From Midlife to Early Old Age

Health Trajectories Associated With Retirement

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Background: Previous studies report contradictory findings regarding health effects of retirement. This study examines longitudinally the associations of retirement with mental health and physical functioning.

Methods: The participants were 7584 civil servants from the Whitehall II cohort study aged 39–64 years at baseline and 54–76 years at the last follow-up. Self-reported mental health and physical functioning were assessed using the Short Form Medical Outcomes Survey questionnaire, and the scales were scored as T-scores (mean [SD] = 50 [10]). Retirement status and health were assessed with 6 repeated measurements over a 15-year period.

Results: The associations between retirement and health were dependent on age at retirement, reason for retirement, and length of time spent in retirement. Compared with continued employment, statutory retirement at age 60 and early voluntary retirement, respectively, were associated with 2.2 (95% confidence interval = 1.7 to 2.8) and 2.2 (1.7 to 2.7) points higher mental health and with 1.0 (0.6 to 1.5) and 1.1 (0.8 to 1.4) points higher physical functioning. Retirement due to ill health was associated with poorer mental health (−0.7 points [−1.62 to 0.2]) and physical functioning (−4.5 points [−5.1 to −3.9]). Within-subject analyses suggested a causal interpretation for statutory and voluntary retirement, but health selection for retirement due to ill health.

Conclusions: Longitudinal analyses of repeat data suggest that health status improves after statutory and voluntarily retirement, although the improvement seems to attenuate over time. By contrast, the association between retirement due to ill health and subsequent poor health seems to reflect selection rather than causation.

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Retirement is one of the most important social transitions of late adulthood. Previous studies on the potential health consequences of retirement have produced conflicting results.[1–13] Retirement has been associated both with improving[1–4] and deteriorating mental health,[5–8] whereas some studies have found retirement to be unrelated to mental[8,9] and physical health.[10,11] An association between early retirement and increased mortality risk has also been reported,[14,15] but it is unclear whether this association is causal or explained by the preexisting poor health among people retiring early on health grounds. Depending on the evidence considered, retirement has been characterized either as an additional stressor or a relief occurring in late adulthood.[13]

Many of the previous studies have been cross-sectional.[2,5,7–9] Reverse causality may confound such studies because poor physical health is a strong predictor of early retirement.[16,17] The few prospective studies available are based on relatively short follow-up periods,[1,3,4,11] leading to a limited perspective on retirement and health, because the short-term and long-term effects of retirement may differ. Moreover, it is important to take into account the reason for retirement,[4] ie, whether individuals are forced to retire due to illness, whether they retire voluntarily, or whether they retire at the statutory retirement age for their occupation; different reasons for retirement may be differently related to health consequences.

The Whitehall II study[18,19] of British civil servants provides an opportunity to examine the associations of retirement with mental health and physical functioning using

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repeated measurements over a 15-year period to determine mental health and physical functioning before and after retirement. A large sample size and an age range of 39–76 years provided sufficient power to examine whether the effects of retirement on mental health and physical functioning varied depending on reason for retirement, age at retirement, and length of time spent in retirement. The longitudinal setting also afforded the opportunity to assess potential confounding due to reverse causality.

METHODS

Participants

Participants and measurements from the ongoing longitudinal Whitehall II study have been described previously in detail.[18,19] Briefly, the study has followed up a sample of 10,308 men and women who were London-based civil servants. Here, we used data from 6 study phases (phases 3 through 8, collected between 1991 and 2006); all of these phases included measures of retirement, mental health, and physical functioning. The participants were aged 39–64 years at baseline (phase 3) and 54–76 years at the most recent follow-up. We included all participants with data on retirement status and health from at least one study phase, but excluded those who were already retired at baseline (n = 722). For participants who left the civil service for reasons other than retirement, detailed data on subsequent retirement decisions outside the civil service were not available. Therefore, these participants were included in the sample at phases when they still worked in the civil service but were excluded from the sample after they left the civil service (n = 881, 398, 206, 122, and 105 participants leaving civil service at phases 4, 5, 6, 7, and 8, respectively). These selection criteria resulted in a sample of 7584 participants (5248 men and 2336 women; 74% of the original cohort). At phases 3, 4, 5, 6, 7, and 8, data were available for 7584, 5931, 5133, 4689, 4815, and 5433 participants, respectively. Ethical approval for the Whitehall II study was obtained from the University College London Medical School committee on the ethics of human research.

