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## **Body Mass Index and persistent pain in New Zealand: Patient characteristics and treatment outcomes**

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## Body Mass Index and persistent pain in New Zealand: Patient characteristics and treatment outcomes

### Abstract

Body mass index (BMI), calculated using a person's weight by the square of their height (kg/m<sup>2</sup>), is used to broadly categorise weight as underweight, normal weight, overweight and obese. This paper will explore the association of patient characteristics and outcomes by BMI category using data collected by the electronic Persistent Pain Outcomes Collaboration (ePPOC).

### Publication Details

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# Body Mass Index and persistent pain in New Zealand: Patient characteristics and treatment outcomes

## EPPROC INFORMATION SERIES NO.2 2022

### Summary:

This study aimed to explore sociodemographic profile, clinical characteristics and treatment outcomes by body mass index (BMI) for individuals who completed an episode of care at pain management services in New Zealand. Overall, 17863 adult patients (aged 18 years and over) who completed treatment and provided BMI information at referral were included in the analyses. These patients provided data at referral during the period 2014-2021. The analyses showed:

- In the cohort, 72% of patients were either in the overweight or obese category.
- The proportion of obesity increased with patients' pain duration and area of socioeconomic disadvantage. Obesity percentage was 35.1% and 46.3% in the least and most disadvantaged areas, respectively.
- Medication use such as opioids, paracetamol, antidepressant and anticonvulsant was more reported in obese patients compared to those in the healthy weight range.
- Pain severity, interference, depression, anxiety, stress, catastrophising and pain self-efficacy were similar at referral, regardless of BMI
- Following pain treatment, there were some differences in patient reported outcomes by BMI. However, the effect sizes were less than small despite statistical significance. This suggests that the difference is unlikely to be clinically important.

### Publication details

D Shebeshi, S F Allingham, H Tardif & D Holloway. Body Mass Index and persistent pain in New Zealand: Patient characteristics and treatment outcomes, ePPOC Information Series No. 2, 2022.

<https://ahsri.uow.edu.au/epproc/informationseries>

# Background

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Body mass index (BMI), calculated using a person's weight by the square of their height ( $\text{kg}/\text{m}^2$ ), is used to broadly categorise weight as underweight, normal weight, overweight and obese. This paper will explore the association of patient characteristics and outcomes by BMI category using data collected by the electronic Persistent Pain Outcomes Collaboration (ePPOC).

ePPOC is an Australasian initiative that aims to improve the quality of care and outcomes for people who experience chronic pain. ePPOC works with Australia and New Zealand pain services to improve the quality of care and outcomes for people with chronic pain through the collection of non-identifiable data related to patients and their care. Service data are then analysed and benchmarked to highlight areas for quality improvement to services. Furthermore, ePPOC promotes research into areas of importance in pain management. Further details regarding the establishment of ePPOC and collection of non-identifiable data can be found in Tardif et al<sup>1</sup> and at <https://www.uow.edu.au/ahsri/eppoc/>.

## Aims

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This study aimed to explore the sociodemographic profile, clinical characteristics and pain treatment outcome for patients as a function of BMI using data collected from New Zealand pain management services.

## Methods

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The data included in the analyses were provided by New Zealand persistent pain management services participating in ePPOC. The inclusion criteria were:

- Adult patients aged 18 years and above at referral
- Completion of patient-reported information at referral during the period January 2014 - December 2021
- Completion of an episode of pain management at the same pain management service based in New Zealand
- Completion of a Weight (in kg) and Height (in cm) from which a valid BMI could be calculated

After application of the inclusion criteria, 17863 patients formed the dataset included in this information series. Frequencies and percentages were used to explore patients' sociodemographic profiles, clinical characteristics and treatment outcome by BMI. Chi-squared tests were used to observe the association of BMI categories with patient characteristics, which were measured as categorical variables. Furthermore, the effect size test (Cramer's V) has been calculated to assess the degree or magnitude of the association. The Cramer's V values range from 0 to 1, and are categorised as small (0.06 – 0.17), moderate (0.17 – 0.29) and high ( $> 0.29$ )<sup>2</sup>.

Kruskal-Wallis test was used to test the relationship of age and pain assessment scores at referral with BMI category. The effect size for Kruskal-Wallis test was computed using eta squared<sup>3</sup>, with the value interpreted as a small (0.01 – 0.06), moderate (0.06 – 0.14) and large ( $> 0.14$ ) effect.

