Supplemental Table S1. Overview of municipal health promotion offers targeted participants in the Check Your Health Preventive Program 2013-2019.

Promotion program	**Target group**	**Duration**		**Frequency**	**Content**	**Professionals**
		Overall	Session			
Check on lifestyle	Persons with low physical activity level, persons who are overweight or obese	10 meeting days (over 20 weeks)	2-3 hours (group based)	Every second week	Aim: To provide the theoretical and practical background and motivation to a healthy eating and physically active lifestyle. - Exercise training programs (cardio- and strengths training) - Yoga - Mindfulness - nutritional counselling	Health professionals: nutritionists, sport scientists, physical therapists
Check on well-being	Persons at high risk of mental health problems	10 meeting days (over 20 weeks)	2,5 hours (group based)	Every second week	Aim: To empower persons with low well-being. Theoretical and practical counselling with focus on: enhancing self-efficacy, stress- and conflict handling, health behavior and its association with mental well-being, mindfulness, self-image, taking care of self.	Health professionals: nurses, nutritionists, sport scientists, physical therapists, mindfulness coaches, psychologists.
Check on alcohol	Persons with an abnormal alcohol consumption and/or alcohol risk behavior	Individual	Individual	Individual	Evidence-based psychological and medical alcohol addiction treatment and aftercare	Professionals at the Municipal Drug Addiction Treatment and Rehabilitation Center in Randers
Check on smoking	Persons smoking	Various	Various	Various	Various existing smoking cessation programs, individual and group based counselling and education and follow-up (physical meetings and/or online counselling/motivation). According to the principles in the Danish healthcare reform and recommendations for practice[1,2]	Health professionals educated in smoking cessation and affiliated with the healthcare centre in Randers

[1] Andersen PT, Jensen J-J. Healthcare reform in Denmark. Scand J Public Health 2010;38:246-53

[2] Pisinger CH. Treatment for tobacco dependence – recommendations for practice. Danish Health Authority 2011 (www.sst.dk).

SUPPLEMENTAL MATERIAL, S2, STATISTICAL METHODS:

Multiple imputations

Multiple imputation (MI) was used to impute missing values only for persons participating in the health checks (i.e. not for non-participants). MI was performed by inclusion of baseline characteristics that explained the missingness: age, sex, income, occupation, nationality, cohabitation status, educational attainment, self-rated health, self-rated physical activity, fitness level, smoking status, height, weight, waist circumference, blood pressure, cholesterol, HDL cholesterol, HbA1c, sick leave and fraction of full-time employment. We treated the missingness mechanism as at random given the observed information (the Missing At Random (MAR) assumption) and used multiple imputations based on chained equations, (MICE).[1] We report analyses based on 100 imputations, with adjustments according to Rubin's rules,[2] since adding more imputations did not change results (results not shown). Additionally, sex and age-stratified imputations were performed. Since they did not change results either (results not shown), results from the non-stratified imputations are presented. To assess the robustness of the MAR assumption we conducted supplementary analyses. Since we were concerned that people with missing data for fitness level might have a lower fitness level, even after allowing for their observed characteristics, we subtracted the value 10 from the imputed records of fitness level, in order to test the effect of a significant manipulation (Supplemental Table S2). Following, the estimates from the analysis with and without multiple imputation were compared and evaluated. In addition to estimates of interest, we report the Fraction of Missing Information (FMI) to facilitate assessment of the impact of missing data.

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Supplemental Table S2. Violation of the missing at random assumption

		Estimate	95% CI LB	95% CI UB	FMI	RVI
Original estimates (see Table 3 in manuscript)						
Cardiorespiratory fitness (ml O2 / kg / min)	CG	32.073	31.433	32.713	0.177	0.214
	IG	32.206	31.648	32.764	0.047	0.049
	IG - CG	0.133	-0.560	0.826	0.158	0.187
Imputed values of fitness level subtracted the value 10 before analysis:						
Cardiorespiratory fitness (ml O2 / kg / min)	CG	31.199	30.509	31.888	0.172	0.207
	IG	31.358	30.750	31.966	0.041	0.043
	IG - CG	0.159	-0.605	0.924	0.148	0.173

Violation of the missing at random assumption was performed by subtracting the value 10 from the imputed records of 'fitness level'. Following, the estimates from the analysis with and without manipulation were compared and evaluated.

