

Supplementary data

Table 1. Examples illustrating the definition of the group and time variables

Survey year	Survey 2 1998	Survey 3 2001	Survey 4 2004	Survey 5 2007	Survey 6 2010	Survey 7 2013	Classification
Case 1: TKA in 2005							
Year relative to date TKA	-7	-4	-1	+2	+5	+8	Yes TKA Good MH
			CES-D=3				
Case 2: no TKA, matched with case 1							
Year relative to date TKA	-7	-4	-1	+2	+5	+8	No TKA Poor MH
			CES-D=12				
Case 3: TKA in 2011							
Year relative to date TKA	-13	-10	-7	-4	-1	+2	Yes TKA Poor MH
					CES-D=12		
Case 4: no TKA, matched with case 3							
Year relative to date TKA	-13	-10	-7	-4	-1	+2	No TKA Good MH
					CES-D=5		

TKA: total knee arthroplasty; MH: mental health; CES-D: Centre for Epidemiological Studies Depression scale. This table illustrates how the groups were classified and how the time variable was created. Time of survey was anchored on time of TKA by subtracting the date of TKA from the date of survey return. The time variable thus specifies the year relative to date of TKA. This can be done for cases with a TKA only. To compare those with a TKA with those without a TKA, cases were matched based on pattern of survey return (i.e. they had to have returned and not returned exactly the same surveys), number of chronic conditions and age (< 50 or ≥ 50 years in 1998). Cases without TKA were then assigned the same timing of surveys as their matched cases with TKA. To classify cases as either having or not having poor mental health, the CES-D score of the last returned survey before date of TKA was used in middle-aged women and the mental health index of the last returned survey before date of TKA was used in the older women. Cases with scores of CES-D ≥ 10 or MHI ≤ 52 were classified as having poor mental health.

Table 2. Comparison of participants whose data were included and excluded ^a in the current analyses at survey 2 (1998 for the middle-aged women and 1999 for the older women)

		Middle-aged women		Older women	
		Model for TKA	Model for THA	Model for TKA	Model for THA
N	Included	8,435	7,580	6,871	6,663
	Excluded	3,903	3,641	3,563	3,771
Age, mean (SD)	Included	49.6 (1.5)	49.6 (1.5)	75.3 (1.5)	75.3 (1.5)
	Excluded	49.4 (1.4)	49.3 (1.4)	75.4 (1.4)	75.4 (1.4)
	p-value	< 0.001	< 0.001	0.39	0.13
Post high school education, %	Included	35.2	35.1	18.9	16.8
	Excluded	31.7	32.3	12.3	12.7
	p-value	< 0.001	< 0.001	<0.001	<0.001
BMI, mean (SD)	Included	26.2 (5.2)	26.1 (5.1)	25.3 (4.6)	25.2 (4.4)
	Excluded	26.6 (5.7)	26.7 (5.8)	25.3 (4.5)	25.4 (4.7)
	p-value	0.008	< 0.001	0.83	0.24
Physical activity ^b , %	Included	58.4	58.8	45.8	45.1
	Excluded	52.9	52.9	38.6	38.3
	p-value	< 0.001	< 0.001	< 0.001	< 0.001
Poor mental health, %	Included	22.5	21.7	7.4	7.3
	Excluded	28.2	29.1	9.7	9.9
	p-value	< 0.001	< 0.001	< 0.001	< 0.001
TKA or THA, %	Included	3.7	2.0	5.7	4.8
	Excluded	2.1	0.8	4.3	2.7
	p-value	< 0.001	< 0.001	0.002	< 0.001
Bodily pain, median [IQR]	Included	74 [52–84]	74 [61–84]	72 [41–84]	72 [41–84]
	Excluded	72 [51–84]	72 [51–84]	72 [41–100]	64 [41–100]
	p-value	< 0.001	< 0.001	0.05	0.34
Physical function, median [IQR]	Included	90 [80–95]	90 [80–95]	65 [40–85]	65 [40–85]
	Excluded	90 [75–95]	90 [75–95]	70 [45–85]	70 [45–85]
	p-value	<0.001	<0.001	0.41	<0.001
Mental health, median [IQR]	Included	80 [6–88]	80 [64–88]	84 [72–92]	84 [72–92]
	Excluded	76 [60–88]	76 [60–88]	84 [68–92]	84 [68–92]
	p-value	< 0.001	< 0.001	0.04	< 0.001
Social function, median [IQR]	Included	100 [75–100]	100 [75–100]	100 [75–100]	100 [75–100]
	Excluded	88 [63–100]	88 [63–100]	100 [63–100]	100 [63–100]
	p-value	< 0.001	< 0.001	0.06	< 0.001

