Appendix A:

Plan for deriving musculoskeletal healthcare contacts from The National Patient Register, The National Health Insurance Service Register, The Register of Medicinal Product Statistics and The Rehabilitation According to "The Danish Act of Health §140" register (Rehab-register).

Registre	Definitions	Annual number of musculoskeletal contacts (2006 – 2017) for each participant based on:
The National Patient Register	A musculoskeletal contact was defined as a registered date with a healthcare encounter (out-patient visits (e.g. test, surgery, treatment), inpatient or emergency department visits) with a registered musculoskeletal-related primary or secondary diagnosis. Each course may have had several contacts with several service codes but only one contact each day was considered (e.g. examination, imaging and surgery on the same day, was considered as one contact). Hospitalizations of several days' duration were considered as one contact per day.	**To count number of musculoskeletal contacts each year, we searched The National Patient Register for the following primary (A) or secondary (B) diagnostic codes based on the Danish version of the International Classification of Diseases and Related Health Problems classification system (https://medinfo.dk/sks/brows.php?s_nod=6193).** **Number of Musculoskeletal face-to-face contacts**: M (Chapter XIII - Diseases of the musculoskeletal system and connective tissue) - All codes. G (Chapter VI Diseases of the nervous system) - Following codes: G43 (migraine), G44 (headache), G546+547 (phantom pain), G500A+501 (facial pain), G55 + G56 + G57 (nerve compression from discus/stenosis or in UE/LE) R (Chapter XVIII - Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified) - Following codes: R52 (nonspecific pain syndrome), R51 (Headache) S (Chapter XIX - Injury, poisoning and certain other consequences of external causes) - Following codes: S12+13+16 (neck), S22+23 (Thorax), S32+33 (Low back/pelvis), S42+43+46 (Shoulder/Upper arm), S52+53+56(elbow/lower arm), S62+63+66(Hand) S72+73+76(Hip/thigh), S82+83+86(Knee/crus), S92+93+96(Ankle/foot), T02+03+06(Multiple) K (Chapter XI - Diseases of the digestive system) - Following code: K076A (mandibular joint pain)

The National Health Insurance Service Register	A musculoskeletal contact was defined as a musculoskeletal health-related face-to-face encounter. E-mail and telephone contacts was not considered as contacts. The National Health Insurance Service Register service codes chosen to represent face-to-face musculoskeletal healthcare contacts were based on agreements between the Danish Health Authority and relevant professional organizations (see www.okportalen.dk).	**To count number of musculoskeletal contacts each year, we searched The National Health Insurance Service Register for the following encounters:** Anesthesiology (Spec. 01) (encounters regarding pain management), Diagnostic radiology (Spec 03 + 05) (encounters regarding musculoskeletal diagnosis), Rheumatology (Spec 06) (all encounters), Orthopedic surgery (Spec 20) (all encounters), Physiotherapist (Spec 51) (musculoskeletal encounters), Chiropractor (Spec 53 and spec 64 (special clinical pathways for lumbar disc herniation, cervical disc herniation and lumbar spinal stenosis)), General practitioner (Spec 80) (musculoskeletal encounters based on algorithm (Please see Appendix B).

The Register of Medicinal Product Statistics	A musculoskeletal contact was defined as a redeemed/collected medication for pain relief. Anatomical Therapeutic Chemical Classification System (ATC) codes considered to be relevant for musculoskeletal pain relief was guided by consensus between medical doctors with expertise in musculoskeletal pain treatment.	**To count number of musculoskeletal contacts each year, we searched The Register of Medicinal Product Statistics for collection of pain medication with the following ATC codes**: N01B (Anesthetics, local) N02A + B (Opioids, other analgesics and antipyretics) N03A (Antiepileptic) N05B + C (Anxiolytics and Hypnotics) M01A (Anti-inflammatory/anti-rheumatic, non-steroids)

The Rehabilitation According to "The Danish Act of Health §140" register (Rehab-register)	A musculoskeletal contact was defined as a musculoskeletal health-related face-to-face encounter. Only face-to-face encounters in courses after hospital contact with a musculoskeletal diagnosis were considered (Please see The National Patient Register). Each course may have several contact days with different service codes but only one contact each day was considered.	**To count number of musculoskeletal contacts each year, we searched The Rehabilitation According to "The Danish Act of Health §140" register for the following encounters:** Number of musculoskeletal contact days in a course at a municipality rehabilitation unit beginning no later than 2 months after a hospital discharge registered with a musculoskeletal ICD-10 diagnostic code (see the National Patient Register: A and B diagnostic codes (ICD-10) considered to be musculoskeletal contacts).

