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## Barriers and opportunities for prolonging working life across different occupational groups: the SeniorWorkingLife study

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**Background:** Increasing retirement age is a pivotal issue in labour market reforms. This study analyses factors conditioning retirement intentions. **Methods:** In SeniorWorkingLife, 11 444 employed workers  $\geq 50$  years replied to questions in random order about expected reasons for leaving and potential reasons for staying longer at the labour market. Respondents were stratified based on the Danish version of International Standard Classification of Occupations (ISCO). Representative estimates were produced using the SurveyFreq and SurveyLogistic procedures of SAS combined with model-assisted weights based on national registers. **Results:** For ISCO groups 1–4 (seated work) main expected reasons for retiring were freedom to choose and desire for more leisure time, but many would consider staying longer if there were better possibilities for additional senior days, longer vacations and flexible working hours. For ISCO groups 5–9 (physical work), poor physical health and not being capable of doing the job were common expected reasons for retiring, but many would consider staying longer if the work were less physically demanding and there were more senior days. Possibility for pension was a general expected reason for retiring. Expected reasons differed to a less extent between genders than between ISCO groups, e.g. economic factors were more important for men and high work demands more important for women. **Conclusion:** Different barriers and opportunities for prolonging working life exist across different occupational groups of the labour market—with most consistent differences between those with seated and physical work. Targeting these specifically seems opportune for policy makers and future interventions.

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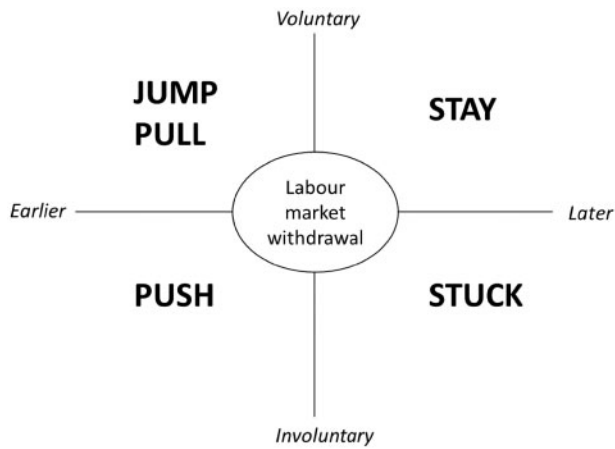
### Introduction

Due to declining birth rates and increasing lifespan, the age-distribution in the European countries—as well as in most parts of the world—is shifting towards a relatively larger proportion of elderly citizens.<sup>1</sup> Thus, in EU-28 the percentage of people 65 years or older has increased from 17.1% in 2008 to 19.7% in 2018, and this trend is predicted to continue.<sup>2</sup> To resist negative socioeconomic consequences of this demographic transformation, most European countries have orchestrated pension reforms encouraging older workers to postpone retirement. However, retirement intentions and the timing of retirement is an outcome of complex and dynamic processes that may not be in line with the intentions of political reforms.<sup>3,4</sup>

For decades, factors motivating older workers to leave the labour market before the state pension age have been conceptualized as Push and Pull factors.<sup>5</sup> Push is defined as involuntary early retirement, i.e. the worker is being ‘pushed out’, e.g. due to poor health or mentally stressful or heavy physical work. Pull is triggered by generous early retirement schemes (financial incentives) or norms as to when it is appropriate to leave the labour market. These concepts, however, have been criticized for their inability to explain social variability in early retirement, e.g. gender differences. To meet this problem the concept of Jump has been constructed,<sup>6</sup> referring to values and needs that come from within, e.g. a desire to travel the world or spend more time with grandchildren or a retired spouse. In recent years, however, research has increasingly focused on why a growing segment of older workers continues to work until

or beyond retirement age. This new trend has been conceptualized as ‘need’ and ‘maintain’<sup>7</sup> resembling the concepts of Stay and Stuck developed by Snartland and Øverbye in the early 2000s.<sup>8</sup> Stay refers to older workers voluntarily prolonging working life due to having a fulfilling job, good salary, good interpersonal relations with colleagues and leaders, while Stuck is about prolonging working life involuntarily because retirement would have negative consequences for their life situation, e.g. cannot afford to retire due to high fixed costs of living.