Measures

At all phases, mental health and physical functioning were assessed using the self-administered Short Form Medical Outcomes Survey (SF-36) questionnaire.[20,21] We used 2 of the subscales, mental health and physical functioning, which represent the main SF-36 subscales for mental and physical health.[20] The mental health subscale includes 5 items assessing aspects of mental well-being (eg, feeling happy, feeling nervous), and the physical functioning subscale includes 10 items assessing the ability to carry out daily activities (eg, difficulties in carrying groceries, difficulties in walking long distances). Both subscales were negatively skewed, and were corrected by cubic transformations ($X_T = X^3/10{,}000$). Following common practice for using the SF-36, the subscales were then transformed into T-scores so that the overall mean scores across participants and study phases was 50 (standard deviation = 10) for both mental health and physical functioning. High values indicated better health or functioning.

At each study phase, the participants reported whether they were still working in the civil service, had retired from the civil service, or had left the civil service for a reason other than retirement (eg, employment outside civil service, privatization, or redundancy). They also reported the reason for their retirement: early voluntary retirement, retirement due to ill health, or statutory retirement at the age of 60 years. On the basis of these data, we created a 4-category retirement status variable (0, working in the civil service; 1, statutory retirement; 2, ill-health retirement; and 3, voluntary early retirement). Retirement was coded as a time-varying predictor, such that a participant's retirement status could change across study phases. Although there is a statutory retirement age of 60 in the civil service, some workers may continue longer if their job is regarded as essential or if they have insufficient years of service to be eligible for a full pension.

Socioeconomic status (SES) was measured by the participant's civil service employment grade assessed on a 6-point scale at baseline (mean [SD] = 3.4 [1.6]). Grade of employment was determined by asking all participants for their civil service grade title. On the basis of salary, the civil service identified 12 nonindustrial grades that, in order of increasing salary, comprise clerical assistant, clerical officer, executive officer, higher executive officer, senior executive officer, and 7 "unified grades." Other professional and technical staff were assigned to these grades on the basis of salary. As in previous reports from the Whitehall II cohort,[18,19] unified grades 1–6 were combined into 1 group and the bottom 2 clerical grades into another, producing 6 categories; here, we coded the variable so that category 1 represents the lowest status jobs and category 6 the highest. In 1995, the annual salary in the 2 lowest grades was £4000 to £10,999, for the 2 intermediate grades was £5500 to £26,000, and for the 2 highest grades was £28,975 to £150,000.[1,19] For retired participants and participants no longer working in the civil service, the assigned SES was the final grade before leaving the civil service. The civil service pension is based on years of service and employment grade on departure; civil servants with 40 years of service should receive a pension equivalent to about half their final salary. The pension of an employee who is medically retired may be higher than an ordinary pension (to allow for medical care costs).[22] Voluntary early retirement has previously been shown to have a positive effect on personal income,[4] reflecting the financial package offered to people retiring early.

Statistical Analysis

Age-dependent mental health and physical functioning trajectories associated with retirement status were assessed using random-intercept multilevel modeling.[23,24] In multilevel longitudinal models, the data are structured so that measurement times (observations) are nested within participants. On average, participants provided data at 4 of the possible 6 study phases, resulting in a total of 33,585 observations for the 7584 participants. In a random-intercept model, the average level of the outcome (ie, the intercept) is allowed to vary across individuals. The regression coefficients for the covariates are calculated as weighted averages of between-participant effects (comparison between different participants having different values for the covariates) and within-participant effects (comparison between repeated measurements for the same participant).

