BMI and Labor Market Participation

A Cohort Study of Transitions Between Work, Unemployment, and Sickness Absence

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BMI and labor market participation: A cohort study of transitions between work, unemployment, and sickness absence

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What is already known on this subject?

- Obesity and being outside of the labor market are both individual risk factors for poor health.
- Cross-sectional studies suggest that unemployment is much more frequent in individuals with obesity than in individuals with normal weight.

What this study adds

- Individuals with obesity were at higher risk of unemployment and sickness absence, as compared to individuals with normal weight.
- Individuals with obesity who were unemployed had a lower chance of getting employment, as compared to normal weight individuals.

Abstract

Objective: We aim to test the hypotheses that individuals with obesity are at higher risk of unemployment and sickness absence and have a lower chance of getting employed compared to individuals with normal weight.

Methods: Data on weight and height were collected at baseline from 87,796 participants in the Danish National Health Survey 2010. Participants were then followed in national registers for five years. Outcome measures were transitions from employment to unemployment and sickness absence, and the transitions from unemployment or sickness absence to employment. Data were analyzed by Cox proportional hazards models adjusted for potential confounders.

Results: Hazard ratios for unemployment were 1.18 (95% CI: 1.10-1.26) for individuals with obesity and 1.27 (95% CI: 1.14-1.41) for individuals with severe obesity compared to individuals with normal weight. Participants with obesity also had a higher risk of sickness absence. Additionally, Participants with obesity who were unemployed at baseline had a lower chance of becoming employed as compared to participants with normal weight.

Conclusion: Obesity was associated with a higher risk of unemployment and sickness absence compared with individuals of normal weight. Additionally, obesity was associated with a lower chance of employment.

Introduction

Obesity is an important risk factor for several health complications and constitutes an immense cost to society (1). Furthermore, individuals with obesity, are often targets of stigmatization and discrimination, which affect labor market status. In experimental studies, job applicants with obesity are often ascribed negative characteristics, rated more negatively, and are less likely to be hired compared to a person with normal weight (2). Also, employees with obesity are presumed, by their colleagues and employers, to be lazy, sloppy, less competent, and lacking in self-discipline (2). Another mechanism by which obesity could affect labor market status is health; excessive weight is a risk factor for a range of morbidities which could lead to decreased productivity and sickness absence (3). Employment and economic security contribute to good health maintenance and being outside of the labor market is associated with health problems and unhealthy life style habits such as cigarette smoking, alcohol consumption, unhealthy eating, and low levels of physical activity (4). Exclusion from the labor market could add considerably to the recognized negative consequences of obesity, increasing the burden for the individual as well as for society. From a public health perspective, it is therefore important to generate knowledge about the relationship between obesity and labor market participation. However, available evidence on the association of obesity and the risk of unemployment, or chance of getting back to work when being outside of the labor market, is limited and demonstrate conflicting results (5-11). The reasons behind the conflicting results are perhaps the huge differences in study design and study populations, relatively small sample sizes and lack of good follow-up data. This study adds to the literature, by examining the associations in a large prospective cohort study with good follow-up data. We aim to test the hypotheses that - compared to being normal weight - individuals with obesity who are currently employed, have higher risks of becoming unemployed as well as going on sickness absence; and that individuals with obesity who are currently unemployed or on sickness absence, have a lower chance of becoming employed. Additionally, we aim to assess whether associations differ between men and women.

Methods

This cohort study was based on data from the Danish National Health Survey 2010. Participants' labor market participation was followed for five years by linkage to nation-wide registers using the unique personal identification number given to all residents in Denmark. Information on covariates was obtained partly from the Danish National Health Survey 2010 and partly from nation-wide registers. According to

Danish law, register-based studies do not require approval from ethical committees or consent from participants.