In this paper, the concepts of Push, Pull, Jump, Stay and Stuck (figure 1) are looming in the background as a reference point regarding factors affecting retirement intentions of older workers. In this way, understanding factors conditioning retirement intentions—before actual retirement—may stimulate initiatives in the society and at workplaces to diminish negative factors and promote positive factors. Within the framework of Push, Pull, Jump, Stay and Stuck, existing studies of retirement patterns of older workers have shown that intentions to retire are conditioned by the work environment, including physical work demands and psychosocial work conditions,<sup>9–16</sup> health and subjective life expectancy,<sup>17</sup> gender,<sup>18</sup> marital status, i.e. spouses may coordinate retirement,<sup>19</sup> economic incentives and norms embedded in public pension systems,<sup>20</sup> burn-out and life dissatisfaction<sup>21</sup> and a preference for more leisure time to be used for a new ‘life project’ and/or social gains such as spending more time with grandchildren.<sup>22</sup> Still, our knowledge about factors conditioning intentions to retire is far from complete, and this paper will address two research gaps:



**Figure 1** The concepts of Push, Pull, Jump, Stuck and Stay in relation to early/late voluntary/involuntary withdrawal. Early withdrawal from the labour market can be involuntary (Push) or voluntary (Jump, Pull). Late withdrawal can be involuntary (Stuck) or voluntary (Stay)

First, studies analysing intentions to retire have been preoccupied with specific occupational groups, e.g. physicians, practitioners, professional workers or civil servants, crude occupational groups, e.g. class, status or skill level,<sup>23</sup> or—most studies—older workers on an aggregate level. In contrast, this paper comprehensively analyses factors conditioning retirement intentions as well as differences in retirement intentions among nine different occupational groups. Second, the paper does not only consider factors conditioning retirement intentions, it also analyses factors that could potentially change such intentions and prolong working life.

The aim of addressing these research gaps is to qualify the debate about barriers and opportunities for prolonging working life across different occupational groups. The analyses use representative data from Danish employed individuals aged +50 years.

## Methods

### Study design

The questionnaire survey was sent out in July 2018 and terminated in October 2018. To increase transparency, the study is registered as a cohort study in ClinicalTrials.gov (Identifier: NCT03634410) and the open-access protocol is published elsewhere.<sup>24</sup> This article reports the first findings based on the baseline questionnaire, i.e. as a cross-sectional study design. The first longitudinal follow-up is expected in 2020 or 2021. For the baseline, a total of 30 000 Danes  $\geq 50$  years (18 000 employed, 7000 unemployed, 3000 on voluntary early retirement, 2000 on disability pension) were drawn as a probability sample by Statistics Denmark and invited with a personal questionnaire-link via e-Boks (online digital mailbox linked to the Danish social security number) to participate. The survey data were merged with high-quality national registers through the unique social security number assigned to all Danish residents at birth or immigration. For the present analyses, only currently employed wage earners belonging to International Standard Classification of Occupations (ISCO) groups 1–9 were included. Among those who were employed the response percentage to the entire questionnaire was 56%, but for the present analyses those replying only partly were included as well, yielding a total sample size of 11 444 employed individuals. Table 1 shows descriptive characteristics of the sample.

### Subgroups of the study population

Based on national registers, respondents were stratified into nine occupational groups based on the official Danish version of the ISCO. The International Labour Organization is responsible for the ISCO,

which was updated in 2008.<sup>25</sup> The Danish version of ISCO is a six-digit classification, structured as a five-level hierarchical structure based on information from high-quality national registers at Statistics Denmark, and divides the Danish labour market into 563 professional groups, each containing a number of closely related work functions. The skill requirements in each ISCO group range from I (most basic) to IV (most advanced). For this study, we used the first-level ISCO groups: (i) **Managers** (levels III and IV skill requirement), (ii) **Professionals** (level IV skill requirement), (iii) **Technicians and Associate Professionals** (level III skill requirement), (iv) **Clerical Support Workers** (level II skill requirement), (v) **Services and Sales Workers** (level II skill requirement), (vi) **Skilled Agricultural, Forestry and Fishery Workers** (level II skill requirement), (vii) **Craft and Related Trades Workers** (level II skill requirement), (viii) **Plant and Machine Operators and Assemblers** (level II skill requirement), (ix) **Elementary Occupations** (level I skill requirement). Armed Forces Occupations is also an ISCO group (group 0), but were excluded in the present analyses due to a low number of observations. Based on questionnaire replies about the physical work characteristics from each respondent of this study, the majority of ISCO groups 1–4 has seated work (76%, 57%, 74% and 75%, respectively), and the majority of ISCO groups 5–9 has physical work (86%, 83%, 89%, 72% and 89%, respectively). For the main analyses of this study, we therefore combined these respective ISCO groups, but detailed results from the nine distinct ISCO groups are provided in Supplementary Appendix S1.

