original reports

abstract

National Study of Pain Medicine Access Among Māori and Non-Māori Patients With Lung Cancer in New Zealand

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PURPOSE Pain is among the most common and consequential symptoms of cancer, particularly in the context of lung cancer. Māori have extremely high rates of lung cancer, and there is evidence that Māori patients with lung cancer are less likely to receive curative treatment and more likely to receive palliative treatment and to wait longer for their treatment than non-Māori New Zealanders. The extent to which Māori patients with lung cancer are also less likely to have access to pain medicines as part of their supportive care remains unclear.

METHODS Using national-level Cancer Registry and linked health records, we describe access to subsidized pain medicines among patients with lung cancer diagnosed over the decade spanning 2007-2016 and compare access between Māori and non-Māori patients. Descriptive and logistic regression methods were used to compare access between ethnic groups.

RESULTS We observed that the majority of patients with lung cancer are accessing some form of pain medicine and there do not appear to be strong differences between Māori and non-Māori in terms of overall access or the type of pain medicine dispensed. However, Māori patients appeared more likely than non-Māori to first access pain medicines within 2 weeks before their death and commensurately less likely to access them more than 24 weeks before death.

CONCLUSION Given the plausibility that there are differences in first access to pain medicines (particularly opioid medicines) among Māori approaching end of life, further investigation of the factors contributing to this disparity is required.

INTRODUCTION

Pain is among the most common and consequential symptoms of cancer.[1] Patients with lung cancer are particularly vulnerable to the painful symptoms of their disease,[2] with those with advanced disease commonly experiencing moderate to severe pain.[2-4] As such, pain management is a critical part of supportive care for patients on their lung cancer journey[5]; however, there is some evidence that pain among lung cancer patients with advanced disease may be undertreated.[3]

Lung cancer is the most common cause of cancer death for Māori New Zealanders.[6] Māori patients have extremely high rates of lung cancer, but also once diagnosed, Māori patients with lung cancer are around 30% more likely to die of their cancer compared with non-Māori patients with lung cancer.[7] There is evidence that Māori patients with lung cancer are less likely to receive curative treatment and more likely to receive palliative treatment and to wait longer for their treatment than European New Zealanders, even after adjusting for multiple explanatory factors.[8]

There is currently an absence of robust, national-level evidence regarding ethnic and/or Indigenous access to pain medicines following a diagnosis of cancer and how this access compares with other ethnic or non-Indigenous groups. The particular lack of national-level evidence regarding access to pain medicines among Indigenous Māori and non-Māori patients with lung cancer means that the extent to which patients with lung cancer are accessing pain medicines as part of their supportive care remains unclear. This raises several interlinked questions: given known disparities in access to services in other parts of the cancer pathway, along with evidence that Māori might have reduced access to medicines compared with non-Māori,[9] are there also differences in access to pain medicines between Māori and non-Māori patients with lung cancer?[10] Among those accessing pain medicines, when is this access occurring on their cancer journey relative to their date of diagnosis? Are there differences in this timing between Māori and non-Māori patients?

CONTEXT

Key Objective

Given known disparities in access to both cancer services and medicines in general, are Indigenous Māori patients with lung cancer in New Zealand less likely to gain timely access to pain medicine compared with non-Indigenous patients?

Knowledge Generated

The majority of patients with lung cancer are accessing some form of pain medicine, and there do not appear to be differences between Māori and non-Māori in terms of overall access. However, we did observe that Māori appear more likely to first access pain medicine in the 2 weeks before death and commensurately less likely to have first access more than 24 weeks before death.

Relevance

Although there do not appear to be strong differences in absolute access to pain medicine between Indigenous and non-Indigenous patients with lung cancer in New Zealand, it does appear that Indigenous patients are first accessing these medicines too late in their cancer journey. Cancer clinicians and palliative medicine specialists should be aware that their Indigenous patients may not be accessing these medicines in a timely manner and reduce barriers to this access wherever possible.

In this manuscript, we describe access (and the timing of that access) to subsidized pain medicines among patients with lung cancer diagnosed over the decade spanning 2007-2016 and compare this access between Māori and non-Māori patients.