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<sup>1</sup> Tardif, H., et al., *Establishment of the Australasian electronic persistent pain outcomes collaboration*. Pain Medicine, 2017. **18**(6): p. 1007-1018

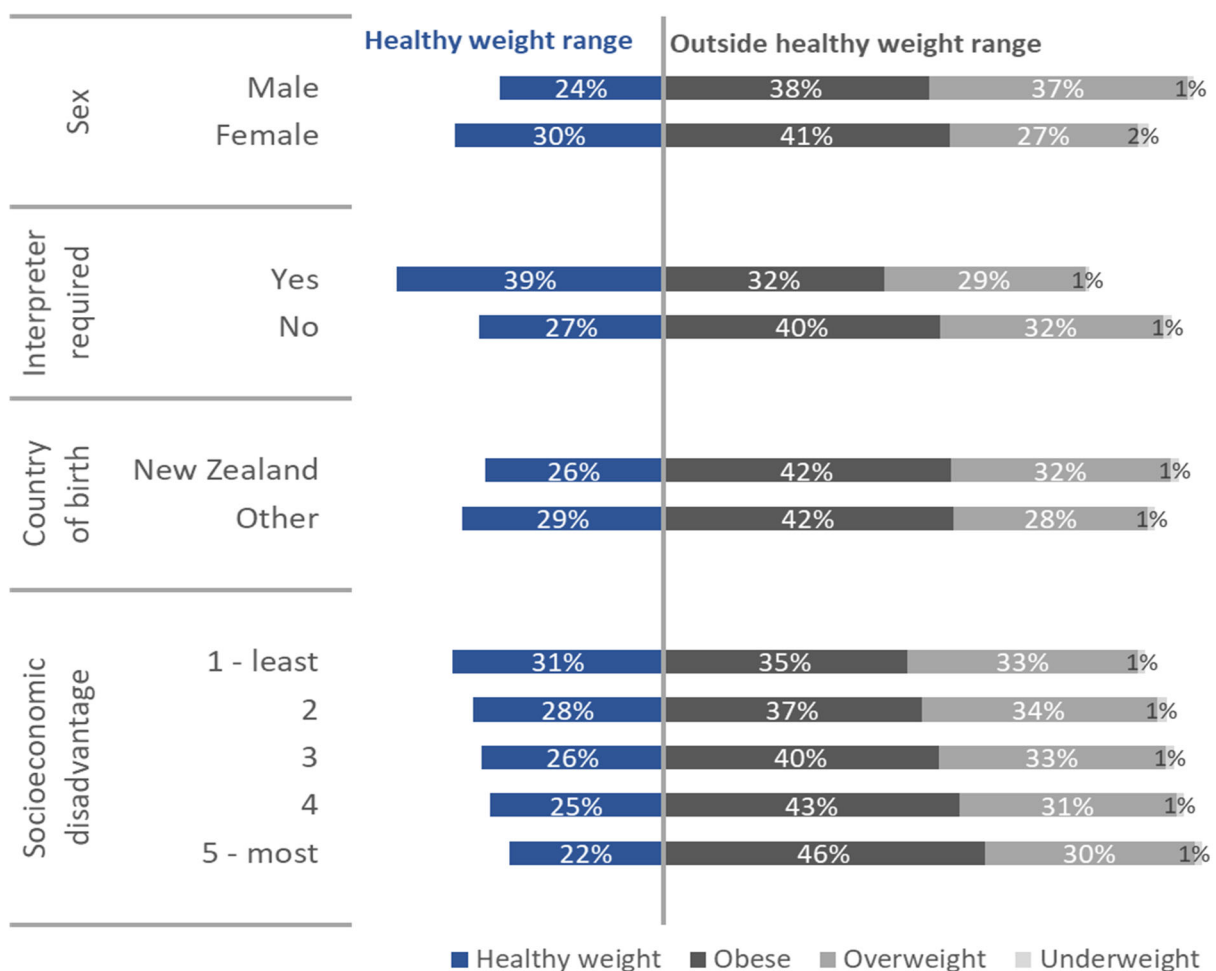
<sup>2</sup> Kim, H.-Y., *Statistical notes for clinical researchers: Chi-squared test and Fisher's exact test*. Restorative dentistry & endodontics, 2017. **42**(2): p. 152-155.

