

## ONLINE SUPPLEMENTARY DATA

**Supplementary Table 1.** List of opioids considered when determining the prevalence of chronic opioid use

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### Opioids

Acetaminophen/Caffeine/Dihydrocodeine Bitartrate

Acetaminophen/Codeine Phosphate

Acetaminophen/Hydrocodone Bitartrate

Acetaminophen/Oxycodone Hydrochloride

Acetaminophen/Pentazocine Hydrochloride

Acetaminophen/Propoxyphene Hydrochloride

Acetaminophen/Propoxyphene Napsylate

Acetaminophen/Tramadol Hydrochloride

Alfentanil Hydrochloride

APAP/Butalbital/Caff/Codeine Phos

APAP/Hydrocod Bit;Medical Food

ASA/Oxycodone HCl/Oxycodone Terephthalate

Aspirin/Butalbital/Caffeine/Codeine Phosphate

Aspirin/Caffeine/Dihydrocodeine Bitartrate

Aspirin/Carisoprodol/Codeine Phosphate

Aspirin/Oxycodone Hydrochloride

Buprenorphine

Buprenorphine Hydrochloride

Butorphanol Tartrate

Codeine Phosphate

Codeine Sulfate

Dextrose/Morphine Sulfate

Fentanyl

Fentanyl Citrate

Hydrocodone Bitartrate

Hydrocodone Bitartrate/Ibuprofen

Hydromorphone Hydrochloride

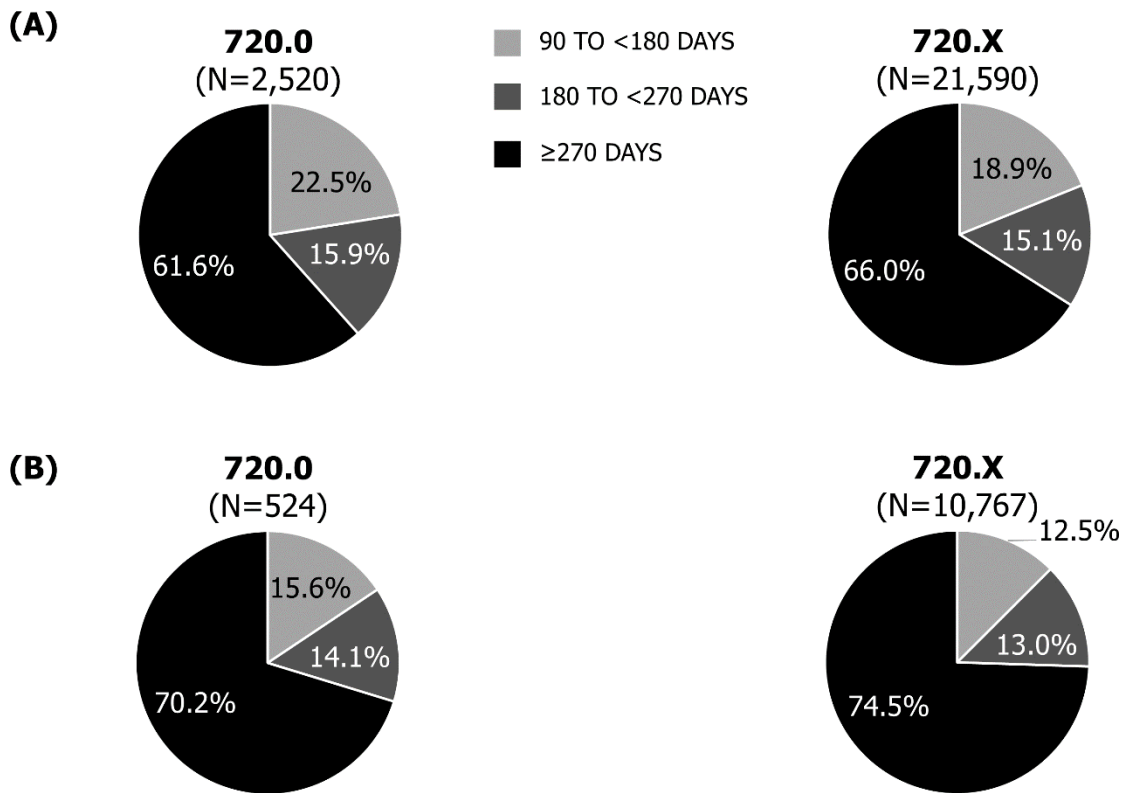
Ibuprofen/Oxycodone Hydrochloride  
Levorphanol Tartrate  
Meperidine HCl/Promethazine HCl  
Meperidine Hydrochloride  
Methadone Hydrochloride  
Morphine Sulfate  
Morphine Sulfate/Naltrexone Hydrochloride  
Nalbuphine Hydrochloride  
Naloxone Hydrochloride/Pentazocine Hydrochloride  
Oxycodone  
Oxycodone Hydrochloride  
Oxymorphone Hydrochloride  
Pentazocine Lactate  
Propoxyphene Hydrochloride  
Propoxyphene Napsylate  
Remifentanil Hydrochloride  
Sufentanil Citrate  
Tapentadol Hydrochloride  
Tramadol Hydrochloride