SD: standard deviation; BMI: body mass index; TKA: total knee arthroplasty; IQR: interquartile range.

^a Participants with incomplete data are those who returned the respective survey, but whose data could not be matched or who had missing data on the exposure or one of the confounding variables.

^b Percentage accumulating moderate to high levels of physical activity.

Table 3. Sample characteristics of middle-aged participants, by total knee arthroplasty and mental health status at study baseline (1998)

	No TKA Good MH	No TKA Poor MH	TKA Good MH	TKA Poor MH	p-value
n (%)	7,478 (76.8)	1,886 (19.4)	270 (2.8)	103 (1.1)	
Age, mean (SD)	49.6 (1.5)	49.6 (1.5)	49.8 (1.4)	49.5 (1.5)	0.1
Living in urban areas, %	36.3	36.1	30.9	33.3	0.4
Married/de facto, %	85.2	76.4	86.8	74.8	< 0.001
Level of education, %					< 0.001
No formal	14.7	22.2	21.3	32.7	
School	32.2	33.1	30.2	31.7	
High school	17.1	16.1	14.2	9.9	
Trade/apprentice/diploma	20.9	17.4	22.8	15.8	
University or higher	15.1	11.2	11.6	9.9	
Menopausal status, %					< 0.001
Surgical	22.9	32.6	38.4	48.5	
HRT/OCP	15.5	17.2	12.6	10.7	
Pre-menopausal	24.6	17.4	19.6	14.6	
Peri-menopausal	25.1	23.0	22.5	19.4	
Post-menopausal	11.9	9.9	7.0	6.8	
No. of chronic conditions, median [IQR]	0 [0–0]	0 [0–1]	0 [0–1]	0 [0–1]	< 0.001
CES-D score, median [IQR]	4 [2–7]	11 [7–16]	4 [3–8]	11 [6–16]	< 0.001
Often joint pain/stiffness, %	14.7	32.7	42.0	67.3	< 0.001
BMI, mean (SD)	25.9 (5.0)	26.8 (5.7)	31.1 (6.4)	31.1 (6.5)	< 0.001
Current smoker, %	15.1	23.1	12.8	15.0	< 0.001
Physical activity					< 0.001
Inactive	16.0	22.8	20.3	23.4	
Low	24.4	26.5	23.1	22.3	
Moderate	27.5	23.8	30.3	20.2	
High	32.1	26.9	26.3	34.0	

TKA: total knee arthroplasty; MH: mental health; SD: standard deviation; IQR: interquartile range; HRT/OCP: hormone replacement therapy/oral contraceptive pill; CES-D: Centre for Epidemiology Studies Depression scale.

Normally distributed continuous variables are presented as mean and SD, with group differences examined using ANOVA. Non-normally distributed continuous variables are presented as median and IQR, with group differences examined using Kruskal-Wallis test. Categorical variables are presented as percentage, with group differences examined using chi-squared test.

Table 4. Sample characteristics of middle-aged participants, by total hip arthroplasty and mental health status at study baseline (1998)