The Danish National Health Survey 2010

The Danish National Health Survey 2010 is a population-based survey. Individuals were randomly selected from the adult population in Denmark, aged 16 years or older, alive and living in Denmark on January 1st, 2010, using the Danish Civil Registration System (12). A total of 298 850 individuals were invited by postal mail to complete an enclosed paper questionnaire or a web-based questionnaire accessed by a unique link. Data were collected from February to April 2010. The questionnaire was completed by 177 639 individuals, corresponding to 59.5% of the total sample. A detailed description of the sampling procedure and design is published elsewhere (13).

Assessment of body mass index

Self-reported data on body weight and height was obtained from the Danish National Health Survey 2010, and body mass index (BMI) was calculated by dividing body weight in kilograms by the square of body height in meters. BMI was categorized into the following groups: underweight (BMI < 18.5 kg/m^2), normal weight (18.5 kg/m^2 ≤ BMI <25 kg/m^2), overweight (25 kg/m^2 ≤ BMI <30 kg/m^2), obesity (30 kg/m^2 ≤ BMI < 35 kg/m^2), and severe obesity (BMI ≥ 35 kg/m^2), as defined by the WHO (14).

Covariates

Five covariates were included in the main analyses: gender, age, living area, educational level, and labor market participation one year prior to baseline. Information on gender, age, and living area (densely populated area, intermediate density area, thinly populated area (15) was obtained from Statistics Denmark. Educational level was defined as the highest obtained education and put into three categories; primary (<10 years), upper secondary/vocational (10-12 years), and higher education (≥13 years). Information on education was extracted from Danish education registers, which are generated from educational institutions administrative records (16). Participants with missing information on highest obtained educational level (<1%) were included in the lowest educational level. Labor market status one year prior to baseline (proportion of the time spent as employed, unemployed, receiving sickness benefit, or other (please see below for definitions)) was also included. This information was obtained from The Danish Register-based Evaluation of Marginalization database (17).

Additionally, we included six covariates in a separate model: Charlson comorbidity index, smoking status, alcohol consumption, mental illness, physical fitness, and cohabitation status. The Charlson

comorbidity index (18) was calculated according to 19 selected diseases based on data from the National Patient Registry (19). The index was divided into two categories; none and Charlson comorbidity index ≥1. Data on smoking status (never smoker, ex-smoker, non-cigarette smoker, current smoker of 1-14 and 15+ cigarettes/day), alcohol consumption (drinks/week), mental illness (no, yes – now or previously with current repercussions), and physical fitness (poor, moderate, good) were all derived from the Danish National Health Survey 2010. Last, cohabitation status (living alone vs. not) was obtained from Statistics Denmark.

Assessment of labor market participation

The well-fare system in Denmark consists of several types of benefits that can be allocated depending on individual circumstances for a citizen. All benefits are registered on a weekly basis in The Danish Register-based Evaluation of Marginalization database (17). The database includes all residents of Denmark who have received any kind of benefits since 1991. For this study, unemployment was defined as receiving any kind of benefit due to unemployment (unemployment benefits or social benefits) and sickness absence was defined as receiving sickness benefits, meaning that the individual is temporarily unavailable to work due to health problems. Employment was defined as not receiving any social benefits. Individuals in this category can therefore be self-supporting (such as for instance stay home parents) or having a job.

Final study population

To be eligible for inclusion in the present study, participants had to be either employed, unemployed, or on sickness absence at baseline. Of the 177 639 individuals who participated in the Danish National Health Survey 2010, we excluded 67 330 participants who were younger than 18 or older than 60 years of age; 19 622 participants as they were retired or received other social benefits at baseline (e.g. education support, retirement, or disability pension); 1555 participants were excluded due to missing information on height or weight; and 1336 had missing information on potential confounding variables. Thus, the final study population for main analyses consisted of 87 796 participants.

Participants were followed from baseline (February 2010) until any of the three outcomes (employment, unemployment, or sickness absence), emigration, retirement, death, or end of follow-up (five years after baseline), whichever came first. Information on vital status and migration during follow-up was obtained from the Danish Civil Registration System (12).