### Questionnaire

First, participants were asked about their expected retirement age. Next, participants replied to two main multiple-choice questionnaire batteries concerning (i) factors conditioning retirement intentions and (ii) factors that might encourage continuing working beyond the expected retirement age.

The questionnaire regarding factors conditioning retirement intentions contained 15 multiple-choice response options—provided in random order—with regard to expected factors that might cause the respondents to leave the labour market. (i) **Push**: poor physical and mental health; failure to thrive in the workplace; termination of employment relation; wish from employer; no longer capable of working; no longer able to cope with work demands; to make space for younger staff. (ii) **Pull**: retirement norms; economic considerations, including access to early retirement or pension benefits; generous retirement benefit scheme at the workplace. (iii) **Jump**: wish from spouse; wish for more self-determination; wish for more time to leisure activities. The questions were inspired by The Danish Longitudinal Study of Ageing.<sup>26</sup> The option ‘none of the above’ was given at the bottom of the multiple-choice questions as the 16th option.

For possible reasons to stay longer, 15 multiple-choice response options were given in random order for each respondent. Respondents were asked whether they would be willing to prolong working life beyond intentions, if certain conditions were fulfilled. (i) **Stay**: if there were more flexible working hours, longer vacations or more senior days, if there were a higher level of recognition and influence at work, if there were more challenges at work, if there were support from the spouse, if there were better possibilities for continuing education, if the work were less strenuous, if health were better. The last two options can also be viewed as ‘suppression of Push’, i.e. indirectly promoting Stay. The questions were inspired by The Danish Longitudinal Study of Ageing.<sup>26</sup> The option ‘none of the above’ was given at the bottom of the multiple-choice questions as the 16th option.

### Statistics

The SurveyFreq procedure (SAS version 9.4) was used to produce estimates of prevalence and 95% confidence intervals. The

**Table 1** Demographics, lifestyle, health and work in ISCO groups 1–4 (mainly seated work) and 5–9 (mainly physical work), respectively

	ISCO 1–4 (mainly seated work)		ISCO 5–9 (mainly physical work)	
	Men n = 3498	Women n = 3899	Men n = 2600	Women n = 1447
Age (mean)	56.9 (5.8)	56.2 (4.9)	56.9 (5.5)	56.2 (4.5)
Smoking (% yes)	14 (13–15)	14 (13–16)	26 (24–28)	26 (24–29)
Alcohol (% men >14 and % women >7 per week)	16 (15–17)	18 (17–19)	12 (10–13)	9 (8–11)
Height, cm (mean)	181.3 (7.4)	168.1 (6.5)	179.7 (7.9)	166.6 (7.1)
Weight, kg (mean)	87.6 (15.5)	71.8 (15.8)	88.7 (17.5)	72.2 (17.3)
BMI (mean)	26.6 (4.3)	25.4 (5.0)	27.4 (4.8)	26.0 (5.8)
Physical activity leisure (%)				
Seated	11 (9–12)	12 (11–14)	19 (17–21)	20 (17–22)
Light exercise at least 4 h	55 (53–57)	67 (65–69)	58 (56–61)	66 (63–69)
Sports or heavy physical activity at least 4 h per week	31 (29–33)	20 (19–21)	20 (18–22)	13 (11–15)
Training and competing regularly and several times a week	4 (3–5)	1 (0–1)	2 (1–3)	1 (0–2)
Physical activity work (%)				
Seated	70 (68–71)	63 (62–65)	19 (17–21)	10 (8–12)
Standing or walking	21 (20–23)	26 (24–28)	24 (22–26)	23 (20–25)
Standing or walking with a lot of lifting or carrying	8 (7–9)	9 (8–10)	43 (40–45)	52 (49–55)
Heavy or fast work that is physically strenuous	1 (1–2)	1 (1–2)	14 (12–16)	15 (13–17)
Weekly working hours (mean)	41.0 (9.1)	37.3 (7.6)	39.1 (10.1)	35.0 (7.4)
Expected retirement age (mean)	67.5 (5.0)	66.2 (3.5)	66.8 (4.4)	65.7 (3.0)

Results are either mean (SD) or prevalence as percentage (95% CI).