METHODS

Participants and Data Sources

Patients with lung cancer diagnosed between 2007 and 2016 were identified from the New Zealand Cancer Registry (NZCR) and linked via encrypted National Health Index number to the national pharmaceutical data collection (PHARMS), which collates all dispensings for government-subsidized medicines filled in the community, as well as for residents of aged care facilities and some hospices. PHARMS data were extracted for the period 2006-2017, meaning that each patient had at least one year of pharmaceutical follow-up, as well as at least 6 months prior to allow for the examination of previous access to pain medicines. Patients were also linked to the national Mortality Collection for the same time period, which records all deaths in New Zealand and their underlying cause. Patients were excluded from further analysis if they died on or before their date of diagnosis (n = 771), leaving a total of N = 20,081 patients in the final cohort. Ethics approval was received from the University of Otago Human Ethics Committee (reference No. HD18/056).

Variables

Patient characteristics. Age was defined by subtracting date of cancer diagnosis as recorded on the NZCR from date of birth. Age was categorized as < 50, 50-64, 65-74, and > 75 years. Sex was derived from the NZCR (female or male). Prioritized ethnicity was derived from the NZCR and defined as Māori (n = 4,058) or non-Māori (n = 16,673). Missing data prevented the attribution of ethnicity status for

n = 40 patients (0.2% of the cohort). Europeans comprised the majority of the non-Māori group (89%), followed by Pacific (4%), Asian (4%), and Middle Eastern-Latin American African or Other New Zealanders (3%). Level of area deprivation was defined using the NZDep 2013 deprivation scale, a small area-based index that uses multiple factors to define the level of deprivation of a given area.[11] Missing data prevented the attribution of deprivation for 818 patients (4% of the cohort). Patient rurality at the time of diagnosis was defined using a modified version of the Urban-Rural Profile Classification,[12] with the area where a patient lived at the time of the procedure classified as urban (main urban area + satellite urban area), independent urban, or rural. Missing data prevented the attribution of rurality for 831 patients (4% of the cohort). The majority of those missing deprivation data were also missing rurality data, since both require the availability of relevant area unit data. Cancer date of diagnosis was derived from the NZCR. Cancer stage at diagnosis was determined from the NZCR and based on the SEER Summary Stage method (A-F).[13] Stage was categorized into Local (B), Regional (C and D), Advanced (E), and Unknown (F).[14]

Opioid access. From the PHARMS data set, we extracted all medicines dispensed to our cohort. Pain medicine dispensings were identified using the PHARMS data set, chemical identification codes, and a mapping file derived from the Ministry of Health. In consultation with the palliative medicine specialists on our team, we separated pain medicines into nonopioids (paracetamol and nonsteroidal anti-inflammatory drugs), opioids for mild or moderate pain (codeine phosphate, dextropropoxyphene with paracetamol, paracetamol with codeine, dihydrocodeine tartrate, and tramadol hydrochloride), and opioids for strong pain (methadone hydrochloride, morphine hydrochloride, morphine sulfate, pethidine hydrochloride, morphine

tartrate, fentanyl, and oxycodone hydrochloride). We set binary indicators (0 or 1) if a case had accessed a non-opioid, mild or moderate opioid, or strong opioid medicines at some point on or after their lung cancer diagnosis, up to 12 months following their diagnosis. To assess the frequency of pain medication access before a lung cancer diagnosis was made, we also set a binary variable that indicated whether (or not) any of these medicines had been accessed sometime between 3 and 6 months before the diagnosis date.

To determine the timing of access among those who accessed pain medication, we searched for the earliest dispensing date from the date of diagnosis onward and determined the interval (in days) between the date of diagnosis and earliest access to a given pain medicine. Using data from the Mortality Collection for those who died during the study period (2007-2017), we also looked backward from the date of death to the earliest dispensing date. This second timing of access variable was therefore the interval (in days) between the date of death and earliest access to a given pain medicine.