Statistical analysis

Baseline characteristics are presented by category of BMI group. Median values with 5^{th}-95^{th} percentiles are presented for continues variables and proportions are presented for categorical variables.

Transitions between employment, unemployment, and sickness absence were analyzed using the Cox proportional hazards model with time since baseline (in days) as the underlying time scale. The reference category was normal weight (18.5 kg/m^2 ≤ BMI <25 kg/m^2). Evaluation of the proportional hazards assumptions in the Cox analyses was performed by visual inspection of log-log plots and statistical significant testing, with no violation detected. Analyses were performed using SAS version 9.3 and Stata version 15. All analyses were unweighted.

First, we examined the main associations between BMI and risk of each of the labor market outcomes separately for men and women. We adjusted for age, education, living area, and labor market status during the year prior to baseline. We repeated the analyses with further adjustment for smoking status, alcohol consumption, Charlson comorbidity index, cohabitation status, physical fitness, and mental illness. In sensitivity analyses, we repeated the analyses after excluding smokers from the study population since smokers have lower BMI compared to non-smokers and smoking is associated with unemployment and sickness absence.

Second, BMI was modelled continuously using cubic splines to account for non-linear associations (20). For this analysis, a BMI of 24 kg/m^2 was used as the reference category. To avoid inexpedient influence by outliers we excluded participants with a BMI lower than 16 kg/m^2 or greater than 50 kg/m^2, resulting in 77 858 participants working at baseline, 6763 unemployed participants, and 3122 participants on sickness absence. The analysis was adjusted for age, gender, education, living area, and labor market status during the year prior to baseline.

Results

Baseline Characteristics

In total, 87 796 participants (47.2% men) with a median age of 44.5 years were included in the study (Table 1). Of the study sample, 1.4% were categorized into the underweight group, 50.6% into the normal weight group, 34.3% into the overweight group, 10.2% into the obesity group, and 3.5% into the severe obesity group. Participants with obesity or severe obesity were more likely to be unemployed or on sickness absence, live in thinly populated areas, be less educated, suffer from comorbidity and mental illness, and have poor self-reported physical fitness, compared to participants with normal weight. In general, the group of participants with underweight had a similar adverse risk factor profile as participants with obesity or severe obesity.

[Table 1]

Body mass index and risk of unemployment

Of 77 896 participants who were employed at baseline, 9992 participants became unemployed during the five-year follow-up period. Hazard ratios (HR) of unemployment showed similar trends for men and women (Table 2). Having obesity or severe obesity, as compared to being normal weight, was associated with a higher risk of unemployment. For example, the HRs of unemployment were 1.33 (95% CI: 1.14-1.55) and 1.18 (95% CI: 1.02-1.37) for men and women with severe obesity.

Body mass index and risk of sickness absence

Of 77 896 participants who were employed at baseline, 17 249 went on sickness absence during the five-year follow-up period. The risk of sickness absence was higher in participants with overweight, obesity, and severe obesity compared with normal weight participants in both men and women. For example, the HRs in participants with severe obesity were 1.51 (95% CI: 1.33-1.73) and 1.48 (95% CI: 1.35-1.63) in men and women.

Body mass index and chance of employment

Of 6775 participant who were unemployed at baseline, 4550 became employed during the 5-year follow-up period. For women, being underweight was associated with a lower chance of becoming employed compared to normal weight participants (HR = 0.61 (95% CI: 0.45-0.82)). Overweight and obesity were not associated with the chance of employment, whereas severe obesity was associated with a lower chance in women (HR = 0.76 (95% CI: 0.61-0.93)) but not significantly in men (HR = 0.84 (95% CI: 0.70-1.02)).

Of 3125 participants who were on sickness absence at baseline, 2253 returned to work during the follow-up period. Overall, overweight and obesity did not seem to be associated with the chance of returning to work after a period of sickness absence. However, the HR for returning to work was 1.25 (95% CI: 1.01-1.56) in men with obesity compared to men with a normal BMI.

