful rehabilitation as roughly half of those with temporary disability retirement return to the labor force while, for the other half, retirement becomes permanent.

Overall, the findings on pre- and post-retirement changes are partly similar to and different from those seen in previous studies. A Norwegian study linking the date of retirement to a previously made questionnaire survey found that depression and anxiety was most common among those who responded to the study just before or soon after their disability retirement (27). A French study found that depressive symptoms decreased markedly in the years of old-age retirement, breaking the pattern of a slow, long-term increase (12). Another study including also disability retirees found that sleep disturbances followed a similar pattern (13). A Finnish study found a decreasing use of antidepressants after retirement among those retiring due to mental illnesses but not among those retiring due to physical illnesses (14). A decrease was also found among old-age retirees from the year preceding retirement to the year following retirement, after adjusting for retirement age and calendar year. This is different from our study showing

a constant increase in the purchases of all psychotropic drugs among old-age retirees. The increase was mainly related to hypnotics and sedatives, but there was no clear change in the purchases of antidepressants at the time of the retirement (supplementary figure F: http://www.sjweh.fi/data_repository.php).

Strengths and weaknesses of the study

The strengths of this study include a large study population and reliable register-based data on retirement and drug purchases. However, a limitation is that the data were derived from a single employer, the City of Helsinki. In the Finnish municipalities, occupational structures and typical work tasks differ from those of the private sector and the central government. There are also slight differences in the policy and practices of granting disability retirement. Therefore, generalization of these results to the total workforce should be made with caution. Nevertheless, old-age and disability retirement ages in this cohort roughly correspond to the national averages (15) and the level of psychotropic medication was approximately the same as that previously found in nationwide surveys (28). In these data, information was not available on the clinical indication for which the psychotropic medication was prescribed. Given that depressive and anxiety disorders have high co-morbidity (29) and antidepressants can also be used in the treatment of anxiety disorders (30), different mental health problem cannot be exclusively distinguished using data on medication. Furthermore, the drugs examined here can also be used for other purposes, such as treating chronic pain, but this is relatively rare when considering the overall use of psychotropic medication. The analyses presented examined the amount of medication measured in DDD. Sensitivity analyses were conducted using a dichotomous measure of having redeemed at least one purchase during the 3-month interval, and the results remained basically identical (supplementary figures B–E in the Appendix: http://www.sjweh.fi/data_repository.php).

Concluding remarks

In this study based on closely-spaced repeated measurements on psychotropic medication extending from 5 years before to 5 years after retirement, we found no overall decrease in medication after retirement. Yet the purchases of antidepressants decreased after disability retirement, suggesting a possible beneficial effect of retirement on mental health. Post-retirement decrease was also seen among those who retired due to mental disorders and those with temporary disability retirement. In addition to effects of changes in life circumstances, this may reflect a wearing off of the intensive pre-retirement treatment or successful return to work after temporary retirement.

We also found that purchases of psychotropic drugs increased dramatically before disability retirement. While this suggests that the disability retirement procedure may work well in identifying those with worsening mental health, the long-term trajectories in this observational study also suggest that disability retirement might events be prevented if mental health problems were tackled more efficiently earlier in the pre-retirement period. Since preventing early retirement plays a key role in lengthening work careers, tackling mental health problems before they are aggravated should be of primary concern for political decision-makers and other actors striving to reach this goal.

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