Although physical functioning is known to decline with age, there have been conflicting findings regarding aging and mental health.[25,26] We therefore began our analysis by plotting the mean mental health and physical functioning scores by age, allowing the association between age and health to take any shape. On the basis of these preliminary analyses, we chose to model the effect of age, using a piecewise approach[27] in which the age range was divided into 2 parts—before and after the age of 60—by creating 1 variable for ages 39–59 (age <60 years) and another variable for ages 60–76 (age >60 years). This offered a flexible model to evaluate whether retirement had different effects before and after the age of 60. In addition to taking into account the effect of age, all models were adjusted for the effect of measurement period, ie, study phase.[28]

To assess whether the association between retirement status and health was dependent on age at retirement, we tested retirement status by age interaction effects. These interactions were assessed by testing interaction terms first with linear terms of age and then with quadratic terms of age. Only statistically significant terms were retained in the models. The findings were illustrated by growth curve models showing the predicted trajectories by age and retirement status. All models were adjusted for sex and SES, and the aforementioned procedure of testing interaction effects with age was applied to these covariates. In addition to including sex and SES as covariates in the main analyses, we ran subsidiary analyses stratified by sex and SES to examine potential moderating effects of these covariates. These analyses yielded results substantially similar to the main analyses (eAppendix, http://links.lww.com/EDE/A378).

The association between retirement status and health could change depending on how long a person has been retired. To assess this possibility, we created cumulative indicators of retirement status at each phase, summing the number of phases at which the participant had been retired up to and including that phase. Separate cumulative indicators were created for statutory retirement, ill-health retirement, and voluntary early retirement. For example, a participant who took voluntary early retirement (say, between phases 4 and 5) and remained retired at phases 6, 7, and 8 was assigned the values of 0, 0, 1, 2, 3, and 4 on the cumulative voluntary-early-retirement indicator at phases 3, 4, 5, 6, 7, and 8, respectively. The cumulative variables ranged from 0 (being retired in none of the phases) to 5 (being retired in all the phases after baseline). In this analysis, the participants contributed observations from all phases in which they had complete data between baseline and the phase being analyzed (n = 6714 participants; 31,104 observations). For example, a participant with data available at phases 3, 4, 5, 7, and 8 contributed 3 observations (at phases 3, 4, and 5) because missing data at phase 6 prevented the calculation of the cumulative retirement variable after phase 5.

The associations between cumulative retirement indicators and health outcomes were assessed with random-intercept multilevel modeling. Because we had time-varying measures of retirement status and health outcomes at 6 phases, it was possible to examine within-participant effects, ie, comparing postretirement health with preretirement health within the same person (in contrast to comparing retired and nonretired participants).[23,24] For the analysis of cumulative retirement time, we therefore fitted multilevel models estimating only within-participant effects of retirement. If the association between retirement and health is causal rather than a reflection of selection effects, one would expect there to be within-participant effects.

Finally, to assess reverse causality, we applied discrete-time survival analysis[23,29] to assess whether mental health and physical functioning of nonretired participants predicted the likelihood of becoming retired. Only participants who were not retired at phase 3 and who had complete data at each phase were included in this analysis (n = 4837). We fit separate survival-analysis models for each reason for retirement. In each analysis, participants retiring for reasons other than the reason of interest were censored when they retired. Time-varying mental health and physical functioning scores assessed at a given phase were used to predict retirement status at the next phase. We adjusted survival analysis models for sex, SES, and age. All models were fitted using STATA 9.2 statistical program (StataCorp, College Station, TX).

