Methods: We analyzed data from the Canadian Longitudinal National Population Health Survey, a nationally representative community sample followed every 2 years for 18 years (1994/95 through 2010/11). Standardized questionnaires were administered at each interview and included information on chronic conditions, socio-demographic variables and lifestyle/health behaviours. We used data for four birth cohorts ($n = 8,809$ at baseline): World War II generation, born 1935–1944; older baby boomers, born 1945–1954; younger baby boomers, born 1955–64; and generation X, born 1965–74. Data included self-reported arthritis diagnosed by a health professional (likely mainly osteoarthritis (OA)), years of education, household income, smoking, index of physical activity, and height (m) and weight (kg) (used to calculate body mass index (BMI: wt/ht2)). Multilevel growth models were used to estimate the age-trajectory for reported arthritis for each cohort accounting for period. Once the age-trajectory was established, education, household income, smoking, physical activity, and BMI were separately introduced into the models to examine their influence on arthritis. Sensitivity analyses restricted the analysis to respondents reporting OA. However the question about type of arthritis was only asked after 2000.
Results: There was a trajectory of increasing prevalence of arthritis with increasing age in all cohorts, with younger cohorts having successively greater prevalence. After accounting for period effects the cohort effect was no longer apparent. There were marked population-level cohort effects for increasing education, income, physical activity, and BMI and decreasing smoking from the youngest to oldest cohorts, which were much reduced (education, smoking, and physical activity) or removed (income and BMI) once period was taken into account. Including these variables in a multi-level growth model showed the prevalence of arthritis was significantly lower (p16 years vs <12 years of school) or higher income (OR: 0.60; 95% CI: 0.53–0.68: highest vs lowest quartile) and the prevalence was significantly higher for obese individuals (OR: 2.63; 95% CI: 2.20–3.14: BMI>=35 vs normal BMI (18.5–24.9) and current smokers vs non-smokers (OR: 1.63; 95% CI: 1.42–1.88). Physical activity was not significantly associated with arthritis. Further analysis showed that the population-level effects of increasing education and income on reducing the arthritis prevalence were almost counter-balanced by effects of increasing BMI (obesity). Findings from sensitivity analyses restricted to the smaller OA sample were similar.
Conclusions: The findings suggest that the cohort effect of more arthritis in younger cohorts is explained by period effects such that the potential benefits of increased education and income in reducing the prevalence of arthritis have been partially offset by increases in BMI over time. Our understanding of the impact of BMI on arthritis is therefore likely to be an underestimate. The cohort effect of increased arthritis in younger cohorts also suggests that previous population projections may be underestimated.

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PATTERNS OF JOINT INVOLVEMENT IN FOOT OSTEOARTHRITIS: FINDINGS FROM THE CLINICAL ASSESSMENT STUDY OF THE FOOT

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Purpose: The aetiology of foot osteoarthritis (OA) is poorly understood. OA most commonly affects the 1st metatarsophalangeal joint (MTPJ), followed by joints in the midfoot; the 2nd cuneo-metatarsal joint (CMJ), talo-navicular joint (TNJ) and navicular-first cuneiform (NCJ) joint. Patterning of OA joint involvement has been investigated at other sites, particularly the hands where a strong symmetrical patterning has been noted followed by clustering of joint groups. However, little is known about the patterning of OA in the joints of the feet. Examining the clustering and patterning of joint involvement, both within a foot and across feet could help identify distinct phenotypes and advance our understanding of the possible causal mechanisms of foot OA.
The aim of this study was to investigate the patterns of radiographic OA in ten joints across both feet among a sample of community-dwelling older adults.
Methods: The Clinical Assessment Study of the Foot is a population-based cohort of adults aged ≥50 years who reported foot pain in the last year. Participants attended a research clinic where weight-bearing dorso-plantar and lateral radiographs of each foot were taken. Using a validated atlas, radiographic foot OA was defined as scoring ≥2 for either osteophytes or joint space narrowing in the 1st MTPJ, 1st and 2nd CMJ, NCJ and TNJ on either view. Chi square tests determined whether radiographic OA affects multiple joints more than expected by chance within a foot and across both feet. Generalised estimating equations were used to examine pairwise associations between affected joints within a foot and to test for overall symmetry across the feet. Latent class analysis was used to investigate subgroups of radiographic foot OA.
Results: 560 participants attended research clinics and after exclusion for inflammatory arthritis ($n = 24$) and no radiographs ($n = 3$), 533 were eligible for the analyses (mean age 64.9 years (SD 8.4), 55.9% female). The 1st MTPJ was most frequently affected (287 feet, 27.2%) followed by the 2nd CMJ (184, 17.3%), TNJ (158, 14.8%), NCJ (86, 8.1%) and the 1st CMJ (50, 4.7%). Radiographic OA was found to cluster across both feet ($p < 0.001$) but not within each foot separately. Radiographic OA was also found to be highly symmetrical in the same joint in both feet even after adjustment for age, sex, total number of affected joints and the affected joint [adjusted odds ratio (OR) 2.96, 95% CI: 2.10, 4.18]. Clustering across both feet and symmetrical patterning was stronger in females than males. Within a foot, the strongest pairwise associations were found between the joints of the midfoot: the 2nd CMJ and NCJ [OR 6.12, 95% CI: 3.68, 10.17], the NCJ and TNJ [2.83, 95% CI: 1.68, 4.79] and the 2nd CMJ and TNJ [1.61, 95% CI: 1.05, 2.49]. Latent class analysis identified three distinct classes of foot OA: class 1 (64%) had low probability of OA in all joints; class 2 (21%) had high probability of bilateral 1st MTPJ OA; and class 3 (15%) had high probabilities of involvement across all ten foot joints in both feet. Increasing the number of classes preserved class 1 and class 2 however class 3 disaggregated. The 4 class solution showed class 3 splitting into two similar sized groups with high probabilities of either bilateral 2nd CMJ OA or bilateral TNJ OA. The 5 class solution then added a small group with high probability of OA in multiple midfoot joints including bilateral 2nd CMJ, NCJ and TNJ.
Conclusions: OA frequently involves multiple joints across both feet, has a strong symmetrical patterning, and subgroups into those with 1st MTPJ OA and those with midfoot OA which may be distinct subtypes of foot OA. These patterns may signify that certain foot joints have a predilection to OA and person-level risk factors. Further work to replicate these findings and to investigate distinctive causal mechanisms is warranted.