Statistical Analysis

To describe pain medicine access, we completed descriptive analysis using count data and proportions (%), reported by medicine type and cancer stage. All analyses were conducted for the total cohort and then separately by ethnicity, age, deprivation, and rurality categories. Since the Māori population has a younger age structure than the non-Māori population, when comparing Māori and non-Māori patients, we used direct age standardization to determine age-adjusted proportions.[15] To use an Indigenous standard population, we used the total Māori cancer population diagnosed with any cancer between 2007 and 2016 as our standard population.

In terms of the timing of earliest pain medicine access postdiagnosis, we set the following categories: < 2 weeks following diagnosis, 2 to < 4 weeks, 4 to < 12 weeks, 12 to < 24 weeks, and > 24 weeks. In terms of earliest pain medicine access before death, we set the following categories: < 2 weeks before death, 2-4 weeks, 4 to < 12 weeks, 12 to < 24 weeks, and > 24 weeks. We also determined the median and interquartile range (in days) for both timing variables (postdiagnosis and predeath).

To assist comparisons between Māori and non-Māori, we conducted logistic regression modeling with ethnicity as the exposure and medicine access as the outcome, adjusting for age (continuous variable) and sex (female or male). When comparing access before death, we also adjusted for the number of days from diagnosis to death (categorical variable, < 2 weeks, 2 to < 4 weeks, 4 to < 12 weeks, 12 to < 24 weeks, and > 24 weeks). Adjusted odds ratios (ORs) are presented along with 95% CIs.

All analyses were conducted in SAS v9.4 (SAS Institute Inc) and Microsoft Excel 2016 (Microsoft Corp).

RESULTS

Cohort characteristics are shown in the Data Supplement. In terms of stage, nearly half of the cohort were diagnosed with advanced disease (crude proportion: 46%), followed by unstaged (35%), regional (13%), and localized disease (6%). To focus on those patients who had the worst documented disease on the NZCR, at times, we have restricted the interpretation below to those patients with advanced disease. However, data for all stages are presented in the Data Supplement.

Access to Pain Medicines

Around 30% of patients with lung cancer were dispensed nonopioid medicines in the 3-6 months before their cancer diagnosis, whereas around 14% were dispensed mild or moderate opioids, and around 3% were dispensed strong opioids (data not shown). These patterns shifted substantially following cancer diagnosis.

The majority of patients with lung cancer were dispensed nonopioid medication following diagnosis, with this access ranging from 71% of patients with unstaged disease to 89% of patients with localized disease (Table 1). Access to mild or moderate opioids was less common, with access ranging from 36% of patients with advanced disease to 59% of those with localized disease. The most commonly accessed mild or moderate opioid among those with advanced disease was codeine phosphate (24%). Access to strong opioid medicines ranged from 43% of patients with localized disease to 74% of patients with advanced disease. The most commonly accessed strong opioids among those with advanced disease were morphine sulfate (52%) and morphine hydrochloride (41%).

When comparing pain medication access between Māori and non-Māori, we did not observe evidence of strong disparities in access between ethnic groups. Focusing on those with advanced disease (Table 2), we found that a similar proportion of Māori accessed nonopioid medicines (age-standardized proportions: both 78%; adjusted (adj.) OR, 0.89; 95% CI, 0.79 to 1.01). Māori and non-Māori were similarly likely to access mild or moderate opioids (Māori 41% and non-Māori 41%; adj. OR, 1.00; 95% CI, 0.90 to 1.12), with no evidence of strong differences in terms of the type of mild or moderate opioid that was accessed. Likewise, Māori and non-Māori patients were similarly likely to access strong opioid medicines (Māori 78% and non-Māori 76%; adj. OR, 1.09; 95% CI, 0.96 to 1.23).