RESULTS

Mental Health

On average, mental health increased in a curvilinear fashion up to age 60, after which it remained relatively stable (Fig. 1). Preliminary analyses showed that a piecewise model including linear and quadratic terms for both age variables fitted the mental-health trajectory well. In sex- and SES-adjusted analyses, the association between retirement status and mental health was dependent on reason for retirement and age at retirement (Fig. 2;

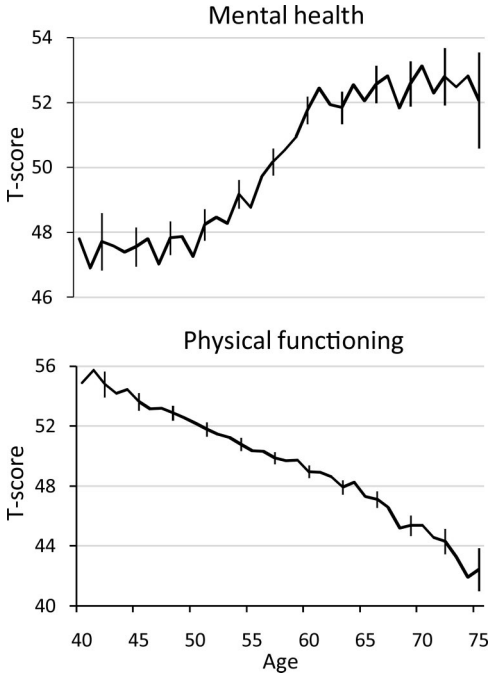

FIGURE 1. Average scores (and 95% confidence intervals) of mental health and physical functioning by age.

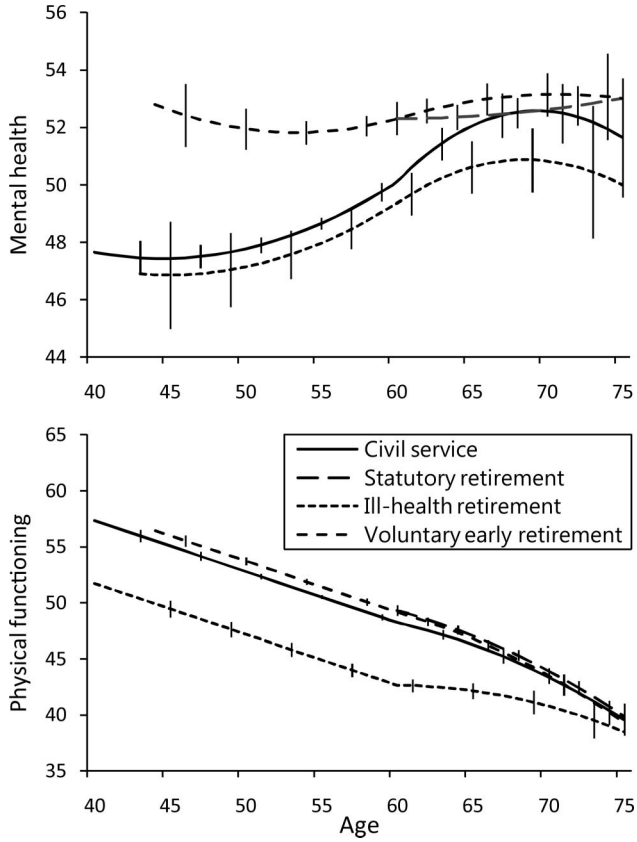

FIGURE 2. Trajectories of mental health and physical functioning as a function of retirement status and age. Mental health and physical functioning are scored as T-scores (mean [SD] = 50 [10]). The vertical lines are 95% confidence intervals. See eTable 1 (http://links.lww.com/EDE/A378) for the percentages of observations belonging to the various retirement status groups by age group. See eTable 2 (http://links.lww.com/EDE/A378) for statistical details of the multilevel model.

eTables 1 and 2, http://links.lww.com/EDE/A378). Voluntary early retirement and statutory retirement were associated with better mental health compared with being in the workforce. By the age of about 65, these differences had disappeared due to improvement in mental health of nonretired participants. Ill-health retirement was associated with poor mental health, but the shape of the trajectory closely followed the trajectory for those still in work. This suggests that ill-health retirement is associated with poor but not deteriorating mental health over time. The size of the mental health benefit associated with statutory or early retirement when the participant was aged 60 was ~3 times the size of the mental health deficit associated with ill-health retirement at the same age (Fig. 2; eTable 2).