	No THA Good MH	No THA Poor MH	THA Good MH	THA Poor MH	p-value
n (%)	7,131 (79.0)	1,716 (19.0)	133 (1.5)	44 (0.5)	
Age, mean (SD)	49.6 (1.5)	49.6 (1.5)	49.6 (1.4)	49.9 (1.7)	0.3
Living in urban areas, %	36.3	35.9	33.8	30.2	0.9
Married/de facto, %	85.2	77.7	85.7	86.4	< 0.001
Level of education, %					< 0.001
No formal	14.8	21.5	15.0	23.3	
School	32.5	32.7	36.1	30.2	
High school	16.8	17.0	18.8	11.6	
Trade/apprentice/diploma	20.8	17.4	19.6	20.9	
University or higher	15.2	11.5	10.5	14.0	
Menopausal status, %					< 0.001
Surgical	22.8	32.3	29.0	25.0	
HRT/OCP	15.6	16.9	17.6	20.5	
Pre-menopausal	24.8	17.8	19.1	18.2	
Peri-menopausal	25.3	22.3	26.7	25.0	
Post-menopausal	11.5	10.8	7.6	11.4	
No. of chronic conditions, median [IQR]	0 [0–0]	0 [0–1]	0 [0–1]	0 [0–1]	< 0.001
CES-D score, median [IQR]	4 [2–7]	11 [6–15]	4 [3–7]	13 [8–17]	< 0.001
Often joint pain/stiffness, %	15.4	32.4	31.9	55.8	< 0.001
BMI, mean (SD)	25.9 (5.0)	26.9 (5.6)	29.3 (6.9)	29.5 (6.4)	< 0.001
Current smoker, %	14.6	22.5	16.9	30.2	< 0.001
Physical activity					< 0.001
Inactive	15.5	23.7	22.5	19.1	
Low	25.5	25.0	21.7	33.3	
Moderate	27.2	25.2	28.3	23.8	
High	32.8	26.2	27.5	23.8	

THA: total hip arthroplasty; MH: mental health; SD: standard deviation; IQR: interquartile range; HRT/OCP: hormone replacement therapy/oral contraceptive pill; CES-D: Centre for Epidemiology Studies Depression scale.

Normally distributed continuous variables are presented as mean and SD, with group differences examined using ANOVA. Non-normally distributed continuous variables are presented as median and IQR, with group differences examined using Kruskal-Wallis test. Categorical variables are presented as percentage, with group differences examined using chi-squared test.

Table 5. Sample characteristics of older participants, by total knee arthroplasty and mental health status at study baseline (1999)

	No TKA Good MH	No TKA Poor MH	TKA Good MH	TKA Poor MH	p-value
n (%)	7,960 (85.7)	812 (8.7)	477 (5.1)	43 (0.5)	
Age, mean (SD)	75.4 (1.5)	75.4 (1.5)	75.1 (1.4)	75.2 (1.4)	< 0.001
Living in urban areas, %	41.0	43.5	45.2	53.5	0.16
Married/de facto, %	50.9	54.2	55.3	53.5	< 0.001
Level of education, %					< 0.001
No formal	30.7	43.0	29.2	44.7	
School	39.8	35.2	41.6	39.5	
High school	13.4	11.1	10.8	2.6	
Trade/apprentice/diploma	12.1	8.0	12.4	10.5	
University or higher	4.0	2.8	6.0	2.6	
No. of chronic conditions, median [IQR]	0 [0–1]	0 [0–1]	0 [0–1]	0 [0–1]	< 0.001
Mental health score, median [IQR]	84 [72–92]	52 [40–68]	84 [72–92]	60 [48–76]	< 0.001
Often joint pain/stiffness, %	19.3	35.2	35.0	38.5	< 0.001
BMI, mean (SD)	25.1 (4.4)	25.2 (4.9)	27.3 (4.2)	26.8 (5.2)	< 0.001
Current smoker, %	4.8	6.2	1.6	4.7	< 0.001
Physical activity, %					< 0.001
Inactive	31.2	46.9	30.6	51.4	
Low	24.2	21.4	25.2	16.2	
Moderate	21.0	17.2	19.5	16.2	
High	23.6	14.6	24.7	16.2	

TKA: total knee arthroplasty; MH: mental health; SD: standard deviation; IQR: interquartile range. Normally distributed continuous variables are presented as mean and SD, with group differences examined using ANOVA. Non-normally distributed continuous variables are presented as median and IQR, with group differences examined using Kruskal-Wallis test. Categorical variables are presented as percentage, with group differences examined using chi-squared test.