<sup>3</sup> Tomczak, M. and E. Tomczak, *The need to report effect size estimates revisited. An overview of some recommended measures of effect size*. Trends in sport sciences, 2014. **1**(21): p. 19-25

# Results

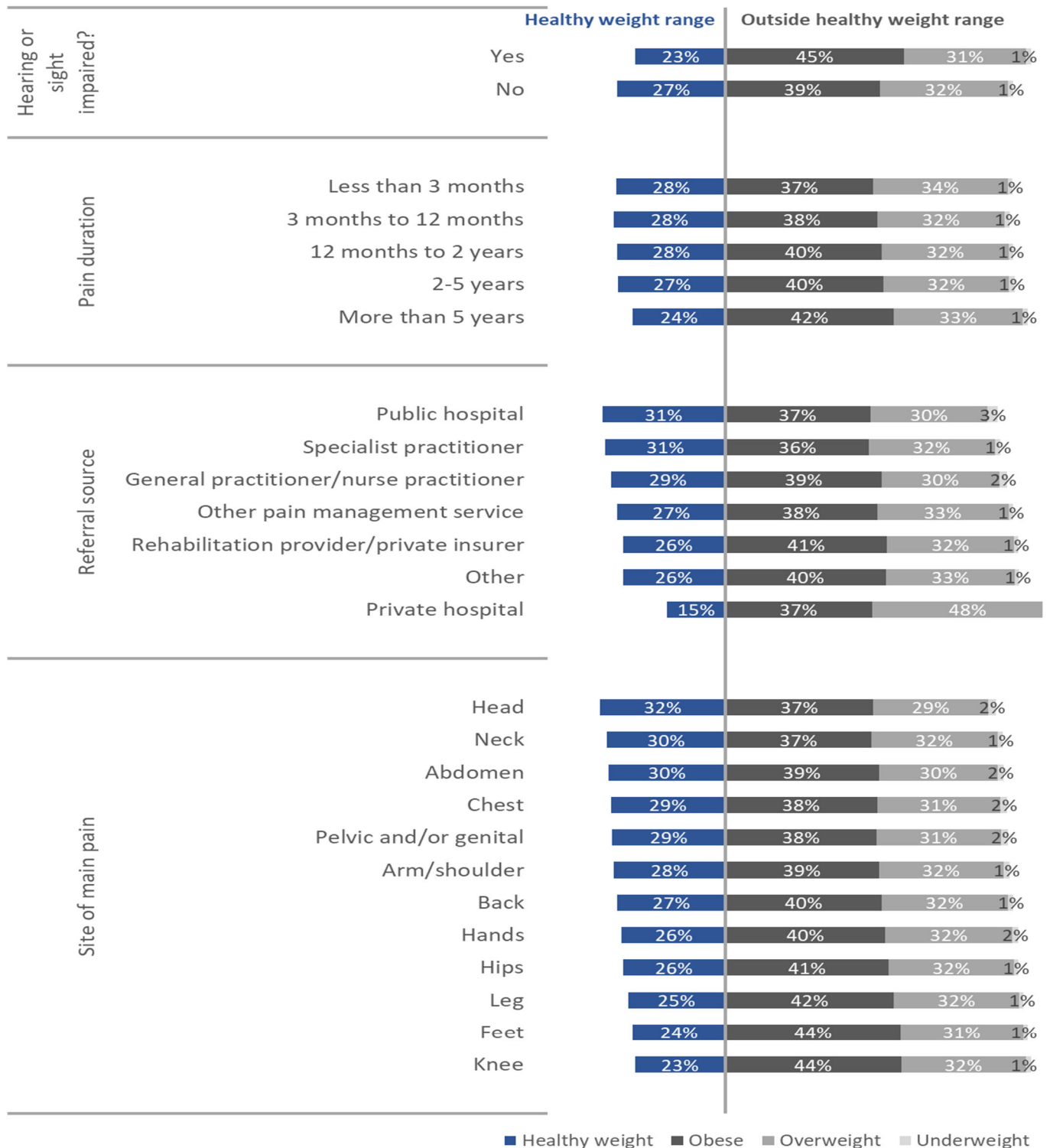
Overall, 17863 patient data were analysed. Of these patients, 226 (1.3%), 4800 (26.9%), 5747 (32.2%) and 7090 (39.7%) were classified as underweight, healthy weight, overweight and obese, respectively. The proportion of underweight patients (N = 226, 1.3%) was relatively small, and therefore the comparison focuses on differences between the healthy weight and overweight/obese groups. Patients who did not require an interpreter were more likely to be overweight or obese. There was a decrease in the proportion of people in the healthy weight range and an increase in obesity from the least (35.1%) to the most disadvantaged socioeconomic areas<sup>4</sup>. Patients with hearing or sight impairment were more likely to be in the obese group. The characteristics of the group by BMI category are shown in Figure 1 and Figure 2 (and in Tables A1 and A2 in the Appendix).