[Table 2]

Sensitivity analyses

In any of the labor market transitions, further adjustment for smoking status, alcohol consumption, Charlson comorbidity index, cohabitation status, physical fitness and mental illness had little effect on the

results (results not shown). The Charlson comorbidity index includes diabetes, however, in a sensitivity analysis, we ran the analyses again adjusted for diabetes separately. This did not change the estimates (results not shown). In a second sensitivity analysis, we excluded smokers from the study population, however, this did not change the estimates (results not shown).

Spline curves

To investigate curvilinear relations, analyses were repeated modelling BMI by cubic splines with 24 kg/m^2 as reference (Figure 1). In accordance with categorical analysis, a U-shaped curve for transition from work to unemployment (Figure 1A); a monotone increasing curve for the transitions from work to sickness absence (Figure 1B); and an inverted U-shaped curve for the transitions from unemployment or sickness absence back to work (Figure 1C &D) were observed.

The BMI associated with the lowest risk (the nadir of the curve) was 25.2 kg/m^2 for the transition from work to unemployment, and the BMI associated with the highest chance (the peak of the curve) was 26.1 kg/m^2 for the transition from unemployment to work, and 26.05 kg/m^2 for the transition from sickness absence to work. For the association for transition from work to sickness absence, a monotone increasing curve was observed, hence, the lowest risk of sickness absence was observed in participants with the lowest BMI (16 kg/m^2).

[Figure 1]

Discussion

Our findings show that obesity was associated with a higher risk of unemployment and sickness absence compared with individuals with normal weight. Additionally, obesity was associated with a lower chance of employment. However, results were not convincing for an association between overweight and the chance of getting back to work after a period of sickness absence. Results were similar for men and women.

Employment status, lifestyle, and mental and physical health are intimately connected. Being unemployed is associated with higher risk of depression (21), cardiovascular disease (22, 23), and risk of all-cause mortality (22). Additionally, becoming unemployed is associated with the initiation or aggravation of unhealthy habits such as smoking and hazardous drinking (24). Knowledge of risk factors for job loss and barriers for getting back to work is thus of great public health concern. We show that weight and employment status are linked, a somewhat hidden consequence of obesity (i.e. job loss and lower chance of returning to work), likely to create a vicious cycle of negative health concerns.

Few studies have investigated the impact of obesity on unemployment and with inconsistent results. Most studies have been conducted within the field of health economy using methods different from ours including instrumental variables for instance area level obesity (6), genes (7), or obesity status of biological relatives (8, 9). Two studies showed an effect of obesity on employment (6, 9), while four studies indicated no association (7, 8, 10, 11). Two studies, however, use methods comparable to our study (10, 11). Both find no association between obesity and unemployment. However, both studies had relatively small sample sizes, and Robroek et al. (10) only included older adults over the age of 50 and Jusot et al. (11) only included individuals working in the private sector, making comparison difficult.

The observed higher risk of sickness absence among participants with overweight and obesity confirms the results of several previous studies (10, 25-30), all showing a higher risk of sickness absence or disability pension among individuals with overweight and obesity. This is not surprising since prolonged sickness absence generally is a consequence of chronic or otherwise serious illnesses, and many of such illnesses can be related to obesity, including mental illness (31). Our results contribute to the body of evidence, implying that obesity impacts employee well-being and workability. Interestingly, the association between BMI and the risk of going from payed employment to sickness absence was monotonically increasing, reflecting the lowest risk among the leanest participants. This is somewhat surprising, since the risk of developing health problems generally is higher among underweight individuals compared to normal weight individuals (32).

In line with our results, a German observational study found that unemployed women with obesity were 15% less likely to be hired, despite making more job applications and engaging more in job training programs, compared to normal weight women (5). Several experimental studies, using simulated job interviews or weight manipulated photographs of job applicants, also find, that overweight individuals are less likely to be hired (33, 34).