Timing of Access to Pain Medicines

Focusing on those with advanced disease, around half (47%) accessed nonopioids within 2 weeks of their diagnosis (median interval 15 days and interquartile range 33 days; Table 3). Around 44% accessed mild or moderate opioids within 2 weeks of diagnosis (median interval 17 days and interquartile range 47 days), whereas around a third (37%) accessed strong opioids within 2 weeks of

TABLE 1. No. and Proportion of All Patients With Lung Cancer Accessing Nonopioid, Mild or Moderate Opioid, and Strong Opioid Pain Medications Following Diagnosis, by Cancer Stage

Category	Local, No. (%)	Regional, No. (%)	Advanced, No. (%)	Unknown, No. (%)
Total cases (plus row percentage)	1,235 (6)	2,547 (13)	9,280 (46)	7,019 (35)
Total accessing any pain medicine	1,161 (94)	2,320 (91)	8,059 (87)	5,927 (84)
Total accessing nonopioids	1,098 (89)	2,116 (83)	6,935 (75)	4,962 (71)
Paracetamol	1,060 (86)	2,048 (80)	6,683 (72)	4,692 (67)
NSAIDs	497 (40)	856 (34)	2,193 (24)	1,541 (22)
Total accessing mild or moderate opioids	724 (59)	1,341 (53)	3,379 (36)	2,862 (41)
Codeine phosphate	335 (27)	798 (31)	2,204 (24)	1,820 (26)
Dextropropoxyphene with paracetamol	26 (2)	36 (1)	137 (1)	169 (2)
Paracetamol with codeine	150 (12)	289 (11)	605 (7)	721 (10)
Dihydrocodeine tartrate	20 (2)	60 (2)	167 (2)	187 (3)
Tramadol hydrochloride	399 (32)	545 (21)	1,002 (11)	715 (10)
Total accessing strong opioids	526 (43)	1,571 (62)	6,869 (74)	4,144 (59)
Methadone hydrochloride	13 (1)	75 (3)	468 (5)	204 (3)
Morphine hydrochloride	48 (4)	803 (32)	3,838 (41)	2,646 (38)
Morphine sulfate	311 (25)	1,043 (41)	4,806 (52)	2,702 (38)
Pethidine hydrochloride	0 (0)	6 (0)	8 (0)	8 (0)
Morphine tartrate	0 (0)	24 (1)	223 (2)	82 (1)
Fentanyl	16 (1)	114 (4)	705 (8)	381 (5)
Oxycodone hydrochloride	244 (20)	491 (19)	2,106 (23)	1,041 (15)

Abbreviation: NSAID, nonsteroidal anti-inflammatory drug.

diagnosis (median interval 22 days and interquartile range 52 days). Around 18% of those who died with advanced lung cancer first accessed strong opioids in the last 2 weeks before their death (11% nonopioids and 7% mild or moderate opioids).

Although we did not find evidence of strong inequities between Māori and non-Māori in terms of timing of access to pain medicines postdiagnosis, we did observe that Māori tended to be more likely to first access medicines in the 2 weeks before death and commensurately less likely to access medicines more than 24 weeks before death. For example, among those with advanced disease, Māori appeared 30% more likely than non-Māori to first access strong opioids in the 2 weeks before death (age-standardized proportions: Māori 19% and non-Māori 14%; adj. OR, 1.30; 95% CI, 1.07 to 1.59; Table 4). Conversely, Māori with advanced disease appeared less likely to first access strong opioids more than 24 weeks before death than non-Māori (Māori 17% and non-Māori 25%; adj. OR, 0.66; 95% CI, 0.52 to 0.83).

Subgroup Analysis Among Those Not Accessing Strong Opioids

Although the majority of those with advanced disease accessed strong opioids on or after their diagnosis, a substantial minority did not (26% of those with advanced disease). Focusing on those with advanced disease, we observed that half (51%) of those who did not access strong

opioids did not access any other pain medication, whereas 45% accessed nonopioids and 25% accessed mild or moderate opioids (Table 5). This pattern was similar between Māori and non-Māori, by deprivation quintile and by urban or rural status. In terms of age, the proportion of patients not accessing any pain medication increased with increasing age (eg, < 50 years 38% and > 75 years 56%). In separate sensitivity analysis (Data Supplement), we noted that of those who did not access strong opioids, patients who did not access any other form of pain medicine had poorer survival outcomes compared with those who accessed either nonopioids or mild or moderate opioids.