**Figure 1: Distribution of BMI categories by sociodemographic characteristics**



<sup>4</sup><https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2033.0.55.001~2016~Main%20Features~IRSD~19>

**Figure 2: Distribution of BMI category by referral source and other clinical characteristics**



Patients who experienced hearing or sight impairment tended to be obese compared to those who did not (Figure 2). While 45% of hearing or sight-impaired patients were obese, 39.0% of patients were obese patients with no hearing or sight impairment. The proportion of obesity increased with pain duration. For instance, while 37.2% of patients were obese among those who had pain for less than three months, 42.4% of patients were obese among those who had pain for more than five years.

Table 1 shows medication use and comorbidities at referral by BMI category. Patients who were obese and overweight were more likely to use medications containing opioids, paracetamol, antidepressants, NSAID and anticonvulsants compared to those in the healthy weight range. The prevalence of comorbidities was also greater, particularly mental health conditions, arthritis, heart and circulation problems, respiratory problems, high blood pressure and diabetes. The prevalence of living with three or more comorbidities was 15.1% in obese patients compared to 6.9% in healthy weight range patients.

**Table 1: Medication use and comorbidities by BMI category**

	Body Mass Index (BMI) classification				Total
	Underweight	Healthy weight	Overweight	Obese	
<b>Medication use at referral, n(%)</b>					
Opioid	52 (40.3)	947 (34.1)	1260 (37.6)	1852 (42.1)	4111 (38.6)
Paracetamol	46 (35.7)	1137 (41.0)	1500 (44.8)	1978 (44.9)	4661 (43.7)
Antidepressant	44 (34.1)	762 (27.4)	924 (27.6)	1387 (31.5)	3117 (29.3)
NSAID	45 (34.9)	977 (35.2)	1258 (37.6)	1646 (37.4)	3926 (36.8)
Anticonvulsant	34 (26.4)	604 (21.8)	796 (23.8)	1144 (26.0)	2578 (24.2)
Sedatives	18 (14.0)	162 (5.8)	205 (6.1)	282 (6.4)	667 (6.3)
Medicinal cannabinoids	-	20 (0.7)	36 (1.1)	26 (0.6)	82 (0.8)
<b>Comorbidities, n(%)</b>					
Mental Health condition	72 (31.9)	1202 (25.0)	1356 (23.6)	2007 (28.3)	4637 (26.0)
Arthritis	31 (13.7)	480 (10.0)	703 (12.2)	1112 (15.7)	2326 (13.0)
Heart and circulation	14 (6.2)	323 (6.7)	615 (10.7)	1121 (15.8)	2073 (11.6)
Digestive problems	41 (18.1)	567 (11.8)	691 (12.0)	1011 (14.3)	2310 (12.9)
Muscle, bone and joint problems	42 (18.8)	613 (12.9)	763 (13.4)	1044 (14.8)	2462 (13.9)
Respiratory problems	32 (14.2)	455 (9.5)	558 (9.7)	1143 (16.1)	2188 (12.3)
High blood pressure	6 (2.7)	159 (3.3)	363 (6.3)	773 (10.9)	1301 (7.3)
Diabetes	8 (3.5)	84 (1.8)	180 (3.1)	528 (7.4)	800 (4.5)
Neurological problems	15 (6.6)	154 (3.2)	209 (3.6)	244 (3.4)	622 (3.5)
Liver, kidney and pancreas	9 (4.0)	89 (1.9)	142 (2.5)	222 (3.1)	462 (2.6)
Cancer	4 (1.8)	73 (1.5)	90 (1.6)	105 (1.5)	272 (1.5)
Thyroid	8 (3.6)	132 (2.8)	161 (2.8)	273 (3.9)	574 (3.2)
Other medical problems	39 (17.3)	498 (10.4)	551 (9.6)	931 (13.1)	2019 (11.3)
<b>Number of co-morbidities, n(%)</b>					
0	90 (39.8)	2370 (49.4)	2646 (46.0)	2611 (36.8)	7717 (43.2)
1	62 (27.4)	1361 (28.4)	1591 (27.7)	1866 (26.3)	4880 (27.3)
2	32 (14.2)	594 (12.4)	830 (14.4)	1234 (17.4)	2690 (15.1)
3 or more	42 (18.6)	475 (9.9)	680 (11.8)	1379 (19.5)	2576 (14.4)