We then assessed whether the association between retirement and mental health was dependent on the number of phases at which the participant had been retired (Fig. 3; eTable 3, http://links.lww.com/EDE/A378). Statutory retirement was associated with improved mental health from the first through fourth phases after retirement but not at the fifth phase. Voluntary early retirement was associated with greater improvement in mental health, although this association attenuated over time. Ill-health retirement was not associated with poor or declining mental health over time.

Physical Functioning

Physical functioning declined with age, the pace accelerating slightly after age 60 (Fig. 1). A piecewise model with linear term for age <60 and linear and quadratic terms for age >60 fitted the data well. Statutory and voluntary early retirement were associated with better physical functioning compared with being in the workforce. The magnitude of these differences was approximately half of those observed for mental health (Fig. 2; eTable 2), and retired participants at age 60 had the same level of physical functioning as nonretired participants at age 58. Ill-health retirement was associated with substantially poorer physical functioning, such that a 60-year-old person who had retired on health grounds had the physical functioning level of a 71-year-old person who had not retired on health grounds. The trajectories for ill-health retirement and other categories began to converge after age 60.

We then examined whether the association between retirement and physical functioning was dependent on the number of study phases spent in retirement (Fig. 3; eTable 3). Statutory retirement was associated with higher physical functioning across study phases, but this association attenuated after retirement. Voluntary early retirement exhibited a

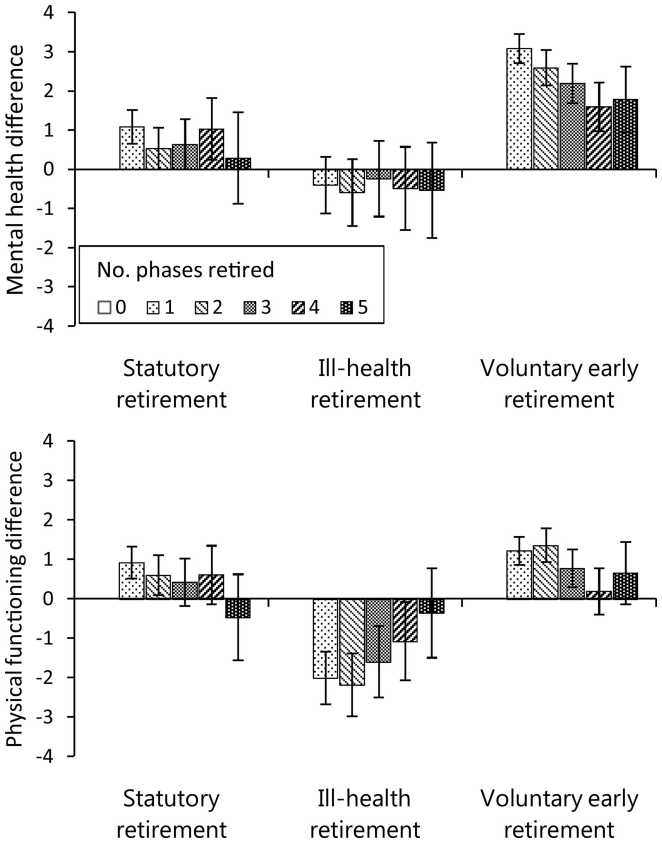

FIGURE 3. Associations between length of retirement (number of follow-up phases being retired) and differences in mental health and physical functioning. The values are within-participants regression coefficients from separate multilevel models for each reason for retirement and indicate the within-participant difference in health associated with retirement compared with not being retired. Mental health and physical functioning are scored as T-scores (mean [SD] = 50 [10]). The vertical lines are 95% confidence intervals. See eTable 3 (http://links.lww.com/EDE/A378) for statistical details.

similar pattern. Ill-health retirement was associated with poor physical functioning at the beginning, but this improved over time spent in ill-health retirement.