Appendix B:

Algorithm to identify musculoskeletal contacts at General practitioners at The National Health Insurance Service Register

Based on self-reported data, about 78% of Danish adults consult their GP each year (Illemann Christensen, 2014). Approximately 14% of these consultations are related to musculoskeletal disorders (Jordan et al., 2010; Kjøller et al., 2007).

To identify the number of face-to-face musculoskeletal health care contacts at General Practitioners (GP), the unique civil registration number (CPR number) (Mainz et al., 2019; Pedersen, 2011; Schmidt et al., 2014) assigned to all residents of Denmark was used to link individuals data from the medical records to register data from the National Health Insurance Service Register (HISR) (Andersen et al., 2011), the National Patient Register (NPS) (Lynge et al., 2011; Schmidt et al., 2015) and the Register of Medicinal Product Statistics (Johansen et al., 2013). The medicinal products register includes information about type of medication, price and prescriber of medicines sold on prescription and over-the-counter, as well as medication used by hospitalized patients. Information about sales of medicinal products in Denmark has been recorded since 1994 (Johansen et al., 2013; The Danish Health Data, 2016; Thygesen et al., 2011).

To determine if a face-to-face GP contact in the National Health Insurance Service Register was related to a musculoskeletal disorder a simple algorithm was developed. The algorithm built on available information from the National Health Insurance Service Register about each face-to-face GP contact, as well as information about subsequent health care activities from the National Health Insurance Service Register, the National Patient Register and the Register of Medicinal Product Statistics. Each face-to-face GP contact was evaluated in two steps. First, all activity codes for each face-to-face GP contact were evaluated. Those activity codes are supplementary administrative codes registered by GP at each face-to-face contact. According to the agreement between The Danish GP organization and the Danish Health Authority, activity codes initiate GP remuneration for services or activities taken at each contact. Such services could be specific diagnostic tests, laboratory tests such as B-hemoglobin (activity code 7108), C-reactive protein (CRP) (activity code 7120), strep-A test (activity code 7109), spirometry/peak flow (activity codes 7113, 7121, 7183) urinary stick (activity code 7101) or blood tests (activity codes 2601 and 2101). Face-to-face GP contacts were considered musculoskeletal contacts if they included activity codes 2109 (immobilizing bandages), 2111 (small fractures or relocations of small joints), 2119 (draining of liquid from joints), 2122 (first treatment – large fractures), 2123 (relocations of larger joints). In the second step, a face-to-face GP contact followed by primary care physiotherapy or chiropractor care seeking (within two months), collection of prescribed pain medication (within one month) or secondary health care seeking due to musculoskeletal disorders (within two months) were considered musculoskeletal contacts. All analyses were performed using STATA 15.1 (StataCorp, College Station, Tx, USA).

Our algorithm estimated 18% (CI 18%-19%) of face-to-face GP consultations to be musculoskeletal related, which is slightly higher than previous estimates based on self-report data, but still credible.

Algorithm to identify face-to-face GP (spec. 80) contacts (0101) from The National Health Service Register related to a musculoskeletal disorder

Original HISR-data	Step 1. Exclusion of GP contacts registered with non-musculoskeletal service or activity codes	Step 2. Exclusion of GP contacts not followed by:
All face-to-face General Practitioners (GP) contacts (0101) from The National Health Insurance Service	1. § 75 laboratory tests (7000 codes) 2. § 70 supplementary service codes (2000 codes) (except musculoskeletal codes: 2109,2111,2119,2122,2123) 3. Vaccine, child- and pregnancy examination codes (8000 codes)	1. Physiotherapy contact (Primary care) within the following two months (HISR-data) 2. Collection or prescribed pain medication within the following month (RMPS-data) 3. In- or out-patient hospital contact for an musculoskeletal disorder within the following two months (NPS-data)