NSAID: Non-steroidal anti-inflammatory medication

Scores at referral on each of the assessment tools are shown in Table 2. These scores reflect increasing symptom severity from the healthy weight range to the overweight and obese categories. Whilst this information suggests that

people in the healthy weight range tend to have less severe problems at referral, it should be noted that the differences between groups (the effect size) are less than the small category and, as such, are unlikely to be clinically significant.

**Table 2: Mean scores on the patient-reported assessment tools at referral, by BMI category**

Assessment component	Body Mass Index (BMI) classification				Total	Effect size	Effect size description
	Under-weight	Healthy weight	Over-weight	Obese			
Pain severity	5.8	5.4	5.5	5.8	5.6	0.006	< small
Pain interference	6.5	6.2	6.4	6.7	6.5	0.009	< small
Depression	17.0	14.5	14.6	15.9	15.1	0.003	< small
Anxiety	11.9	9.8	9.7	11.2	10.3	0.006	< small
Stress	19.6	17.9	18.0	18.9	18.3	0.002	< small
Pain catastrophising	24.7	22.2	22.5	23.7	22.9	0.002	< small
Pain self-efficacy	22.3	25.1	24.2	22.7	23.8	0.006	< small

Note: '< small' indicates the effect size is less than small. Higher PSEQ indicates less impairment.

Table 3 shows the proportion of patients reporting clinically significant improvement on each domain measured by the standardised assessment tools (for patients reporting at least a moderate level of symptom at referral). Patients who reported clinical significant improvement in pain interference were 67% and 61% in the healthy weight and obese group, respectively. Generally, there was an indication that the proportion of patients who reported improvement in all domains was slightly higher in the healthy weight group than in the obese group.

**Table 3: Patients reporting clinically significant improvement at episode end, by BMI category**

Assessment component, n(%)	Body Mass Index (BMI) classification				Total	Effect size	Effect size description
	Under-weight	Healthy weight	Over-weight	Obese			
Pain severity	32 (36.4)	673 (36.1)	799 (34.5)	976 (31.2)	2480 (33.5)	0.044	< small
Pain interference	66 (71.0)	1442 (66.9)	1710 (63.9)	2141 (61.0)	5359 (63.6)	0.052	< small
Depression	38 (62.3)	761 (62.2)	952 (61.6)	1276 (60.0)	3027 (61.1)	0.020	< small
Anxiety	31 (59.6)	535 (49.6)	678 (50.8)	935 (48.0)	2179 (49.4)	0.032	< small
Stress	32 (57.1)	690 (63.1)	865 (62.1)	1172 (61.5)	2759 (62.0)	0.017	< small
Pain catastrophising	33 (50.8)	890 (62.9)	1022 (58.6)	1339 (57.4)	3284 (59.1)	0.049	< small
Pain self-efficacy	54 (60.0)	1041 (56.5)	1187 (51.5)	1585 (51.4)	3867 (52.9)	0.047	< small

< small indicates the effect size is less than small

Table 4 shows scores on the Global Rating of Change, which measures the patient's perception of change (both overall and in respect to physical functioning) compared to before receiving treatment at the pain service. At the end of the episode, 70% of all patients reported making at least some overall improvement, and 72.6% reported some improvement in their physical abilities (Table 4).