Sensitivity Analyses

As a sensitivity analysis, we repeated the analysis of retirement-related health trajectories and within-participant analyses separately by sex and SES. With few exceptions, the shapes of health trajectories were qualitatively similar across the subgroups, suggesting that the findings in the main analysis are robust (eFigures 1–4, http://links.lww.com/EDE/A378).

Reverse Causality

Finally, we assessed whether time-varying mental health and physical functioning prospectively predicted the likelihood of retiring at the next phase (Table). Poor mental health was associated with increased odds of subsequent voluntary early retirement, and poor physical functioning was associated with increased odds of statutory retirement (compared with continuing in the civil service or having left the civil service for reasons other than retirement). Both poor mental health and physical functioning increased the odds of ill-health retirement.

TABLE. Assessing the Selection Effect of Health on the Likelihood of Retiring for Different Reasons Compared With Staying in Work, Using Three Discrete-Time Survival Analysis Models

	Model 1 (Statutory Retirement)	Model 2 (Ill-Health Retirement)	Model 3 (Early Voluntary Retirement)
Mental health	0.99 (0.92–1.08)	0.64 (0.56–0.73)	0.89 (0.84–0.94)
Physical functioning	0.91 (0.84–0.99)	0.55 (0.49–0.62)	0.98 (0.92–1.05)
Female sex	1.02 (0.84–1.23)	0.71 (0.53–0.95)	1.11 (0.98–1.26)
Baseline SES	1.05 (0.99–1.08)	0.88 (0.81–0.95)	1.18 (1.14–1.22)

Values are odds ratios (95% confidence intervals) of discrete-time survival analysis models. Odds ratios for mental health and physical functioning are presented for standardized scales (SD = 1), and higher scores indicate better health (ie, odds ratios <1.00 indicate that good health decreases the odds of retirement). All models adjusted for period effects and age at baseline.

DISCUSSION

In a British occupational cohort, statutory retirement and voluntary early retirement were associated with better mental health and physical functioning compared with being in the workforce. Retirement on health grounds was associated with poorer mental health and physical functioning but not with an accelerated decline in health over time. On average, mental health improved after midlife and reached a plateau around the age of 60. Such improvement in mental health after the midlife years has been observed in several previous studies,[25,30] although the explanation for this general pattern remains unknown. The present findings show that people retiring early may enjoy a head start in this postmidlife mental health improvement.

The improved mental health and physical functioning of retirees tended to attenuate over time since retirement, particularly in voluntary early retirement. This may reflect a process in which people adapt to changes in their life circumstances—a process observed in several studies of life events and subjective well-being.[31] However, it bears emphasis that the level of health in those who took early or statutory retirement did not drop below their preretirement health level even in participants who were retired for most of the study period. Despite the possible attenuation of the health benefits, being retired for several years seems to have no adverse impact on health. Participants taking ill-health retirement, in turn, recovered from their initially low physical functioning, whereas their mental health did not change over the time.

The sex- and SES-specific multilevel models suggest that the associations between retirement and health were qualitatively similar across sexes and SES groups, although statutory retirement and voluntary early retirement were slightly more strongly associated with improved health in men than in women and in participants with high than low SES (eFigures 1–4). There was one exception to these general patterns; participants retiring due to ill health from a high SES job did not have low physical functioning at the beginning of their ill-health retirement, but their physical functioning did improve over time and their mental health deteriorated over time. This stands in contrast to the effect pattern observed in the total sample (or in participants with low SES), ie, a recovery from an initially poor physical functioning and no change in mental health. Reasons for these SES-related differences are unknown. Perhaps having to retire due to ill health is mentally more stressful to employees with high SES because they lose a high-status occupation. Despite declining mental health, however, they seem to enjoy the improving physical functioning associated with ill-health retirement.