DISCUSSION

In this national study of opioid and nonopioid medication access among patients with lung cancer in New Zealand, we observed that the majority of patients with lung cancer are accessing some form of pain medicine and there do not appear to be strong differences between Māori and non-Māori in terms of overall access. There also appears to be no difference in the type of pain medicine dispensed to Māori and non-Māori; morphine remains the drug of choice in New Zealand for treating patients with cancer, which is in line with national best practice guidelines.[16]

We found that the majority (75%) of lung cancer patients with advanced disease were accessing strong opioids and did not observe differences in dispensings between Māori

TABLE 2. No. and Proportion of Māori and Non-Māori Patients With Advanced Lung Cancer Accessing Nonopioid, Mild or Moderate Opioid, and Strong Opioid Pain Medications in the 12 Months Following Diagnosis, by Cancer Stage

	Advanced					
	Māori			Non-Māori		
Category	No. (%)	Adj. %[a]	Adj. OR (95% CI)[b]	No. (%)	Adj. %[a]	Adj. OR[b]
Total cases	1,759	—	—	7,504	—	—
Total accessing any pain medicine	1,559 (89)	90	1 (0.85 to 1.19)	6,489 (86)	89	Ref
Total accessing nonopioids	1,333 (76)	78	0.89 (0.79 to 1.01)	5,593 (75)	78	Ref
Paracetamol	1,293 (74)	76	0.96 (0.85 to 1.08)	5,382 (72)	74	Ref
NSAIDs	424 (24)	26	0.73 (0.64 to 0.83)	1,765 (24)	32	Ref
Total accessing mild or moderate opioids	710 (40)	41	1 (0.9 to 1.12)	2,667 (36)	41	Ref
Codeine phosphate	431 (25)	25	0.88 (0.77 to 0.99)	1,772 (24)	28	Ref
Dextropropoxyphene with paracetamol	28 (2)	2	1.02 (0.66 to 1.57)	109 (1)	1	Ref
Paracetamol with codeine	128 (7)	7	1.08 (0.88 to 1.33)	477 (6)	6	Ref
Dihydrocodeine tartrate	42 (2)	3	1.15 (0.8 to 1.66)	125 (2)	2	Ref
Tramadol hydrochloride	247 (14)	15	1.19 (1.02 to 1.4)	754 (10)	13	Ref
Total accessing strong opioids	1,353 (77)	78	1.08 (0.96 to 1.23)	5,509 (73)	76	Ref
Methadone hydrochloride	93 (5)	6	0.82 (0.65 to 1.04)	375 (5)	7	Ref
Morphine hydrochloride	697 (40)	39	0.92 (0.83 to 1.03)	3,139 (42)	41	Ref
Morphine sulfate	983 (56)	58	1.06 (0.95 to 1.18)	3,817 (51)	55	Ref
Pethidine hydrochloride	1 (0)	0	—	7 (0)	0	Ref
Morphine tartrate	49 (3)	3	0.97 (0.7 to 1.35)	173 (2)	3	Ref
Fentanyl	135 (8)	8	1.01 (0.83 to 1.24)	570 (8)	7	Ref
Oxycodone hydrochloride	430 (24)	26	1.04 (0.92 to 1.18)	1,674 (22)	24	Ref

NOTE. Patients with local, regional, and unstaged disease are presented in the Data Supplement.

Abbreviations: adj, adjusted; NSAID, nonsteroidal anti-inflammatory drug; OR, odds ratio; ref, reference.

[a]Age-standardized to the total Māori cancer population diagnosed with any cancer between 2007 and 2016.

[b]Adjusted for age and sex.

and non-Māori patients. We did find that nearly two thirds of those who were not accessing strong opioids appeared to not be accessing any pain medication at all. This group tended to be those who died soon after diagnosis and might not have received any medication outside of the hospital setting (see below). We also note that pain and other symptoms for which opioid medicines are prescribed do not occur ubiquitously among patients with lung cancer, which may also explain why some patients were not found to access these medicines.