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**Supplementary Table 2.** List of ICD codes used to identify comorbidities

<b>Conditions</b>	<b>ICD-9 codes</b>	<b>ICD-10 codes</b>
Depression	296.20-.25, 296.5, 296.30- 296.35, 296.6, 296.82, 296.90,300.4, 309.0, 309.1 & 309.28, 311	F31.3-F31.6, F32.0-32.9, F33.0- 33.3, F33.8, F33.9, F34.1, F34.8, F34.9, F38.0, F38.1, F38.8, F39, F41.2, F99 F40.00, F40.01, 40.02, F40.10, F40.11, F41.0, F41.1, F41.3,
Anxiety	300.0, 300.01, 300.02, 300.09, 300.21 300.22, 300.23, 300.3, 309.24, 309.81	F41.8, F41.9, F42.2, F42.3, F42.4, F42.8, F42.9, F43.22, F43.10, F43.12
Rheumatoid arthritis	7140-7142	M05.0X, M05.2X-M05.9X, M06.X
Psoriasis	6961, 6968	L400, L401, L403, L408, L409, L448
Psoriatic arthritis	6960	L4050-L4053, L4059
IBD	555-556	K50.X, K51.X
Opioid Dependence or abuse	30400, 30401, 30402, 30403, 30550, 30551, 30552, 30553	F1110, F1112, F1114, F1115, F1118, F1119, F1120, F1121, F1122, F1123, F1124, F1125, F1128, F1129