A comparison of outcomes across the BMI groups suggests that overweight and obese patients are less likely to report clinically significant improvement or provide positive ratings of change. However, the size of the differences between BMI categories was less than small, and hence, unlikely to be clinically important.



**Table 4: Global rating of change scores, by BMI category**

	Body Mass Index (BMI) classification				Total	Effect size	Effect size description
	Under-weight	Healthy weight	Over-weight	Obese			
<b>GRC – overall, n (%)</b>							
3 (very much better)	15 (16.1)	376 (18.4)	414 (16.8)	531 (17.0)	1336 (17.3)	0.041	< small
2	28 (30.1)	681 (33.3)	753 (30.6)	872 (27.9)	2334 (30.2)		
1	27 (29.0)	543 (26.6)	698 (28.3)	887 (28.4)	2155 (27.9)		
0 (no change)	13 (14.0)	311 (15.2)	424 (17.2)	575 (18.4)	1323 (17.1)		
-1	6 (6.5)	63 (3.1)	89 (3.6)	116 (3.7)	274 (3.6)		
-2	3 (3.2)	47 (2.3)	48 (1.9)	98 (3.1)	196 (2.5)		
-3 (very much worse)	1 (1.1)	21 (1.0)	38 (1.5)	47 (1.5)	107 (1.4)		
<b>GRC – physical, n (%)</b>							
3 (very much better)	12 (12.9)	318 (15.6)	337 (13.6)	440 (14.1)	1107 (14.3)	0.036	< small
2	30 (32.3)	678 (33.3)	743 (30.1)	881 (28.3)	2332 (30.2)		
1	27 (29.0)	540 (26.5)	708 (28.7)	893 (28.7)	2168 (28.1)		
0 (no change)	16 (17.2)	377 (18.5)	490 (19.8)	634 (20.4)	1517 (19.7)		
-1	5 (5.4)	59 (2.9)	90 (3.6)	128 (4.1)	282 (3.7)		
-2	2 (2.2)	50 (2.5)	68 (2.8)	92 (3.0)	212 (2.8)		
-3 (very much worse)	1 (1.1)	17 (0.8)	35 (1.4)	47 (1.5)	100 (1.3)		

# Series List

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## **2018**

No.1 2018: *Normative data for patients referred for specialist pain management in Australia*

No.2 2018: *Normative data for children and adolescents referred for specialist pain management in Australia*

No.3 2018: *Carer-proxy and child self-reported ratings of pain and quality of life*

## **2019**

No. 1 2019: *Socioeconomic disadvantage and referral to pain management services in Australasia*

No. 2 2019: *Proximity to specialist pain management services in Australia*

## **2021**

No.1 2021: *Profile of adult patients referred for specialist pain management in New Zealand*

No.2 2021: *Characteristics and outcomes for individuals reporting low back pain*

## **2022**

No.1 2022: *Body Mass Index and persistent pain in Australia: Patient characteristics and treatment outcomes*

No.2 2022: *Body Mass Index and persistent pain in New Zealand: Patient characteristics and treatment outcomes*

# Appendix

**Table A1: Sociodemographic characteristics by BMI category for patients who attended a pain management service in New Zealand (2014-2021)**

Characteristics	Body Mass Index (BMI) classification				Total
	Underweight	Healthy weight	Overweight	Obese	
<b>Age, mean (SD)</b>	41.70 (15.7)	41.79 (14.5)	45.10 (13.2)	45.30 (12.8)	44.2 (13.5)
<b>Sex, n (%)</b>	Sex, n(%)				
Male	75 (0.9)	2064 (23.6)	3272 (37.4)	3346 (38.2)	8757 (49.1)
Female	150 (1.7)	2725 (30.1)	2461 (27.1)	3732 (41.2)	9068 (50.9)
<b>Interpreter required, n (%)</b>					
No	217 (1.3)	4598 (26.7)	5549 (32.2)	6843 (39.8)	17207 (99.0)
Yes	1 (0.6)	68 (38.6)	51 (29.0)	56 (31.8)	176 (1.0)
<b>Country of birth, n (%)</b>					
New Zealand	165 (1.2)	3489 (25.7)	4293 (31.6)	5630 (41.5)	13577 (97.4)
Other	4 (1.1)	107 (29.1)	103 (28.0)	154 (41.8)	368 (2.6)
<b>Socioeconomic disadvantage quintile, n (%)</b>					
1 – Least	28 (1.1)	771 (30.5)	840 (33.3)	885 (35.1)	2524 (17.2)
2	46 (1.4)	896 (27.5)	1103 (33.9)	1213 (37.2)	3258 (22.2)
3	40 (1.3)	815 (26.3)	1014 (32.8)	1225 (39.6)	3094 (21.1)
4	37 (1.1)	816 (25.0)	1018 (31.2)	1393 (42.7)	3264 (22.2)
5 – Most	26 (1.0)	568 (22.3)	773 (30.3)	1180 (46.3)	2547 (17.3)