The general lack of disparity in the receipt of pain medication between Māori and non-Māori patients with lung cancer is reassuring, but should be put in the context of the profound underlying inequities in lung cancer incidence, more advanced disease at diagnosis, and worse outcomes for Māori patients with lung cancer in general.

We found that around half of all patients with advanced disease accessed pain medicines within the first 4 weeks following diagnosis and there were no differences in this timing between Māori and non-Māori. However, we did find a disparity in terms of timing of access, wherein Māori

patients appeared more likely than non-Māori to first access pain medicines within 2 weeks before their death (and commensurately less likely to access them more than 24 weeks before death)—even after adjusting for differences between groups in multiple confounding factors, including the time between diagnosis and death. In other words, non-Māori patients appeared to be prescribed opioids earlier in their journey than Māori. For example, Māori patients with advanced disease were 30% more likely to first access strong opioids in the 2 weeks before their death (adj. OR, 1.30; 95% CI, 1.07 to 1.59) and 33% less likely to access strong opioids more than 24 weeks before their death (adj. OR, 0.66; 95% CI, 0.52 to 0.83).

Although we have controlled for the delay between date of diagnosis and death within our regression models, if we have incompletely adjusted for potential differences between Māori and non-Māori in terms of this delay, then at least part of the observed disparity will be attributable to this residual confounding. However, a sensitivity analysis in which those who died within 2 weeks of diagnosis were removed from our analysis showed no meaningful change in our adjusted estimates, even when we expanded the time

TABLE 3. Timing of Pain Medication Access for all Patients With Lung Cancer, Both Postdiagnosis (for those who accessed pain medication) and Predeath (for those who accessed pain medication and also died during the study period), by Cancer Stage

Category	Local, No. (%)	Regional, No. (%)	Advanced, No. (%)	Unknown, No. (%)
Timing of nonopioid access, weeks				
First dispensing from diagnosis				
< 2	423 (39)	665 (31)	3,270 (47)	1,395 (28)
2-4	141 (13)	360 (17)	1,383 (20)	817 (16)
4-12	422 (38)	723 (34)	1,470 (21)	1,366 (28)
12-24	72 (7)	242 (11)	513 (7)	725 (15)
> 24	40 (4)	126 (6)	299 (4)	659 (13)
Median in days (IQR)	26 (46)	29 (55)	15 (33)	35 (84)
Before death, weeks				
< 2	1 (0)	53 (4)	709 (11)	260 (6)
2-4	1 (0)	68 (5)	732 (12)	239 (6)
4-12	5 (2)	206 (16)	1,861 (30)	706 (18)
12-24	9 (4)	201 (15)	1,255 (20)	655 (16)
> 24	240 (94)	781 (60)	1,715 (27)	2,173 (54)
Median in days (IQR)	1,038 (1,269)	230 (474)	76 (153)	191 (329)
Timing of mild or moderate opioid access, weeks				
First dispensing from diagnosis				
< 2	225 (31)	367 (27)	1,474 (44)	749 (26)
2-4	95 (13)	184 (14)	572 (17)	398 (14)
4-12	260 (36)	428 (32)	754 (22)	719 (25)
12-24	81 (11)	191 (14)	348 (10)	475 (17)
> 24	63 (9)	171 (13)	231 (7)	521 (18)
Median in days (IQR)	33 (60)	38 (79)	17 (47)	45 (114)
Before death				
< 2	- (0)	21 (3)	206 (7)	87 (4)
2-4	1 (1)	29 (4)	236 (8)	108 (5)
4-12	6 (4)	108 (13)	847 (28)	355 (15)
12-24	7 (4)	127 (16)	675 (22)	375 (16)
> 24	150 (91)	516 (64)	1,042 (35)	1,370 (60)
Median in days (IQR)	913 (1,103)	265 (455)	103 (185)	222 (330)
Timing of strong opioid access, weeks				
First dispensing from diagnosis				
< 2	198 (38)	375 (24)	2,557 (37)	978 (24)
2-4	56 (11)	219 (14)	1,286 (19)	554 (13)
4-12	199 (38)	454 (29)	1,711 (25)	954 (23)
12-24	40 (8)	268 (17)	724 (11)	680 (16)
> 24	33 (6)	255 (16)	591 (9)	978 (24)
Median in days (IQR)	31 (52)	44 (98)	22 (52)	54 (144)
Before death				
< 2	5 (4)	111 (10)	1,176 (18)	588 (16)
2-4	2 (2)	97 (9)	885 (14)	335 (9)
4-12	7 (6)	253 (23)	2,008 (32)	843 (23)
12-24	11 (9)	173 (16)	1,138 (18)	634 (17)
> 24	102 (80)	478 (43)	1,168 (18)	1,225 (34)
Median in days (IQR)	869 (1,335)	123 (315)	53 (106)	88 (206)