SurveyLogistic procedure (SAS version 9.4) was used to produce odds ratios (ORs) and 95% confidence intervals for chance of choosing each different option of the multiple-choice questionnaires. In contrast to the 'normal' frequency and logistic procedures of SAS, the survey procedures take into account sampling clusters and strata.<sup>27</sup> The analyses were controlled for age, sex and ISCO group. For sex, men were used as reference, i.e. ORs for women. For ISCO, groups 1–4 (mainly seated work) was used as reference, i.e. ORs for groups 5–9 (mainly physical work). Due to the different size and response percentage of subgroups, model-assisted weights were used to produce representative estimates. These weights were used for both the SurveyFreq and SurveyLogistic procedures and were based on information from high-quality national registers at Statistics Denmark, and took into account sex, age, occupational industry, highest completed education, family income, family type and origin.<sup>24</sup>

## Results

Table 1 is descriptive and shows the background variables of the population. Average age was 56–57 years in the different groups of the study. The expected retirement age was about half a year higher in ISCO groups 1–4 than in 5–9, and about 1 year higher in men than in women.

Table 2 shows prevalence and ORs of expected reasons for leaving the labour market. Leisure time was a general important reason, but much less pronounced among ISCO 5–9 than 1–4 (OR 0.44–0.48). In contrast, poor physical health (OR 2.06) and not being capable of doing the job (OR 1.68) were much more pronounced reasons among ISCO 5–9 than 1–4. Economy and retirement considerations were also generally important, but general economic considerations and good retirement conditions were more important for ISCO 1–4, while the possibility for early voluntary retirement pension was more important for ISCO 5–9. Differences between men and women were not as pronounced as between the ISCO groups, except the possibility for early voluntary retirement pension, which was much more pronounced among women than men (OR 2.28). Although we observed significant differences in terms of ORs for some of the other factors, the prevalence of these were generally low.

Table 3 shows prevalence and ORs of possible reasons for staying longer at the labour market. More leisure time (senior days and vacations) were overall important reasons, but to less extent

among ISCO 5–9 than 1–4 (OR 0.40–0.52). Flexibility of working time was also more important among ISCO 1–4. Encouragement from the management was also important among men in ISCO 1–4. In contrast, lowering of physical work demands (OR 5.32) and better health (OR 2.37) were important reasons for ISCO 5–9. For the women compared with the men, more senior days, and less physically and mentally demanding work were also important. Overall, only few of the respondents selected changes and challenges at work, continued education and external factors as important possible reasons for staying longer. About 1/5 did not indicate any possible reasons for staying longer.

Detailed results for each of the nine ISCO groups are provided in Supplementary Appendix S1 (online only).

## Discussion

This study showed that there were several factors conditioning retirement intentions among older workers and that these differed between occupational groups, most pronounced between those with seated vs. physical work.

Overall, Jump factors were the most important factors affecting retirement intentions. However, when scrutinizing the different occupation groups, Jump factors were most dominant among ISCO groups 1–4. Common for these groups is that they either require high skill levels (ISCO groups 1–3) and/or are predominantly seated work (ISCO groups 1–4). A high proportion of these also replied that they would stay longer if there were possibilities for more senior days, longer vacations and more flexible working hours fitting their needs (Stay factors). This fits well with a recent scoping review indicating that flexible working conditions and additional days off can act as Stay factors.<sup>28</sup> Thus, promoting Stay factors among ISCO groups 1–4 may suppress Jump factors to an extent that retirement intentions are changed towards a longer working life.

In contrast to the first ISCO groups, ISCO groups 5–9 are characterized by physical work, e.g. standing, walking, lifting, using the legs, back, neck, shoulders and arms. When replying to the questions regarding factors conditioning retirement intentions, the balance between Jump and Push factors shifted, i.e. poor physical health and not being capable of doing the work—i.e. Push factors—were just generally as important as the desire for more leisure time. Thus, when Push factors are strong, Jump factors may be suppressed. In a broader view, this fits with basic evolutionary

**Table 2** Expected reasons for leaving the labour market among men and women in ISCO groups 1–4 and 5–9, respectively, provided as prevalence and 95% confidence intervals