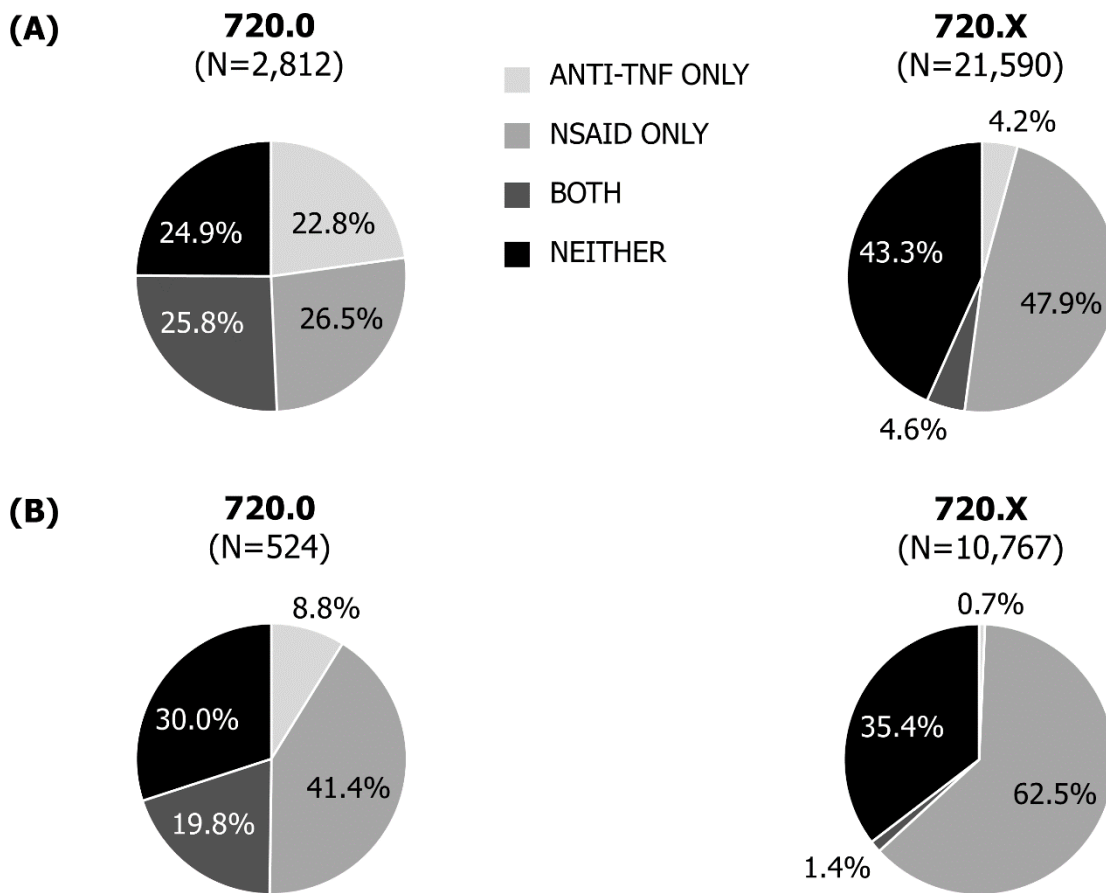
**Supplementary Figure 1.** Cumulative supply of opioids during the follow-up period among patients with (A) Truven commercial and (B) Truven Medicaid claims (chronic opioid users only)



‘Concomitant use’ was defined as a claim for the drug in question within  $\pm 30$  days of an opioid claim.

NSAID: Non-steroidal anti-inflammatory drug; TNF: tumor necrosis factor.

**Supplementary Figure 2.** Concomitant medication use among patients with (A) Truven commercial and (B) Truven Medicaid claims (chronic opioid users only)



**Supplementary Table 3.** Baseline data for patients with Truven commercial claims (720.x cohort)

<b>n (%), unless otherwise stated</b>	<b>Total AS study population N=79,190</b>	<b>Patients WITH chronic opioid use N=21,590</b>	<b>Patients WITHOUT chronic opioid use N=57,600</b>	<b>P-value (chronic opioid vs. not)</b>
<b>Age</b>				<0.0001
Mean (SD)	47 (11.3)	49 (9.7)	46 (11.7)	
18-24 years	3,796 (4.8)	312 (1.4)	3,484 (6.0)	
25-34 years	8,701 (11.0)	1,611 (7.5)	7,090 (12.3)	
35-44 years	17,577 (22.2)	4,481 (20.8)	13,096 (22.7)	
45-54 years	24,636 (31.1)	7,364 (34.1)	17,272 (30.0)	
≥55 years	24,480 (30.9)	7,822 (36.2)	16,658 (28.9)	
<b>Gender</b>				<0.0001
Female	50,631 (63.9)	14,464 (67.0)	36,167 (62.8)	
Male	28,559 (36.1)	7,126 (33.0)	21,433 (37.2)	
<b>Rheumatologist as provider on index claim</b>				<0.0001
Yes	10,442 (13.2)	2,366 (11.0)	8,076 (14.0)	
<b>Comorbidities</b>				
Depression	14,674 (18.5)	6,624 (30.7)	8,050 (14.0)	<0.0001
Anxiety	12,995 (16.4)	5,649 (26.2)	7,346 (12.8)	<0.0001
Rheumatoid arthritis	2,415 (3.0)	1,074 (5.0)	1,341 (2.3)	<0.0001
Psoriatic arthritis	1,109 (1.4)	367 (1.7)	742 (1.3)	<0.0001
Psoriasis	1,299 (1.6)	370 (1.7)	929 (1.6)	0.3195
IBD	1,416 (1.8)	447 (2.1)	969 (1.7)	0.0002