Abbreviation: IQR, interquartile range.

TABLE 4. Timing of Pain Medication Access for Māori and Non-Māori Patients With Advanced Lung Cancer, Both Postdiagnosis (for those who accessed pain medication) and Predeath (for those who accessed pain medication and also died during the study period), by Cancer Stage

Category	Māori, No. (%)	Adj. %[a]	Adj. OR (95% CI)[b]	Non-Māori, No. (%)	Adj. %	Adj. OR[b]
Advanced						
Timing of nonopioid access, weeks						
First dispensing from diagnosis						
< 2	653 (49)	49	1.1 (0.97 to 1.24)	2,612 (47)	47	Ref
2-4	254 (19)	19	0.97 (0.83 to 1.13)	1,129 (20)	19	Ref
4-12	275 (21)	21	0.94 (0.81 to 1.09)	1,193 (21)	21	Ref
12-24	89 (7)	7	0.88 (0.69 to 1.13)	423 (8)	7	Ref
> 24	62 (5)	4	1.03 (0.77 to 1.38)	236 (4)	5	Ref
Median in days (IQR)	14 (34)			15 (32)		
Before death						
< 2	149 (12)	12	1.19 (0.92 to 1.56)	560 (11)	8	Ref
2-4	132 (11)	10	0.9 (0.72 to 1.12)	600 (12)	10	Ref
4-12	372 (30)	30	1.08 (0.91 to 1.28)	1,487 (29)	27	Ref
12-24	262 (21)	22	1.07 (0.88 to 1.31)	992 (20)	20	Ref
> 24	305 (25)	26	0.75 (0.58 to 0.97)	1,409 (28)	35	Ref
Median in days (IQR)	74 (137)			76 (157)		
Timing of mild or moderate opioid access, weeks						
First dispensing from diagnosis						
< 2	318 (45)	45	1.05 (0.89 to 1.25)	1,155 (43)	45	Ref
2-4	105 (15)	15	0.82 (0.65 to 1.04)	467 (18)	17	Ref
4-12	167 (24)	23	1.12 (0.91 to 1.37)	586 (22)	22	Ref
12-24	81 (11)	12	1.16 (0.89 to 1.53)	267 (10)	10	Ref
> 24	39 (5)	5	0.72 (0.5 to 1.04)	192 (7)	7	Ref
Median in days (IQR)	18 (51)			17 (45)		
Before death						
< 2	48 (8)	8	1.49 (0.95 to 2.36)	158 (7)	5	Ref
2-4	48 (8)	7	0.97 (0.67 to 1.4)	188 (8)	7	Ref
4-12	196 (31)	30	1.24 (0.97 to 1.6)	651 (28)	25	Ref
12-24	141 (22)	22	0.81 (0.62 to 1.05)	534 (23)	23	Ref
> 24	206 (32)	34	0.83 (0.6 to 1.14)	835 (35)	41	Ref
Median in days (IQR)	92 (174)			105 (187)		
Timing of strong opioid access, weeks						
First dispensing from diagnosis						
< 2	517 (38)	39	1.04 (0.92 to 1.19)	2,036 (37)	37	Ref
2-4	224 (17)	17	0.88 (0.75 to 1.04)	1,060 (19)	18	Ref
4-12	331 (24)	24	1 (0.87 to 1.16)	1,380 (25)	24	Ref
12-24	155 (11)	11	1.08 (0.89 to 1.31)	568 (10)	11	Ref
> 24	126 (9)	9	1.01 (0.82 to 1.25)	465 (8)	10	Ref
Median in days (IQR)	23 (61)			21 (50)		
Before death						
< 2	255 (20)	19	1.3 (1.07 to 1.59)	921 (18)	14	Ref
2-4	172 (14)	13	0.98 (0.81 to 1.2)	713 (14)	12	Ref
4-12	407 (32)	31	1.08 (0.93 to 1.26)	1,601 (31)	29	Ref