	ISCO 1–4 (mainly seated work)		ISCO 5–9 (mainly physical work)		ISCO 5–9 vs. 1–4	Women vs. men
	Men n = 3466	Women n = 3867	Men n = 2580	Women n = 1439	OR <sup>a</sup>	OR <sup>a</sup>
<b>Leisure</b>						
That you want to determine yourself what you want to do	56 (54–58)	55 (53–56)	39 (36–41)	32 (29–34)	0.44 (0.40–0.49)	0.87 (0.79–0.94)
To have more time for hobbies	50 (48–52)	49 (47–51)	34 (32–36)	29 (26–32)	0.48 (0.43–0.52)	0.89 (0.82–0.97)
<b>Health, work demands and well-being</b>						
That you will not be capable of doing your job	19 (18–21)	24 (23–26)	27 (25–29)	37 (34–39)	1.68 (1.51–1.86)	1.44 (1.30–1.59)
Poor physical health	13 (12–14)	15 (14–16)	25 (23–27)	26 (23–28)	2.06 (1.84–2.30)	1.13 (1.01–1.26)
That you do not thrive at the workplace	11 (10–12)	9 (8–10)	7 (6–8)	6 (4–7)	0.58 (0.49–0.69)	0.85 (0.73–0.98)
Poor mental health	6 (5–7)	5 (5–6)	5 (4–6)	4 (3–5)	0.77 (0.63–0.95)	0.87 (0.72–1.05)
<b>Economy and retirement considerations</b>						
Possibility of receiving pension	30 (28–32)	28 (27–30)	25 (23–27)	23 (20–25)	0.77 (0.69–0.85)	0.91 (0.83–1.01)
Economic considerations	26 (24–28)	23 (21–24)	14 (13–16)	10 (8–12)	0.43 (0.38–0.49)	0.79 (0.71–0.88)
Possibility of receiving voluntary early retirement pension	11 (9–12)	25 (23–26)	20 (18–22)	32 (29–34)	1.69 (1.52–1.89)	2.28 (2.05–2.54)
Good retirement conditions at the workplace	9 (8–10)	6 (6–7)	5 (4–6)	2 (1–3)	0.48 (0.39–0.59)	0.65 (0.55–0.77)
<b>Norms</b>						
It is common to leave at that age in your type of work	11 (10–13)	12 (11–13)	9 (8–10)	9 (8–11)	0.77 (0.67–0.90)	1.04 (0.91–1.19)
To make space for younger employees	10 (9–11)	10 (9–11)	13 (11–14)	12 (10–14)	1.31 (1.13–1.51)	0.98 (0.85–1.12)
<b>External factors</b>						
Wish from spouse	10 (9–11)	7 (6–8)	5 (4–6)	3 (2–4)	0.46 (0.38–0.57)	0.65 (0.55–0.77)
Termination of employment	6 (5–7)	4 (3–4)	3 (3–4)	2 (1–3)	0.51 (0.40–0.65)	0.57 (0.46–0.70)
At the request of the workplace	4 (3–5)	2 (2–3)	1 (1–2)	1 (1–2)	0.42 (0.30–0.59)	0.58 (0.44–0.77)
None of the above	4 (3–5)	3 (2–4)	4 (3–5)	3 (2–4)	0.97 (0.76–1.24)	0.75 (0.59–0.94)

ORs for ISCO groups 5–9 (ref: 1–4) and women (ref: men) are provided in the last two columns.

<sup>a</sup>Controlled for ISCO group, sex and age.

**Table 3** Possible reasons for staying longer at the labour market among men and women in ISCO groups 1–4 and 5–9, respectively, provided as prevalence and 95% confidence intervals