Opioid dependence or abuse	2,125 (2.7)	1,805 (8.4)	320 (0.6)	<0.0001
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**Imaging or genotyping procedures**

MRI or X-Ray	33,892 (42.8)	11,030 (51.1)	21,421 (37.2)	<0.0001
X-Ray	27,022 (34.1)	8,183 (37.9)	18,034 (31.3)	<0.0001
MRI	16,091 (20.3)	7,493 (34.7)	9,486 (16.5)	<0.0001
HLA-B27 testing	2,493 (3.1)	707 (3.3)	2,092 (3.6)	0.0153

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AS: Ankylosing spondylitis; IBD: inflammatory bowel disease; MRI: magnetic resonance imaging;

SD: standard deviation.

**Supplementary Table 4.** Baseline data for patients with Truven Medicaid claims (720.x cohort)

n (%), unless otherwise stated	Total AS study population N=14,041	Patients WITH chronic opioid use N=10,767	Patients WITHOUT chronic opioid use N=3,274	P-value (chronic opioid vs. not)
<b>Age</b>				<0.0001
Mean (SD)	45 (10.9)	46 (10.3)	42 (12.0)	
18-24 years	371 (2.6)	130 (1.2)	241 (7.4)	
25-34 years	2,341 (16.7)	1,608 (14.9)	733 (22.4)	
35-44 years	3,937 (28.0)	3,031 (28.2)	906 (27.7)	
45-54 years	4,280 (30.5)	3,468 (32.2)	812 (24.8)	
≥55 years	3,112 (22.2)	2,530 (23.5)	582 (17.8)	
<b>Gender</b>				0.8643
Female	10,446 (74.4)	8,014 (74.4)	2,432 (74.3)	
Male	3,595 (25.6)	2,753 (25.6)	842 (25.7)	
<b>Rheumatologist as provider on index claim</b>				
Yes	279 (2.0)	132 (1.2)	147 (4.5)	<0.0001
<b>Comorbidities</b>				
Depression	6,991 (49.8)	5,591 (51.9)	1,400 (42.8)	<0.0001
Anxiety	6,374 (45.4)	5,146 (47.8)	1,228 (37.5)	<0.0001
Rheumatoid arthritis	384 (2.7)	305 (2.8)	79 (2.4)	0.1972
Psoriatic arthritis	63 (0.4)	38 (0.4)	25 (0.8)	0.0021
Psoriasis	135 (1.0)	91 (0.8)	44 (1.3)	0.0104
IBD	188 (1.3)	131 (1.2)	57 (1.7)	0.0223



Opioid dependence or abuse	1,898 (13.5)	1,701 (15.8)	197 (6.0)	<0.0001
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**Imaging or genotyping procedures**

MRI or X-Ray	8,163 (58.1)	6,341 (58.9)	1,822 (55.7)	0.0010
X-Ray	6,601 (47.0)	5,049 (46.9)	1,552 (47.4)	0.6083
MRI	4,406 (31.4)	3,523 (32.7)	883 (27.0)	<0.0001
HLA-B27 testing	246 (1.8)	150 (1.4)	96 (2.9)	<0.0001

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SD: standard deviation.