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PREVALENCE AND OVERLAP OF DOCTOR-DIAGNOSED KNEE OA, FREQUENT KNEE PAIN AND RADIOGRAPHIC KNEE OA IN SWEDEN

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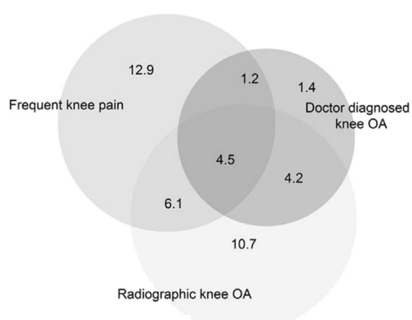
Purpose: To provide estimates of the overlap between subjects that seek healthcare for knee osteoarthritis (OA) and those with knee pain and/or radiographic knee OA.
Methods: In 2007 a random sample of 10 000 56 to 84 year old Region Skåne residents from the Malmö Diet and Cancer Study (Manjer et al 2001) were sent a mailed questionnaire about knee pain in the last 12 months; this being the first part of the Malmö Osteoarthritis Study (MOA). We classified subjects with knee pain with duration of at least 4 weeks as having frequent knee pain. Out of the 7737 questionnaire responders a sample of 1300 subjects with frequent knee pain and a random sample of 650 subjects without were invited for a clinical and radiographic examination including assessment of clinical knee OA according to the American College of Rheumatology (ACR) clinical criteria. Participants underwent radiography of both knees in weight-bearing and semi-flexion. An independent radiologist who was blinded to clinical data assessed all frontal tibiofemoral (TF) and patellofemoral (PF) radiographs. Subjects who fulfilled criteria approximating Kellgren and Lawrence (KL) grade 2 or worse on either the TF or PF joint were considered as having radiographic knee OA. We considered those having radiographic knee OA and frequent knee pain to have symptomatic knee OA. Using the subject's personal identification number and individual linkage with the Skåne Health Care Register, covering the entire population in the county, we retrieved information on all doctor visits with a diagnosis of knee OA (ICD-10 code M17) for the years 1998 to 2008, i.e. the 11-year period preceding the MOA examination. Subjects who received a diagnosis of knee OA at least once where considered as having doctor diagnosed knee OA. We estimated the proportion of

subjects with symptomatic knee OA who consulted and received a diagnosis of knee OA during one year (2008), where we accounted for the missing diagnostic codes in the SHR using multiple imputation technique. We used weighting to adjust for different sampling probabilities depending on the knee pain status as well as for the non-response and volunteer bias in the MOA study.

Results: The 10 000 MOA subjects had mean (SD) age of 70 (7.6) years, mean (SD) body mass index was 27.1 (5.0) and 62% were women. The response rate in mailed questionnaire was 77.4% and 1527 invited subjects (78.3%) attended the clinical visit. The prevalence of frequent knee pain was 24.7% (95%CI) almost equal to the prevalence of radiographic knee OA (25.5%) while 11.3% had doctor diagnosed knee OA. The clinical knee OA criteria were fulfilled by 9.0% of study sample. Out of subjects with the doctor diagnosed knee OA 88% had either frequent knee pain or radiographic knee OA. (Fig.) Sensitivity and specificity of the doctor diagnosed knee OA with respect to the symptomatic knee OA were 43% and 92%, respectively. Annually, 1 in 5 subjects with symptomatic knee OA consulted a physician and were diagnosed with knee OA.

Conclusions: About 9 out of 10 patients with a doctor diagnosed knee OA reported either frequent knee pain or had radiographic knee OA (KL 2 or worse). Annually, 1 in 5 of subjects with symptomatic knee OA consulted a physician for his/her knee(s) symptoms suggesting self-management or coping strategies are common.