	ISCO 1–4 (mainly seated work)		ISCO 5–9 (mainly physical work)		ISCO 5–9 vs. 1–4	Women vs. men
	Men n = 3452	Women n = 3849	Men n = 2573	Women n = 1435	OR <sup>a</sup>	OR <sup>a</sup>
<b>Leisure</b>						
If there were more senior days	43 (41–45)	51 (50–53)	30 (28–32)	33 (31–36)	0.52 (0.48–0.57)	1.31 (1.20–1.43)
If there were a possibility for longer vacations	34 (32–36)	35 (33–37)	19 (17–20)	16 (14–18)	0.40 (0.36–0.45)	0.97 (0.89–1.07)
<b>Flexibility</b>						
If the working time were better organized according to your needs	38 (37–40)	41 (39–43)	24 (22–26)	25 (22–28)	0.49 (0.44–0.54)	1.10 (1.01–1.20)
<b>Economy</b>						
If it would pay better off economically	33 (31–34)	27 (25–28)	29 (27–31)	24 (22–27)	0.86 (0.78–0.95)	0.76 (0.69–0.84)
<b>Physical and mental work demands</b>						
If your health had been better	11 (10–12)	10 (9–12)	22 (21–24)	22 (20–24)	2.37 (2.09–2.68)	0.96 (0.85–1.09)
If the work were less physically strenuous	6 (5–7)	9 (8–10)	25 (23–27)	36 (34–39)	5.32 (4.67–6.06)	1.62 (1.43–1.84)
If the work were less mentally strenuous	15 (13–16)	20 (19–22)	9 (7–10)	14 (12–16)	0.60 (0.52–0.69)	1.52 (1.35–1.72)
<b>Recognition and influence at work</b>						
If the management wanted you to stay longer	23 (21–24)	15 (14–16)	11 (9–12)	5 (4–6)	0.36 (0.32–0.42)	0.55 (0.49–0.62)
If your work were appreciated to a higher extent	12 (11–13)	13 (12–14)	11 (9–12)	12 (10–14)	0.91 (0.79–1.04)	1.11 (0.97–1.26)
If you got more influence on planning the work	14 (13–15)	13 (12–15)	9 (7–10)	9 (7–11)	0.61 (0.52–0.70)	0.99 (0.87–1.13)
<b>Changes and challenges at work</b>						
If there were less demands for adaptation and change	11 (10–12)	16 (15–17)	6 (4–7)	9 (7–10)	0.48 (0.41–0.57)	1.53 (1.33–1.75)
If there were greater professional challenges	7 (6–8)	4 (3–5)	3 (2–4)	3 (2–4)	0.44 (0.34–0.56)	0.60 (0.48–0.73)
<b>Education</b>						
If your opportunities for continuing education were better	6 (5–7)	7 (6–7)	3 (2–4)	4 (3–5)	0.54 (0.43–0.68)	1.14 (0.95–1.39)
If you got a paid educational course to take care of another job (not necessarily at the same workplace)	6 (5–7)	6 (6–7)	6 (5–7)	6 (5–8)	0.93 (0.77–1.12)	1.09 (0.91–1.30)
<b>External factors</b>						
If there were support from spouse/cohabitant/partner	10 (9–11)	4 (3–5)	5 (4–6)	2 (1–3)	0.44 (0.36–0.55)	0.37 (0.30–0.45)
None of the above	19 (17–20)	19 (18–21)	19 (17–21)	21 (19–24)	1.07 (0.96–1.20)	1.09 (0.98–1.21)

ORs for ISCO groups 5–9 (ref: 1–4) and women (ref: men) are provided in the last two columns.

<sup>a</sup>Controlled for ISCO group, sex and age.

principles of survival, where removal of danger has priority over self-realization. However, when asked about possible reasons for staying longer at the labour market, many in ISCO groups 5–9 would stay longer if the work were less physically strenuous. Thus, workers on the edge of being pushed out due to strenuous physical work are positive about staying longer if the work could be made less physically strenuous. In other words, suppressing Push may indirectly promote Stay. At the societal level, this may be achieved through better opportunities for changing occupation and/or job function, e.g. mediated through paid education and vocational training. At the workplace level, this may be achieved through better use of assistive devices and/or changing to less strenuously job functions. At the individual level, this may be achieved through physical training to strengthen the body, preferably performed together with the colleagues at the workplace to achieve high adherence.<sup>29</sup> Thus, evidence synthesis from systematic reviews provides clear evidence that strength training at the workplace improves physical health of workers.<sup>30–32</sup>

Although the differences in factors conditioning retirement intentions were most pronounced between ISCO groups 1–4 and 5–9, there were also some differences between men and women. This was most clear in relation to the demands of the job. Thus, not being capable of doing the job was an expected reason for retiring among 27% and 37% of the men and women in ISCO groups 5–9, respectively (OR 1.44). This was also reflected in possible reasons for later retirement, where 25% and 36% of the men and women in ISCO groups 5–9, respectively (OR 1.62), would stay longer if the work were less physically demanding. Although this study deals with factors conditioning retirement intentions, the results fits well with a recent Nordic research project, showing that women with short education and physically demanding work are especially vulnerable to being pushed out of the labour market due to poor health.<sup>33</sup> While there may be several reasons for this gender difference, a physiological explanation may be that men generally have a higher physical capacity—in terms of muscle strength—than women. Thus, when physical capacity inherently declines with age this may challenge the physical reserve capacity—i.e. the difference between physical work demands and physical capacity of the worker—especially of the women. Another explanation may be rooted in the vertical and horizontal gender division of labour. This constitutes differences in the working conditions between men and women, leaving women with relatively heavy work tasks compared with the men (repetitive work tasks; heavy lifting in the care sector, etc.). However, even when men and women are engaged in the same work task, females run a higher risk than males of work-related musculoskeletal disorders,<sup>34</sup> suggesting that physiological factors may at least be part of the explanation.