A higher probability of returning to work after being on sickness absence was observed in men with obesity compared to men with a normal BMI (Table 2). This is contradictory to what we might expect considering the hypothesis of a lower chance of returning to work among individuals with obesity. However, this was not observed in women, nor when BMI was modelled continuously (Figure 1D).

Strengths and limitations

A main strength of this study includes the prospective design with five-year follow-up, enabling the investigation of different labor market outcomes over time, and the large study population allowed us to examine labor market participation across a wide range of BMI. Additionally, linkage to high-quality

nationwide registers allowed complete follow-up data on labor market outcomes and minimized misclassification bias.

Some limitations of our study should be noted. First, data from the Danish National Health Survey 2010 are self-reported and could be prone to social desirability bias (35). However, this is most common in interview settings and self-administered questionnaires are generally thought to be suitable for sensitive questions about health (35). Nonetheless, BMI is likely to be underestimated (36), which would amplify the risk estimates and the degree of adverse labor market outcomes may be less than reported here. However, a recent validation study of self-reported height and weight against objectively measured height and weight, in a similar sample and setting as the DNHS-2010, reported a high accuracy between the two measures ($R \geq 0.92$) (37). BMI was under-reported by 0.32 kg/m^2 in women and 0.38 kg/m^2 in men. Additionally, the largest difference between self-reported and measured height was found among participants over the age of 60. In this study, we only include participants under 60 years of age. We therefore expect the degree of misreporting and BMI category misclassification to be minimal in the present study.

Second, employment was defined as not receiving social benefits determined through The Danish Register-based Evaluation of Marginalization database. This definition could cause misclassification bias, as the employment group may include individuals who are independently wealthy with no need to work or who are supported by their spouse, and therefore not at risk of becoming unemployed or going on sickness absence. However, in a Danish context, this is not considered a big issue. In 2010, only about 2% of the Danish population between the age of 18 and 60 were not part of the workforce, while at the same time, not receiving any kind of social benefit (38).

Third, unmeasured and residual confounding could be an issue. In this study, we had information on several potential confounders. However, it is possible that other variables, not thought of here, could have influenced the results. Obesity is strongly associated with health-related conditions that may affect productivity at work (39). In our analysis we adjust for health status by applying the Charlson comorbidity index and self-reported mental illness, however, undiagnosed conditions or other health problems like back pain or joint pain are not covered. Additionally, shift work is known to affect BMI and contribute to adverse health behaviors and negative health effects (40). In this study, we did not have information on employment type, and we were unable to adjust for the effect of shift work. Correspondingly, stress is known to affect BMI, as it can lead to both weight gain and weight loss (41). Work related stress could also affect labor market status, and it is possible that a stressful employment situation can lead to changes in BMI before it leads to unemployment or sickness absence.

Possible mechanisms

Obesity could affect employment status through different pathways. In our study we did not have information on reasons for why participants became unemployed or why an employer chose to hire one person over another. However, obesity and health are closely related (42-44), which is also evident by the higher rate of sickness absence among participants with obesity. It is possible that employees with obesity, even with mild health issues, are less able to cope with the demands of their job, hence resulting in lower productivity. Second, the adverse labor market outcomes for individuals with obesity could be a consequence of discrimination by appearance. In Western society, attractiveness is closely linked to slimness, especially for women (45). Interestingly, we did not observe sex differences, implying that men and women are equally affected by obesity with regards to labor market outcomes. Third, obesity has been perceived as a trait associated with being lazy, sloppy, and less qualified (2). Hence, bias and prejudice toward individuals with obesity exist in the workplace, and employees with obesity could be the first to be laid off in the event of cut-backs at the company or work place. The theory of bias and prejudice towards individuals with obesity could also explain the observed inverted u-shaped relationship between BMI and the chance of employment.

The elevated risk persisted even after adjusting for health-related covariates and life style factors (i.e., comorbidity, smoking status, alcohol intake, mental illness, and physical fitness). This finding suggests that the observed higher risk of unemployment and lower chance of employment cannot be explained entirely by health, and that discrimination and stigmatizing of individuals with obesity may play an essential role.