Radiographic knee OA–changes on x-ray approximating Kellgren-Lawrence grade 2 or worse on either the tibiofemoral or patellofemoral joint; frequent knee pain – knee pain with duration of at least 4 weeks during last 12 months; doctor diagnosed knee OA – a diagnosis of knee OA in the Skåne Health Care Register during 1998–2008



Radiographic knee OA –changes on x-ray approximating Kellgren-Lawrence grade 2 or worse on either the tibiofemoral or patellofemoral joint; Frequent knee pain – knee pain with duration of at least 4 weeks during last 12 months; doctor diagnosed knee OA – a diagnosis of knee OA in the Skåne Health Care Register during 1998-2008.

Fig. The. 2008 prevalence (%) of *frequent knee pain, radiographic knee OA* and *doctor diagnosed knee OA* in a random sample 56 to 84 year old residents in Skåne, Sweden.

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DIETARY FAT INTAKE AND KNEE OSTEOARTHRITIS PROGRESSION: DATA FROM THE OSTEOARTHRITIS INITIATIVE

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Purpose: Obesity has been a predictor of knee osteoarthritis (OA) progression. Few studies have investigated the role of dietary factors on knee OA progression. We examined the prospective association of dietary fat intake with radiographic progression of knee OA.

Methods: In the Osteoarthritis Initiative, 2,134 participants (3,045 knees) with radiographic knee OA (Kellgren-Lawrence Grade $>$ 2) and having dietary data at baseline were followed up to 12, 24, 36 and 48 months. The fat intake (including total fat, saturate fat, mono- and poly-unsaturate fat intake) was assessed with a Block Brief Food Frequency Questionnaire completed at baseline. To evaluate progression of knee OA, we used quantitative joint space width (JSW) between the medial femur and tibia of the knee based on weight-bearing, posterior-anterior, fixed-flexion knee radiographs measured at a fixed distance (x = 0.25 mm from the edge of the medial condyle) . The multivariate linear models for repeated measures were used to test the independent association between dietary fat intake and the decrease in JSW over time, while adjusting for baseline disease severity, body mass index (BMI), dietary factors (total calories, grain, vegetable and fruit servings, meat, fish and soft drinks) and other potential confounders including age, race, education, marital status, household income, employment, depression, knee injury and knee surgery, smoking, physical activity, NSAID use, baseline K-L grade, weight change, change in rim distance and beam angle.

Results: Among 2,134 participants, the median (interquartile range, IQR) daily fat intake at baseline was 50.5 (35.7, 69.0) grams. We observed a significant dose-response relationship between baseline total fat intake and adjusted mean decrease of JSW in women (p trend = 0.001) (Table). With increasing quartiles of total fat intake, the mean decreases of JSW were 0.21mm, 0.25mm, 0.33mm and 0.40mm respectively. When we stratified analyses by BMI and sex, stronger association was observed in women with BMI≥30kg/m2 than those with BMI $<$ 30kg/m2. Similar associations were also observed between saturated fat, mono- and poly-unsaturated fat intake(data not shown)and JSW changes. In men, we observed no significant association between fat intake and the decreases of JSW.

Conclusions: Our results suggest that high fat intake at baseline may be associated with increased OA progression in women. Replication of these novel findings in other prospective studies and demonstrating that reduction in dietary fat intake leads to delay in knee OA progression are needed.

Adjusted mean decreases in JSW by quartiles of daily Dietary Fat intake (grams) in Women

	All (N = 1252)				BMI <30 (n = 644)			BMI>= 30 (n = 608)		
	Quartiles	Change in JSW (SE)	P	p trend	Change in JSW (SE)	P	P trend	Change in JSW (SE)	P	p trend
Total Fat	Q1	0.21 (0.04)	ref		0.25 (0.05)	ref		0.19 (0.06)	ref	
	Q2	0.25 (0.03)	0.37		0.30 (0.04)	0.280		0.22 (0.05)	0.596	
	Q3	0.33 (0.03)	0.007		0.33 (0.04)	0.170		0.36 (0.04)	0.007	
	Q4	0.40 (0.04)	0.002	0.001	0.38 (0.06)	0.118	0.116	0.45 (0.05)	0.003	0.001
Saturated Fat	Q1	0.24 (0.04)	ref		0.26 (0.05)	ref		0.24 (0.06)	ref	
	Q2	0.27 (0.03)	0.460		0.33 (0.04)	0.177		0.24 (0.05)	0.982	
	Q3	0.33 (0.03)	0.034		0.30 (0.04)	0.491		0.40 (0.04)	0.014	
	Q4	0.35 (0.04)	0.055	0.024	0.37 (0.06)	0.186	0.310	0.37 (0.05)	0.113	0.017
Monosaturated Fat	Q1	0.21 (0.04)	ref		0.24 (0.05)	ref		0.20 (0.06)	ref	
	Q2	0.28 (0.03)	0.081		0.33 (0.04)	0.105		0.27 (0.05)	0.254	
	Q3	0.32 (0.03)	0.015		0.33 (0.04)	0.145		0.34 (0.04)	0.028	
	Q4	0.39 (0.04)	0.003	0.003	0.37 (0.06)	0.155	0.157	0.44 (0.05)	0.005	0.004