Pull factors were also at play. The option of receiving pension at a certain age was chosen as a common expected reason for retiring, although more dominant among ISCO groups 1–4 than 5–9. In contrast, the possibility of receiving early voluntary retirement pension (i.e. before the official retirement age), was more common among ISCO groups 5–9 (OR 1.69). Likewise, this was more common among women than men (OR 2.28). A previous Nordic study showed that early voluntary retirement is utilized to a higher extent among those with physically demanding work,<sup>33</sup> and can be seen as a way out of the labour market if the Push factors are strong, e.g. if the work is physically demanding.

Although not the main focus of this study, economic considerations were a common expected reason for retiring as well as a possible reason for staying longer at the labour market. A previous study from the US showed that older workers felt encouraged to stay longer if the workplace provided economic benefits like paid healthcare.<sup>35</sup> It can be speculated that personal economy may act both as Pull, Stuck and Stay factors, i.e. the worker may be (i) pulled out due to an attractive retirement scheme, (ii) stuck at the labour market because the personal economy does not allow one to

retire in spite of poor health, (iii) tempted to stay longer and thereby gain further income and pension savings. Many replied that they would consider staying longer if it would pay better off economically, although this was more dominant among ISCO groups 1–4 and men. Thus, economic incentives may one of the tools to prolong working lives. However, future studies should investigate this in more depth.

Finally, there were also some underappreciated factors. Only a few respondents indicated that they would consider staying longer if there were less demands for changes, more challenges at work, continued education and support from a spouse. About 1/5 did not indicate any possible reasons for staying longer, which indicates that some people have already made a decision about their retirement age.

### Strengths and limitations

The SeniorWorkingLife study has both limitations and strengths. A strength is that Statistics Denmark drew a probability sample among all eligible Danish residents age 50 years or older. As in all questionnaire studies, non-response is a study limitation. To account for this, all analyses were performed using statistical weights based on high-quality national registers. This procedure ensures that data are representative of +50-year workers in Denmark. Using ISCO to stratify groups is a study strength as it is an internationally accepted way to group occupations into professional groups containing a number of closely related work functions. The Danish version of ISCO is based on objective and high-quality register information from Statistics Denmark and is therefore highly reliable. Compared with other types of groupings, e.g. socioeconomic class, ISCO is a better predictor of health outcomes.<sup>25</sup> Finally, we studied factors conditioning retirement intention, and not actual retirement. Thus, a prospective follow-up to determine the influence of these conditional factors on actual retirement will be performed during the years to come. Based on the present findings it can be hypothesized that retirement intentions will be prospectively associated with actual retirement in the years to come.

### Conclusion

This study has shown that Push, Pull and Jump factors have a major impact on retirement intentions of older workers. As such, to prolong working life, i.e. to turn Push, Pull and Jump into Stay, calls for measures encouraging older workers to work longer. Such measures, however, should be targeted and designed to fit different characteristics and needs of different occupational groups. To avoid that those with physical work (mainly ISCO groups 5–9) are being pushed out, there seem to be an opportunity to prolonging working lives by fitting the physical work demands to the workers capacity and health condition, i.e. diminishing the Push factors. In contrast, among those where the Push factors are not so dominant—i.e. among those with more seated work (mainly ISCO groups 1–4)—an opportunity could be to stimulate Stay factors to overrule the Jump factors, e.g. by making the work so engaging that the worker chooses not to retire. Economic incentives for staying longer than normal retirement age may also be considered across occupational groups. Finally, prolonging working life should not focus only about maximizing years at the labour market, but also ensure that workers can retire in good health and be able to enjoy the years after retirement.

### Supplementary data

Supplementary data are available at *EURPUB* online.

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## Availability of data and material

The authors encourage collaboration and use of the data by other researchers. Data are stored on the server of Statistics Denmark, and researchers interested in using the data for scientific purposes should contact the project leader Prof. Lars L. Andersen, lla@nfa.dk, who is responsible for the study design, questionnaire development, definition of population, and data collection.

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*Conflicts of interest:* None declared.

### Key points

- Most European countries are increasing statutory retirement age, but this may run counter to abilities and wishes of older workers.
- In occupations with seated work, many would stay longer at the labour market if there were better possibilities for additional senior days, longer vacations and flexible working hours.
- In occupations with physical work, many would stay longer if the work were less physically demanding and there were more senior days.