Health Causation and Selection

Survival analyses indicate that all 3 forms of retirement were predicted by poor rather than good health; the specific associations varied according to the reason for retirement. Poor mental health increased the probability of opting for voluntary early retirement, whereas poor physical functioning increased the probability of leaving the workforce at statutory retirement age. It is possible that people with mental health problems are more troubled by work-related stressors and therefore more likely to retire early. The decision to continue working beyond statutory retirement age, in turn, might be affected more by individuals' physical capabilities than their mental health. Both poor mental health and physical functioning contributed to the probability of ill-health retirement, which is in agreement with the fact that ill-health retirement is granted because of mental and physical illnesses.

Our study shares the limitations inherent to all observational studies, including the difficulty of establishing causal relations. Nevertheless, 2 arguments support a causal interpretation for the association of statutory and early retirement with improved health. First, our analyses of reverse causality indicate that the probability of retirement was increased by poor health, and so, reverse causality is unlikely to account for the observed association between retirement and improved health. If anything, such a selection effect might have led to a conservative estimation of the health improvements associated with retirement. Second, longitudinal within-participant analyses suggested that, for a given individual, mental health and physical functioning were better after retirement than before.

Not surprisingly, and in contrast to patterns observed for statutory and early voluntary retirement, our analyses suggest that the association between ill-health retirement and poor health reflects health selection rather than causation. First, possible selection and causation effects were both in the same direction, ie, ill-health retirement was associated with poorer health both before and after retirement. Second, within-participant analyses indicated no deterioration in mental health after ill-health retirement. There was an initial decline in physical functioning associated with ill-health retirement, which may reflect an onset of a disease between the study phases, ie, the cause rather than the effect of ill-health retirement. However, physical functioning of ill-health retirees improved over time and tended to reach its preretirement level in ~15 years. Together, these findings suggest that, with the exception of participants with high SES, ill-health retirement has generally no adverse health effects. If anything, it may be related to recovering of physical functioning.

Given the inherent limits of observational studies in establishing causal relationships, the causal role of retirement remains uncertain and should be interpreted cautiously. The changes in health after retirement were most pronounced in early retirees, suggesting that removal of work-related mental strain[32–34] could underlie the beneficial effect of retirement. Increased leisure time and opportunity to pursue personal interests and hobbies could also be contributing factors. One may argue that it is actually these factors, rather than retirement per se, that improve health. However, we believe that such life changes after retirement are best interpreted as mediating mechanisms that bring about the beneficial effects of retirement, rather than as co-occurring events confounding the independent effects of retirement. If retirement had not taken place, the life changes and opportunities after retirement would not have taken place either. From this perspective, it seems justifiable to consider retirement as a potentially causal social transition that influences health.

Strengths and Limitations of the Study

The main strength of the study is the prospective longitudinal design, with 6 follow-up phases covering the ages between 39 and 76 years (during which most people leave the workforce). These data allowed us to model health trajectories across the adult life course while taking into account age at retirement and the length of time spent in retirement. Multiple repeated measurements of retirement and health outcomes strengthened the evidence supporting causal interpretations, thus contributing to previous evidence based on cross-sectional studies and longitudinal studies with only 1 follow-up, including 2 earlier studies[1,4] of retirement in the Whitehall II cohort. The main limitation of the study was the homogeneity of the study sample because the participants consisted mainly of white-collar men and women working in public sector workplaces. Further research is needed to assess whether our results are generalizable across all occupational settings and across different countries with different retirement policies. For instance, recent evidence

from the GAZEL study[35,36] suggests that the beneficial effects of retirement may not be limited to the United Kingdom settings because retirement in this French occupational cohort, including also blue-collar workers, was associated with a substantial decrease in the prevalence of sleep disturbances and improved self-rated health.

In conclusion, data from British civil servants provide clear support for the hypothesis that mental health and physical functioning improve after statutory and voluntarily retirement, although the improvement seems to attenuate over time. The magnitude of observed improvements was relatively modest, particularly in the within-participant analyses and for statutory retirement, and thus, the health consequences of retirement should not be overemphasized. Our findings suggest that these health consequences are mostly positive and that much of the assumed negative health effects of retirement[14,15] are attributable to health selection rather than causation.

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