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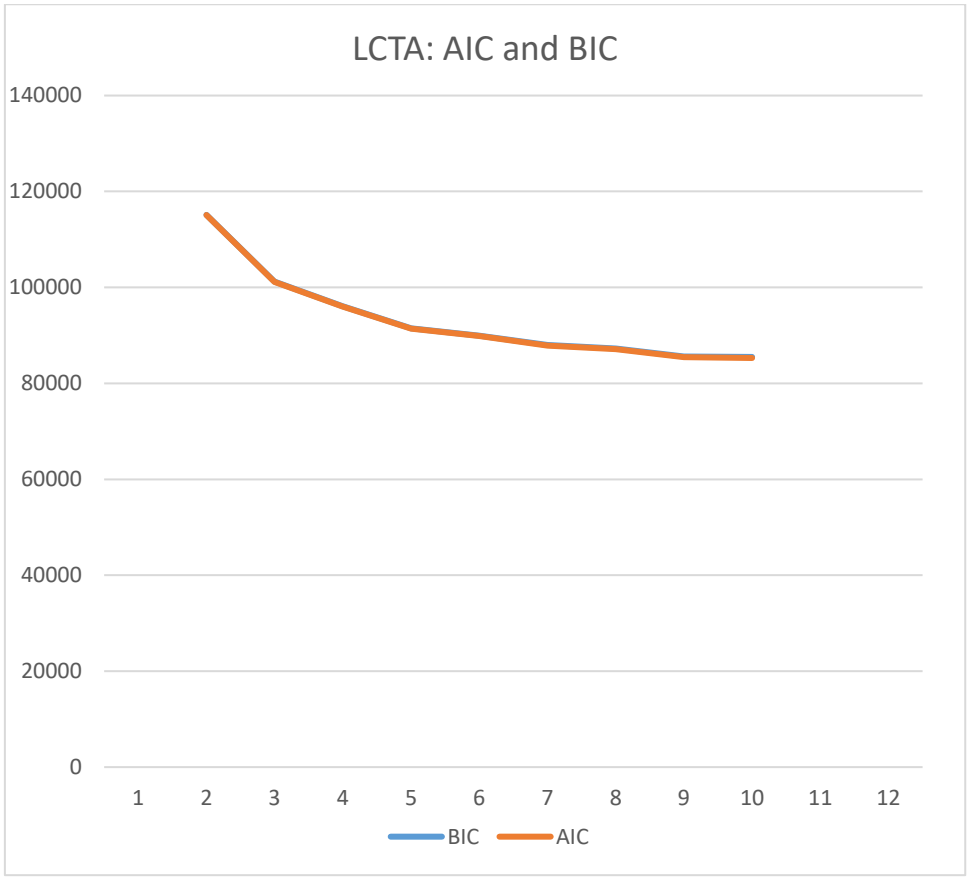
Appendix C:

Comparison of Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) from Latent Class Growth Analysis of models with one to ten classes

Latent Class Growth Analysis (LCGA)									
Musculoskeletal health care contacts 2008 - 2017 **BIC and AIC of a censored normal distribution model (zip)** **N=2929. Adults between 17-64 reporting chronic pain at baseline.** **Max number of annual MSK contacts was truncated to 30 visits per year.**									
Groups	**Order**	**BIC**	**BIC Δ**	**BIC Δ%**	**AIC**	**AIC Δ**	**AIC Δ%**	**Group split (%)**	**Comments**
1	3								Likelihood could not be computed at start values.
2	33	115130	-115130	-100%	115093	-115093		72, 28	882 persons in high healthcare seeking group.
3	333	101234	13896	14%	101176	13917	14%	52,35,13	Quite similar patterns over time. Only frequency seems to vary. 383 persons in high healthcare seeking group.
4	2233	96106	5128	5%	96035	5141	5%	47,22,18,12	Quite similar patterns over time. Only frequency seems to vary. 346 persons in high healthcare seeking group.
5	13323	91463	4643	5%	91376	4659	5%	39,17,20,16,8	Different trajectories of MSK healthcare seeking.

									229 persons in the high healthcare seeking group.
6	212232	89942	1521	2%	89847	1529	2%	28,10,24,14,6,17	Different trajectories of MSK healthcare seeking. 192 persons in the high healthcare seeking group.
7	2112223	87996	1946	2%	87888	1959	2%	15,36,10,13,10,8,6	Different trajectories of MSK healthcare seeking. 184 persons in high healthcare seeking group.
8	21122212	87241	755	1%	87125	763	1%	14,27,18,8,4,10,14,5	Different trajectories of MSK healthcare seeking. 143 persons in high healthcare seeking group.
9	211111112	85580	1661	2%	85464	1661	2%	7,28,18,8,11,11,5,8,4	Different trajectories of MSK healthcare seeking. 139 persons in high healthcare seeking group.
10	1111111112	85513	67	0%	85288	176	0%	12,22,12,7,17,6,6,9,5,4	Different trajectories of MSK healthcare seeking. 116 persons in healthcare care seeking group.


LCTA: AIC and BIC
140000
120000
100000
80000
60000
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8
9
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11
12
BIC
AIC

Appendix D:

Trajectories of musculoskeletal (MSK) healthcare utilization for people reporting chronic pain using Latent Class Analysis (five group model)