**Table A2: Hearing or sight impairment, pain duration, referral source and main pain area by BMI category for patients who attended a pain management service in New Zealand (2014-2021)**

Characteristics	Body Mass Index (BMI) classification				Total
	Underweight	Healthy weight	Overweight	Obese	
<b>Hearing or sight impaired?, n (%)</b>					
No	193 (1.2)	4238 (27.4)	4998 (32.3)	6038 (39.0)	15467 (89.3)
Yes	24 (1.3)	424 (22.8)	574 (30.9)	837 (45.0)	1859 (10.7)
<b>Pain duration, n (%)</b>					
Less than 3 months	13 (1.1)	316 (27.6)	390 (34.1)	426 (37.2)	1145 (6.6)
3 months to 12 months	80 (1.3)	1696 (28.2)	1927 (32.0)	2312 (38.4)	6015 (34.6)
12 months to 2 years	32 (1.0)	909 (27.5)	1059 (32.0)	1306 (39.5)	3306 (19.0)
2-5 years	46 (1.4)	903 (27.1)	1060 (31.8)	1329 (39.8)	3338 (19.2)
More than 5 years	50 (1.4)	847 (23.6)	1168 (32.6)	1520 (42.4)	3585 (20.6)
<b>Referral source, n (%)</b>					
GP/nurse practitioner	33 (1.9)	508 (29.0)	522 (29.8)	690 (39.4)	1753 (9.8)
Specialist practitioner	12 (1.3)	274 (30.5)	286 (31.9)	325 (36.2)	897 (5.0)
Other pain management service	31 (1.1)	771 (27.4)	933 (33.2)	1078 (38.3)	2813 (15.6)
Public hospital	17 (2.6)	202 (31.2)	191 (29.5)	237 (36.6)	647 (3.6)
Private hospital	-	4 (14.8)	13 (48.1)	10 (37.0)	27 (0.2)
Rehabilitation provider/private insurer	63 (1.2)	1324 (25.9)	1639 (32.1)	2078 (40.7)	5104 (28.6)
Other	70 (1.1)	1717 (25.9)	2163 (32.7)	2672 (40.4)	6622 (37.1)
<b>Main pain, n (%)</b>					
Abdomen	34 (1.6)	612 (29.6)	622 (30.0)	802 (38.7)	2070 (11.6)
Arm/shoulder	97 (1.4)	1918 (28.3)	2145 (31.6)	2629 (38.7)	6789 (38.0)
Back	116 (1.2)	2633 (27.4)	3057 (31.8)	3798 (39.5)	9604 (53.8)
Chest	24 (1.8)	396 (29.0)	423 (31.0)	523 (38.3)	1366 (7.7)
Feet	64 (1.2)	1230 (23.6)	1612 (31.0)	2298 (44.2)	5204 (29.1)
Hands	53 (1.5)	942 (26.3)	1147 (32.0)	1443 (40.3)	3585 (20.1)
Head	43 (1.9)	713 (31.8)	650 (29.0)	835 (37.3)	2241 (12.6)
Hips	81 (1.2)	1737 (26.0)	2109 (31.6)	2751 (41.2)	6678 (37.4)
Knee	71 (1.2)	1375 (22.9)	1891 (31.5)	2667 (44.4)	6004 (33.6)
Leg	93 (1.1)	2108 (24.7)	2719 (31.8)	3627 (42.4)	8547 (47.9)
Neck	61 (1.3)	1407 (30.0)	1506 (32.1)	1723 (36.7)	4697 (26.3)
Pelvic and/or genital	24 (1.7)	404 (28.8)	441 (31.4)	535 (38.1)	1404 (7.9)