Conclusion

The results of this large prospective cohort study indicate that men and women with excess weight are at higher risk of experiencing adverse labor market outcomes, compared to men and women with normal weight. Although our observational study was unable to identify the mechanisms through which obesity contribute to negative labor market outcomes, results indicate that the adverse effect could not be attributable to difference in distribution of other variables such as smoking status, alcohol consumption, the Charlson comorbidity index, cohabitation status, physical fitness, and mental illness between individuals with normal weight and individuals with obesity. Thus, some discrimination towards heavier individuals may exist in the labor market.

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Tables and figures:

Table 1. Baseline characteristics of 87,796 participants in the Danish National Health Survey 2010 according to BMI group

Table 2. Hazard Ratios for transitions from work to unemployment, work to sickness absence, unemployment to work, and sickness absence to work by BMI and gender

Figure 1. Hazard ratios for transitions from work to unemployment (**A**), work to sickness absence (**B**), unemployment to work (**C**), and sickness absence to work (**D**) by BMI, modelled by cubic splines. Solid curve = hazard ratios. Dashed curves = 95% confidence intervals. Estimates were adjusted for age, gender, education, living area, and labor market status during the year prior to baseline.

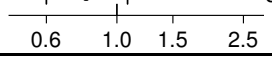
Table 1. Baseline characteristics of 87,796 participants in the Danish National Health Survey 2010 according to BMI group

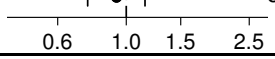
		BMI group				
	All (n= 87 796)	Underweight BMI <18.5 (n=1249; 1.4%)	Normal weight 18.5≤ BMI <25 (n=44 382; 50.6%)	Overweight 25≤ BMI <30 (n=30 125; 34.3%)	Obesity 30≤ BMI <35 (n=8951; 10.2%)	Severe obesity BMI ≥35 (n=3089; 3.5%)
Employment status						
Working (n, %)	77 896 (88.7)	1057 (84.6)	40 038 (90.2)	26 714 (88.7)	7659 (85.6)	2428 (78.6)
Unemployed (n, %)	6775 (7.7)	146 (11.7)	2977 (6.7)	2351 (7.8)	872 (9.7)	429 (13.9)
Sickness absence (n, %)	3125 (3.6)	46 (3.7)	1367 (3.1)	1060 (3.5)	420 (4.7)	232 (7.5)
Demographics						
Men (n, %)	41 462 (47.2)	220 (17.6)	17 376 (39.2)	18 003 (59.8)	4634 (51.8)	1229 (39.8)
Age, yrs, median (5^{th}-95^{th})	44.5 (23-58)	37.4 (19-58)	43.3 (21-58)	45.9 (26-59)	45.9 (27-58)	44.3 (25-58)
Living alone (n, %)	18 609 (21.2)	377 (30.2)	9975 (22.5)	5650 (18.8)	1786 (20.0)	821 (26.6)
Living in thinly populated areas[a] (n, %)	35 411 (40.3)	416 (33.3)	16 468 (37.1)	12 875 (42.7)	4187 (46.8)	1465 (47.4)
Education						
Primary school education[b] (n, %)	17 765 (20.2)	371 (29.7)	8077 (18.2)	6259 (20.8)	2198 (24.6)	860 (27.8)
Upper secondary/vocational education[c] (n, %)	38 657 (44.0)	479 (38.4)	18 202 (41.0)	14 076 (46.7)	4407 (49.2)	1493 (48.3)
Higher education[d] (n, %)	31 374 (35.7)	399 (32.0)	18 103 (40.8)	9790 (32.5)	2346 (26.2)	736 (23.8)
Health variables						
Current cigarette smoker (n, %)	17 503 (20.0)	388 (31.6)	9104 (20.5)	5753 (19.1)	1723 (19.3)	535 (17.5)
Alcohol, drinks/wk[e], median (5^{th}-95^{th})	4.0 (0-24)	3.0 (0-22)	4.0 (0-23)	5.0 (0-26)	3.0 (0-26)	2.0 (0-24)
Charlson comorbidity index ≥1[f] (n, %)	4522 (5.2)	69 (5.5)	1950 (4.4)	1545 (5.1)	638 (7.1)	320 (10.4)
Mental illness (n, %)	1650 (1.9)	45 (3.6)	761 (1.7)	517 (1.7)	217 (2.4)	110 (3.6)
Poor physical fitness (n, %)	18 025 (20.5)	255 (20.4)	5685 (12.8)	6355 (21.1)	3747 (41.9)	1983 (64.2)