Propensity score matching

Due to the modest participation in the initial health check (51% IG and 40% CG), and the even lower participation at follow-up (26% IG), a direct comparison between the IG follow-up and CG baseline would not represent a fair comparison based on randomisation. Consequently, we used propensity score (PS) matching to restore the comparability of the two groups. The propensity refers to the probability of IG individuals participating in their follow-up health check, given that they had participated in their baseline health check. Propensity scores were estimated in imputed datasets with logistic regression based on the following observed baseline characteristics: sex, age, cohabitation status, educational attainment, income, nationality, occupation, smoking status, BMI, HbA1c, cholesterol, and fitness level. The estimation was done among individuals in the IG who participated in the year 2 examination using their participation status in the year 5 examination as outcome in a logistic regression. These characteristics were selected based on information from prior research[3] and by forward stepwise model selection. For all in the IG and the CG, who participated in the first health check they were invited to, we predicted the propensity for participating in a re-examination, based on the likelihood of participation in the re-examination among the IG (as shown in Supplemental Table S3). This propensity score formed the basis for the comparison between groups. To estimate the intervention effect we used a matching approach as

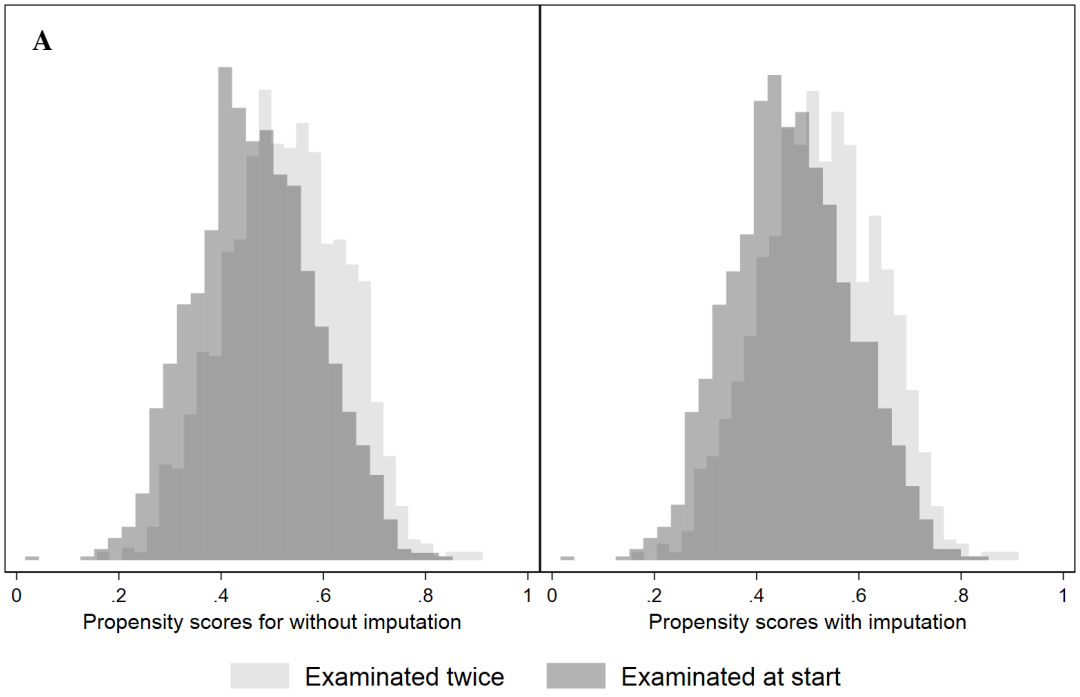
suggested and validated by Austin[4] , matching on the propensity scores. We examined the balancing properties of the propensity score (Supplemental Figure S1). The capacity of the propensity score to remove bias in estimated treatment effects was assessed by mimicking the analytic strategy for the functional capacity outcomes, and comparing with the estimates obtained for these outcomes when considering the entire invited population in an intention-to-treat analysis (Supplemental Table S4).