Table 6. Sample characteristics of older participants, by total hip arthroplasty and mental health status at study baseline (1999)

	No THA Good MH	No THA Poor MH	THA Good MH	THA Poor MH	p-value
n (%)	7,769 (86.8)	783 (8.8)	369 (4.1)	29 (0.3)	
Age, mean (SD)	75.4 (1.5)	75.3 (1.5)	75.3 (1.5)	75.1 (1.4)	
Living in urban areas, %	41.2	43.0	46.2	48.3	
Married/de facto, %	51.5	53.5	48.8	62.1	
Level of education, %					
No formal	30.7	42.0	25.9	28.0	
School	39.8	36.7	42.7	36.0	
High school	13.3	11.3	14.5	24.0	
Trade/apprentice/diploma	12.1	7.3	11.5	12.0	
University or higher	4.1	2.7	6.4	0	
No. of chronic conditions, median [IQR]	0 [0–1]	0 [0–1]	0 [0–1]	0 [0–1]	
Mental health score, median [IQR]	84 [75–92]	52 [44–68]	88 [76–92]	56 [48–68]	
Often joint pain/stiffness, %	19.5	34.8	25.0	26.1	
BMI, mean (SD)	25.1 (4.4)	25.2 (5.1)	25.8 (3.8)	25.4 (3.3)	
Current smoker, %	4.9	6.6	1.7	0	
Physical activity, %					
Inactive	31.0	47.4	23.7	31.8	
Low	24.4	21.4	25.5	18.2	
Moderate	20.9	18.2	21.4	45.5	
High	23.8	13.0	29.4	4.6	

THA: total HIP arthroplasty; MH: mental health; SD: standard deviation; IQR: interquartile range. Normally distributed continuous variables are presented as mean and SD, with group differences examined using ANOVA. Non-normally distributed continuous variables are presented as median and IQR, with group differences examined using Kruskal-Wallis test. Categorical variables are presented as percentage, with group differences examined using chi-squared test.

Table 7. Mean values at year of surgery and 2 years later ^a

		Physical function	% ^b	Bodily pain	% ^b	Social function	% ^b	Mental health	% ^b
Middle-aged women									
Knee replacement									
no TKA/good MH	year of surgery	95		79		84		76	
	2 years later	94		78		83		76	
no TKA/poor MH	year of surgery	82		62		58		52	
	2 years later	80		62		61		56	
TKA/good MH	year of surgery	62		50		64		76	
	2 years later	80	85	70	90	76	91	74	97
TKA/poor MH	year of surgery	55		38		46		51	
	2 years later	73	92	54	88	57	94	54	96
Hip replacement									
no THA/good MH	year of surgery	96		80		86		78	
	2 years later	94		78		85		77	
no THA/poor MH	year of surgery	83		64		58		53	
	2 years later	84		64		66		56	
THA/good MH	year of surgery	63		50		65		75	
	2 years later	84	89	72	92	82	97	79	103
THA/poor MH	year of surgery	53		37		45		54	
	2 years later	68	82	63	98	70	107	64	113
Older women									
Knee replacement									
no TKA/good MH	year of surgery	63		69		70		74	
	2 years later	58		68		67		73	
no TKA/poor MH	year of surgery	44		52		37		40	
	2 years later	42		54		44		46	
TKA/good MH	year of surgery	48		48		60		75	
	2 years later	54	95	59	87	62	92	71	97
TKA/poor MH	year of surgery	41		37		43		36	
	2 years later	30	71	36	66	31	71	48	104
Hip replacement									
no THA/good MH	year of surgery	62		69		69		73	
	2 years later	59		68		68		73	
no THA/poor MH	year of surgery	46		55		42		39	
	2 years later	45		57		45		50	
THA/good MH	year of surgery	51		55		57		74	
	2 years later	54	93	65	94	67	98	74	103
THA/poor MH	year of surgery	55		37		30		38	
	2 years later	59	131	57	99	51	113	59	117

TKA: total knee arthroplasty; THA: total hip arthroplasty; MH: mental health.

^a Predicted mean values derived from the regression models after adjustment for level of education, BMI, physical activity, and age at surgery.

^b Percentage recovery at 2 years after surgery relative to scores for the equivalent no-TKA group in the same year, i.e. the THA/good MH group was compared with the no THA/good MH group and the THA/poor MH group was compared with the no THA/poor MH group.