Data are presented as median (5^{th} percentile, 95^{th} percentile) or n (%).

[a] residency in a municipality where at least 50 % of its population lives in a rural area; [b] <10 years of education; [c] 10-12 years of education; [d] >12years of education; [e] One drink corresponds to 12g of pure alcohol; [f] one or more diagnoses according to the Charlson comorbidity index.

	Men			Women		
	No.	Events	HR (95% CI) *	No.	Events	HR (95% CI) *
Work -> unemployment						
Underweight	177	49	1.45 (1.09-1.93)	880	153	1.16 (0.99-1.37)
Normal	15 480	2142	1.00 (reference)	24 558	2937	1.00 (reference)
Overweight	16 016	2050	0.99 (0.93-1.05)	10 698	1226	1.04 (0.97-1.11)
Obesity	3956	601	1.14 (1.04.1.25)	3703	467	1.18 (1.07-1.30)
Severe obesity	962	174	1.33 (1.14-1.55)	1466	193	1.18 (1.02-1.37)
Work -> sickness absence						
Underweight	177	25	1.00 (0.68-1.50)	880	166	0.82 (0.70-0.95)
Normal	15 480	2439	1.00 (reference)	24 558	5860	1.00 (reference)
Overweight	16 016	3013	1.12 (1.06-1.18)	10 698	2967	1.16 (1.11-1.21)
Obesity	3956	878	1.29 (1.19-1.39)	3703	1163	1.35 (1.27-1.44)
Severe obesity	962	241	1.51 (1.33-1.73)	1466	497	1.48 (1.35-1.63)
Unemployment -> work						
Underweight	38	16	0.82 (0.50-1.34)	108	46	0.61 (0.45-0.82)
Normal	1453	1013	1.00 (reference)	1524	1006	1.00 (reference)
Overweight	1496	1170	1.12 (1.02-1.21)	855	531	1.00 (0.90-1.12)
Obesity	506	360	1.02 (0.90-1.15)	366	193	0.92 (0.79-1.07)
Severe obesity	185	118	0.84 (0.70-1.02)	244	97	0.76 (0.61-0.93)
Sickness absence -> work						
Underweight			NA	41	31	1.49 (1.04-2.14)
Normal	443	317	1.00 (reference	924	688	1.00 (reference)
Overweight	491	361	1.03 (0.89-1.20)	569	414	1.03 (0.91-1.17)
Obesity	172	114	1.25 (1.01-1.56)	248	179	1.01 (0.86-1.19
Severe obesity	82	52	0.80 (0.60-1.08)	150	97	0.93 (0.75-1.15)





* Adjusted for age, education, living area, and labor market status during the year prior to baseline.

Table 2.