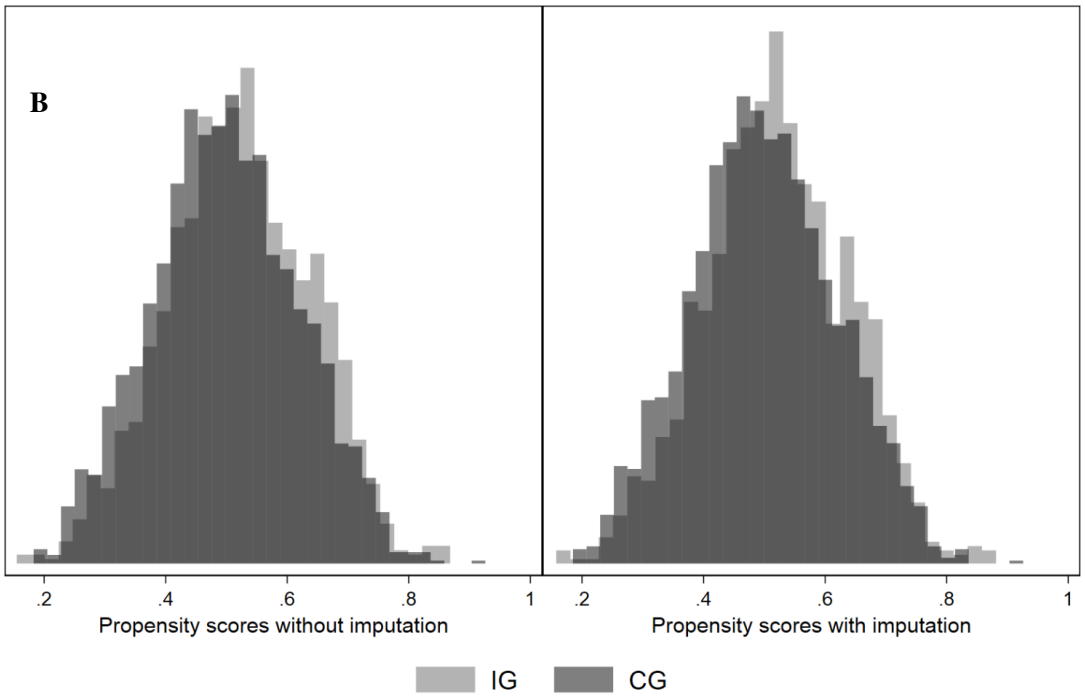
Supplemental Table S3. Prediction of participation in 2nd health examination

Parameter/Characteristics	**Log Odds**	**95% confidence interval**		**P-value**
		Lower limit	Upper limit	
Men (ref. women)	0.161	0.010	0.333	0.064
Age (Age_0)	0.037	0.021	0.052	0.000
Living alone (ref. living with others)	-0.138	-0.389	0.113	0.281
Education (ref <10 years)				
10-15 years	-0.005	-0.268	0.257	0.968
+ 15 years	0.042	-0.241	0.325	0.771
Income	0.002	0.001	0.003	0.001
Immigrants or descendants (ref. Danish)	0.534	0.125	0.943	0.011
Occupation (ref. Employed)				
Self-employed	-0.510	-0.915	-0.106	0.013
Unemployed/On benefits	0.057	-0.422	0.535	0.817
Social welfare recipients	-0.248	-0.676	0.180	0.256
Others	1.072	0.149	1.995	0.023
Fitness level (ref. very poor)				
Poor	0.222	0.006	0.439	0.044
Fair	0.716	0.493	0.939	0.000
Very good	0.172	-0.172	0.517	0.326
Excellent	0.882	0.526	1.238	0.000
Smoking (ref. not smoking)	-0.490	-0.712	-0.268	0.000
HbA1c >=42mmol/mol (ref. below 42 mmol/mol)	-0.013	-0.028	-0.002	0.100

Supplemental Table S4. Comparison of two analysis models to estimate the treatment effect of CHPP on work participation and sick leave.