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# Mortality among Italian male workers in the construction industry: a census-based cohort study

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**Background:** Advances in technologies, occupational hygiene and increased surveillance have reduced the excess mortality previously found in the construction industry. This study is aimed to evaluate cause-specific mortality in a recent cohort of construction workers. **Methods:** We carried out a record-linkage cohort study based on the 2011 Italian census and the mortality archives (2012–2015), including 1 068 653 construction workers. We estimated mortality rate ratios (MRR) using Poisson regression models including terms for age and geographic area. **Results:** Compared with non-manual workers, construction workers showed an excess mortality from all causes (MRR: 1.34), all neoplasms (MRR: 1.30), head and neck (MRR: 2.05), stomach (MRR: 1.56), liver (MRR: 1.62), lung (MRR: 1.80), prostate (MRR: 1.24) and bladder (MRR: 1.60) cancers, respiratory (MRR: 1.41) and liver (MRR: 1.79) diseases, all external causes (MRR: 1.87), falls (MRR: 2.87) and suicide (MRR: 1.58). Compared with manual workers in other industries, construction workers showed excess mortality from prostate (MRR: 1.27) and non-melanoma skin cancers (MRR: 1.95), all external causes (MRR: 1.14), falls (MRR: 1.94) and suicide (MRR: 1.18). Most of this excess mortality disappeared after adjusting for education, with the exception of prostate and non-melanoma skin cancers, all external causes, falls and suicide. **Conclusions:** Construction workers are at high risk of dying from external causes, while the excess mortality found for several cancers, liver and respiratory diseases may be at least partially due to the high prevalence of low education and unfavorable lifestyle factors. The excess mortality from prostate cancer requires further evaluations.

## Introduction

Construction represents one of the industrial sectors with the highest incidence of work-related accidents and illness, including musculoskeletal diseases, dermatitis, hearing loss, but also life-threatening conditions.<sup>1,2</sup> Workers employed in the construction industry are exposed during demolition, reconstruction and maintenance to a mix of hazardous substances, including asbestos, silica dust, gas, fumes, diesel exhaust and solvents.<sup>3,4</sup> In addition, workers in the construction industry have a high prevalence of smoking and heavy alcohol drinking.<sup>5–8</sup>

Some studies found higher mortality from respiratory cancers and non-malignant respiratory diseases among cohorts of construction workers as compared with other workers.<sup>9–11</sup> These workers are also at increased risk of fatalities, since their job entails risky activities, such as working in high places and carrying heavy loads.<sup>12</sup>

Over the last few decades, however, advances in technologies, occupational hygiene and increased surveillance have substantially decreased the workplace exposure to harmful substances, as well as more rigorous regulations have improved the working condition.<sup>13</sup>

In Italy, the construction sector represents an important part of the national economy accounting for 18.8% of the GDP in 2017. Between 2010 and 2017, this industrial sector had experienced a severe crisis that led to 9.8% drop in the number of companies and 23.3% decline in the number of workers, with the largest decline reported in unskilled occupations. Difficulties in access to credit, late payments, time and cost of obtaining building permits and licenses were the main drivers of the crisis in the Italian construction sector.<sup>14</sup> Moreover, the Italian workforce in this sector is being replaced by foreign workers who are often underpaid with less protection, high risk of illegal labor and increased risk of work-related injuries.<sup>15,16</sup> In 2017, 34 812 injuries at work (excluding

those occurred while reaching the workplace) have been officially reported in the construction industry in Italy, 125 of which resulted in death.<sup>17</sup> Intervention programs to enforce two national laws that laid down safety and health requirements for construction sites resulted in a reduction of work-related injuries.<sup>18</sup>

These considerations call for new studies on more recent cohorts of workers for which available data are scanty. In this regard, we carried out a census-based cohort study to evaluate cause-specific mortality in a large cohort of Italian construction workers.

## Methods

### Study population

We carried out a cohort study based on a sample of Italian male residents registered in the 2011 census and the mortality archives. The list of residents in all Italian municipalities was also used to track residents who moved abroad. These individuals were linked with the census and censored at the date of emigration. A detailed description of the study procedures can be found elsewhere.<sup>19</sup>

Construction workers were identified by two items of the census questionnaire: the first one asked the subject the type of occupation he/she did in the week preceding the census date and the second question asked about the industrial sector. We extracted all workers involved in unskilled or skilled manual occupations and personnel in manufacturing, machinery, assembly lines or drivers working in the construction sector aged between 20 and 64 years at the beginning of the follow-up. Non-manual workers employed in the construction sector were excluded. The final cohort included 1 068 653 construction workers.