Hazard Ratios for transitions from work to unemployment, work to sickness absence, unemployment to work, and sickness absence to work by BMI and gender

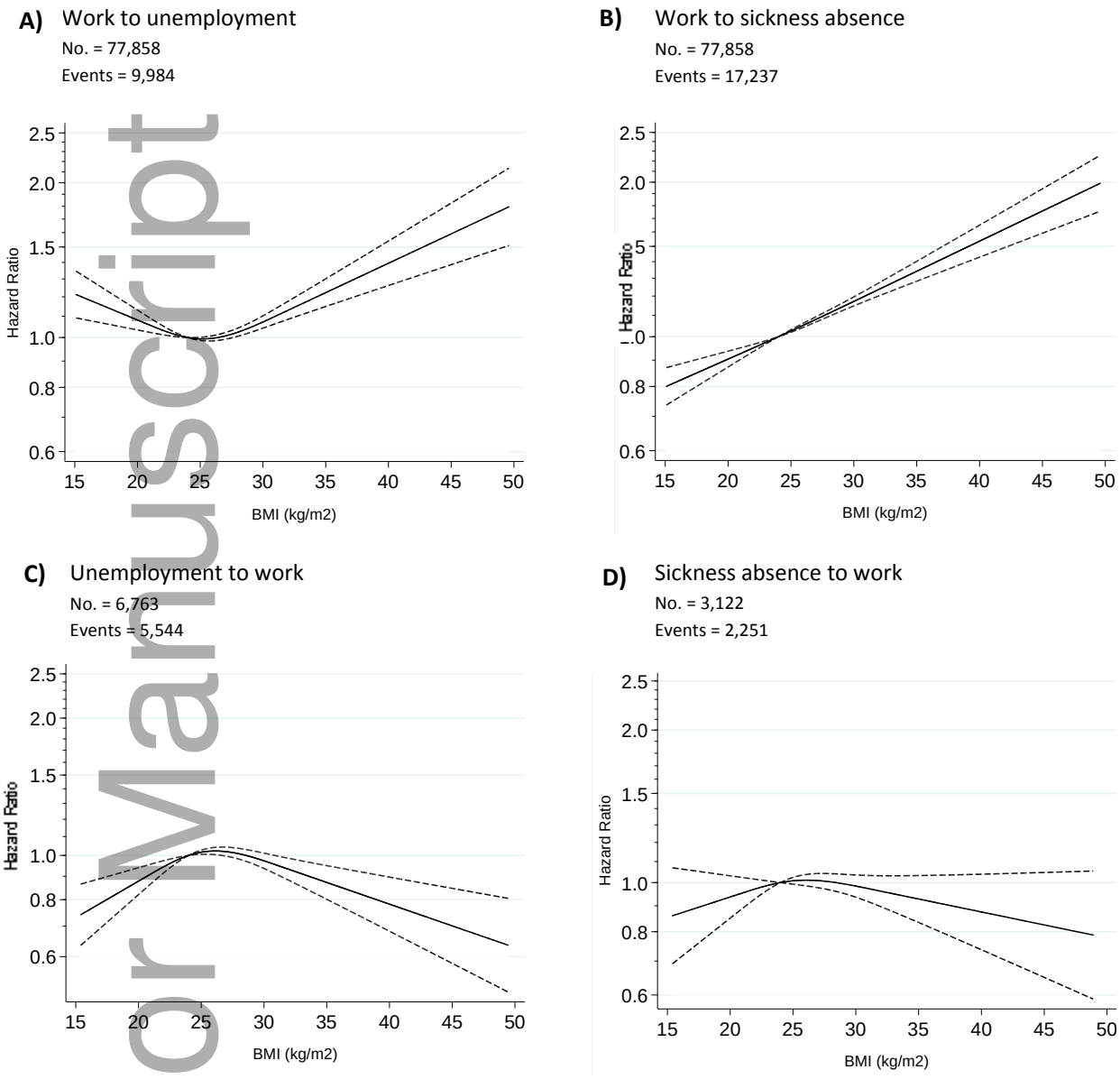


Figure 1. Hazard ratios for transitions from work to unemployment (**A**), work to sickness absence (**B**), unemployment to work (**C**), and sickness absence to work (**D**) by BMI, modelled by cubic splines. Solid curve = hazard ratios. Dashed curves = 95% confidence intervals. Estimates were adjusted for age, gender, education, living area, and labor market status during the year prior to baseline.