		Estimate	95% CI LB	95% CI UB
Estimates from analysis using multiple imputation and propensity score matching				
Employment degree (fraction)	CG	0.805	0.783	0.826
	IG	0.800	0.781	0.820
	IG - CG	-0.004	-0.032	0.024
Sick leave 3w periods (N)	CG	0.068	0.052	0.084
	IG	0.064	0.050	0.078
	IG - CG	-0.004	-0.025	0.017
Estimates from intention-to-treat-analysis				
Employment degree (fraction)	IG	0.703	0.692	0.715
	CG	0.702	0.691	0.714
	IG-CG	-0.001	-0.015	0.017
Sick leave 3w periods (N)	IG	0.078	0.070	0.086
	CG	0.074	0.069	0.086
	IG-CG	0.000	-0.012	0.012





Supplemental Figure S1. Comparison of propensity scores for participation at the follow-up examination among those who participated in the initial examination A) Histograms of propensity scores in the intervention group without imputation (left panel) and with imputation (right panel – one imputed dataset out of 100). **B)** Histograms comparing propensity scores in the intervention group (IG) and the comparison group (CG), without imputation (left panel) and with imputation (right panel – one imputed dataset out of 100). The comparisons confirm a large overlap of propensity scores, which enables estimation of treatment effects.

References

1. Sterne JAC, White IR, Carlin JB et al. Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. BMJ : British medical journal. 2009;338, b2393.
2. Toutenburg H, Rubin DB.: Multiple imputation for nonresponse in surveys: Wiley, New York 1987. XXIX+258 pp. Stat. Pap. 1990;31, 180.
3. Bjerregaard AL, Maindal HT, Bruun NH & Sandbæk A. Patterns of attendance to health checks in a municipality setting: the Danish 'Check Your Health Preventive Program'. Prev. Med. Reports 2017;5, 175–182
4. Austin PC. Optimal caliper widths for propensity-score matching when estimating differences in means and differences in proportions in observational studies. Pharm Stat 2011;10(2):150-61.Ds

Supplemental Table S5. Clinical and behavioral profile of the citizens allocated to the intervention group (IG) at the time of their first health check (HC)

Characteristic	**Allocated to IG and only participating in the first HC (N=1,358)**	**Allocated to IG participating in the first and second HC (N=1,340)**	**Total (N=2,698)**	**Missings / N (Pct)**
BMI (kg/m2), mean (sd)	27.5 (5.3)	26.6 (4.9)	27.0 (5.1)	0 / 2698 (0.00)
BMI > 25 < 30, n (%)	533 (39.2)	515 (38.4)	1048 (38.8)	0 / 2698 (0.00)
BMI ≥ 30, n (%)	351 (25.8)	261 (19.5)	612 (22.7)	0 / 2698 (0.00)
Systolic BP (mmHg), mean (sd)	123.9 (15.7)	123.1 (15.4)	123.5 (15.5)	0 / 2698 (0.00)
Diastolic BP (mmHg), mean (sd)	81.2 (10.3)	80.5 (10.1)	80.9 (10.2)	0 / 2698 (0.00)
Systolic BP ≥ 140 mmHg, n (%)	195 (14.4)	177 (13.2)	372 (13.8)	5 / 2698 (0.19)
Diastolic BP ≥ 95 mmHg, n (%)	145 (10.7)	112 (8.4)	257 (9.5)	5 / 2698 (0.19)
Total cholesterol ≥ 6 mmol/l, n (%)	194 (14.3)	147 (11.0)	341 (12.7)	5 / 2698 (0.19)
HbA1c (mmol/mol), mean (sd)	34.4 (7.7)	33.9 (5.7)	34.2 (6.8)	6 / 2698 (0.22)
HbA1c ≥ 42 ≤ 48 mmol/mol), n (%)	31 (2.3)	14 (1.0)	45 (1.7)	6 / 2698 (0.22)
HbA1c ≥ 48 mmol/mol), n (%)	31 (2.3)	19 (1.4)	50 (1.9)	6 / 2698 (0.22)
HbA1c ≥ 42 mmol/mol, n (%)	62 (4.6)	33 (2.5)	95 (3.5)	6 / 2698 (0.22)
FEV/FVC ratio, mean (sd)	0.8 (0.1)	0.8 (0.1)	0.8 (0.1)	52 / 2698 (1.93)
FEV/FVC ratio ≤ 0.7, n (%)	169 (12.7)	161 (12.2)	330 (12.5)	52 / 2698 (1.93)
HeartSCORE% extrapolated to age 60 years, mean (sd)	2.2 (1.8)	1.9 (1.4)	2.0 (1.6)	57 / 2698 (2.11)
HeartSCORE extrapolated to age 60 years (≥5%), n (%)	85 (6.4)	47 (3.6)	132 (5.0)	57 / 2698 (2.11)

Self-rated health ('good' or better), n (%)	1176 (87.3)	1188 (89.4)	2364 (88.3)	22 / 2698 (0.82)
NEMC mental health t-score - $SF12_{mcs}$, mean (sd)	49.8 (9.3)	50.3 (9.1)	50.1 (9.2)	217 / 2698 (8.04)
Poor mental health, $SF12_{mcs}$ < 35.76, n (%)	107 (8.6)	102 (8.3)	209 (8.4)	217 / 2698 (8.04)
Alcohol risk behaviour (AUDIT), n (%)	107 (8.1)	79 (6.1)	186 (7.2)	97 / 2698 (3.60)
Daily smoker, n (%)	312 (23.5)	176 (13.4)	488 (18.5)	57 / 2698 (2.11)
Moderate Phys. Act (days with min 30 min), mean (sd)	3.5 (2.2)	3.7 (2.2)	3.6 (2.2)	65 / 2698 (2.41)
Moderate Phys. Act (days with min 30 min) (≥ 5 days), n (%)	288 (21.7)	296 (22.7)	584 (22.2)	65 / 2698 (2.41)
Cardiorespiratory fitness $mlO_2/kg/min$, mean (sd)	31.3 (9.3)	33.6 (9.4)	32.5 (9.4)	178 / 2698 (6.60)
Fitness level, n (%)				178 / 2698 (6.60)
Very poor, n (%)	592 (47.1)	442 (35.0)	1034 (41.0)	
Poor, n (%)	298 (23.7)	286 (22.6)	584 (23.2)	
Fair, n (%)	223 (17.7)	340 (26.9)	563 (22.3)	
Very good, n (%)	85 (6.8)	84 (6.7)	169 (6.7)	
Excellent, n (%)	59 (4.7)	111 (8.8)	170 (6.7)	

Supplemental Table S6. Proportion of missing values in individual baseline characteristics from citizens allocated to the control group (CG) and participating in the HC (N=2120)

Characteristic	**Missings / N (Pct)**
BMI (kg/m2), mean (sd)	< 5/2120
BMI > 25 < 30, n (%)	< 5/2120
BMI ≥ 30, n (%)	< 5/2120
Systolic BP (mmHg), mean (sd)	0/2120 (0.00)
Diastolic BP (mmHg), mean (sd)	0/2120 (0.00)
Systolic BP ≥ 140 mmHg, n (%)	0/2120 (0.00)
Diastolic BP ≥ 95 mmHg, n (%)	0/2120 (0.00)
Total cholesterol ≥ 6 mmol/l, n (%)	0/2120 (0.00)
HbA1c (mmol/mol), mean (sd)	< 5/2120
HbA1c ≥ 42 ≤ 48 mmol/mol), n (%)	< 5/2120
HbA1c ≥ 48 mmol/mol), n (%)	< 5/2120
HbA1c ≥ 42 mmol/mol, n (%)	< 5/2120
HeartSCORE% extrapolated to age 60 years, mean (sd)	5/2120 (0.24)
HeartSCORE extrapolated to age 60 years (≥5%), n (%)	5/2120 (0.24)
Self-rated health ('good' or better), n (%)	5/2120 (0.24)
NEMC mental health t-score - $SF12_{mcs}$, mean (sd)	161/2120 (7.59)
Poor mental health, $SF12_{mcs}$ < 35.76, n (%)	161/2120 (7.59)
Alcohol risk behaviour (AUDIT), n (%)	5/2120 (0.24)
Daily smoker, n (%)	< 5/2120
Moderate Phys. Act (days with min 30 min), mean (sd)	47/2120 (2.22)

Moderate Phys. Act (days with min 30 min) (≥ 5 days), n (%)	47/2120 (2.22)
Cardiorespiratory fitness mlO_2/kg/min, mean (sd)	197/2120 (9.29)
Fitness level, n (%)	197/2120 (9.29)

Supplemental Table S7. Proportion of missing values in individual characteristics for the analytic sample, using modeled CVD as outcome example

Characteristic	**Missings / N (Pct)**		
	Intervention group	**Comparison group**	**Total**
BMI (kg/m2), mean (sd)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
BMI > 25 < 30, n (%)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
BMI ≥ 30, n (%)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
Systolic BP (mmHg), mean (sd)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
Diastolic BP (mmHg), mean (sd)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
Systolic BP ≥ 140 mmHg, n (%)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
Diastolic BP ≥ 95 mmHg, n (%)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
Total cholesterol ≥ 6 mmol/l, n (%)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
HbA1c (mmol/mol), mean (sd)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
HbA1c ≥ 42 ≤ 48 mmol/mol), n (%)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
HbA1c ≥ 48 mmol/mol), n (%)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
HbA1c ≥ 42 mmol/mol, n (%)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
HeartSCORE% extrapolated to age 60 years, mean (sd)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
HeartSCORE extrapolated to age 60 years (≥5%), n (%)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)

Self-rated health ('good' or better), n (%)	0/1206 (0.00)	<5/1206 (0.00)	<5/2412 (0.00)
NEMC mental health t-score - $SF12_{mcs}$, mean (sd)	85/1206 (7.05)	67/1206 (5.56)	152/2412 (6.30)
Poor mental health, $SF12_{mcs}$ < 35.76, n (%)	85/1206 (7.05)	67/1206 (5.56)	152/2412 (6.30)
Alcohol risk behaviour (AUDIT), n (%)	<5 /1206	<5 /1206	<5 /2412
Daily smoker, n (%)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
Moderate Phys. Act (days with min 30 min), mean (sd)	16/1206 (1.33)	18/1206 (1.49)	34/2412 (1.41)
Moderate Phys. Act (days with min 30 min) (≥ 5 days), n (%)	16/1206 (1.33)	18/1206 (1.49)	34/2412 (1.41)
Cardiorespiratory fitness mlO_2/kg/min, mean (sd)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
Fitness level, n (%)	0/1206 (0.00)	0/1206 (0.00)	0/2412 (0.00)
Due to the matching procedure, which is different depending on the outcome, the presentation of the analytic sample was based on the outcome modeled CVD risk, as an example.			

Supplemental Table S8. Outcome measures in the participants allocated to the intervention group (IG) and participating in both the first and second health check (N=1,340)*

	At the time of the first health check (baseline)	**Missings N (Pct)**	**At the time of the second health check (follow-up)**	**Missings N (Pct)**
Outcome				
n (%)				
Participation (complete), n (%)	1340 (100.0)	0/1340 (0.00)	1340 (100.0)	0/1340 (0.00)
CVD risk, HeartSCORE(%), mean (sd)	1.9 (1.4)	33/1340 (2.46)	2.0 (1.5)	7/1340 (0.52)
Moderate Phys. Act (days with min 30 min), mean (sd)	3.7 (2.2)	34/1340 (2.54)	3.7 (2.1)	31/1340 (2.31)
Cardiorespiratory fitness (mlO_2/kg/min), mean (sd)	33.6 (9.4)	77/1340 (5.75)	32.6 (9.6)	115/1340 (8.58)
Self-rated health – SF12 (good or better), n (%)	1188 (89.4)	11/1340 (0.82)	1142 (85.2)	0/1340 (0.00)
NEMC mental health t-score - SF12_MCS, mean (sd)	50.3 (9.1)	108/1340 (8.06)	50.9 (9.0)	111/1340 (8.28)
Employment degree (fraction), mean (sd)	0.8 (0.3)	0/1340 (0.00)	0.8 (0.4)	0/1340 (0.00)
Sick leave periods ≥3 weeks duration (N), mean (sd)	0.1 (0.3)	0/1340 (0.00)	0.1 (0.3)	0/1340 (0.00)

*Un-adjusted values based on original non-imputed datasets