(Continued on following page)

TABLE 4. Timing of Pain Medication Access for Māori and Non-Māori Patients With Advanced Lung Cancer, Both Postdiagnosis (for those who accessed pain medication) and Predeath (for those who accessed pain medication and also died during the study period), by Cancer Stage (Continued)

Category	Māori, No. (%)	Adj. %[a]	Adj. OR (95% CI)[b]	Non-Māori, No. (%)	Adj. %	Adj. OR[b]
			Advanced			
12-24	234 (18)	19	0.97 (0.8 to 1.17)	902 (18)	20	Ref
> 24	200 (16)	17	0.66 (0.52 to 0.83)	968 (19)	25	Ref
Median in days (IQR)	51 (96)			53 (108)		

NOTE. Patients with local, regional, and unstaged disease are presented in the Data Supplement.

Abbreviations: adj, adjusted; IQR, interquartile range; OR, odds ratio; ref, reference.

[a]Age-standardized to the total Māori cancer population diagnosed with any cancer between 2007 and 2016.

[b]Adjusted for age and sex for first dispensing from diagnosis models and additionally adjusted for delay from diagnosis to death for before death models.

frame and excluded all those who died within 28 days or 4 weeks of diagnosis (data not shown). This limits the likelihood of residual confounding and increases the likelihood that our findings represent a true difference between Māori and non-Māori in timely access to pain medicines before death. This finding is in line with recent evidence from the United States, which found that Black patients with cancer were less likely to access opioids and 30% more likely to have pain-related emergency department visits in the 30 days before death compared with White patients (adj. OR, 1.29; 95% CI, 1.16 to 1.37).[17] More broadly, the disparities found in the current study are also in line with previous observations that Māori experience greater barriers to best practice cancer care than non-Māori, including timeliness of access to care.[18] Regardless of whether these observed disparities are partially attributable to the nature of the data, they require further scrutiny.

The current study used national-level cancer registry, mortality, and community pharmaceutical data, with collection of these data mandated by government to maximize

TABLE 5. Other Pain Medication Access (or nonaccess) Within 12 Months of Diagnosis Among Those With Advanced Lung Cancer Who Did Not Access Strong Opioids, Separately by Ethnicity, Age Group, Deprivation, and Rurality

Category	No Strong Opioids	Alternative to Strong Opioids, No. (%)		
		No Pain Medication	Nonopioids	Mild or Moderate Opioids
Alternatives to strong opioids	2,412	1,222 (51)	1,086 (45)	606 (25)
By ethnicity				
Māori	406	200 (49)	188 (46)	116 (29)
Non-Māori	1,996	1,016 (51)	894 (45)	489 (24)
By age, years				
< 50	90	34 (38)	53 (59)	38 (42)
50-64	612	263 (43)	320 (52)	213 (35)
65-74	781	408 (52)	334 (43)	194 (25)
> 75	929	517 (56)	379 (41)	161 (17)
By deprivation (NZDep quintile)				
1-2	281	130 (46)	137 (49)	80 (28)
3-4	323	159 (49)	146 (45)	82 (25)
5-6	417	215 (52)	183 (44)	117 (28)
7-8	585	281 (48)	276 (47)	147 (25)
9-10	677	354 (52)	303 (45)	157 (23)
By rurality (URPC category)				
Urban	1,679	816 (49)	794 (47)	416 (25)
Independent urban	403	215 (53)	169 (42)	107 (27)
Rural	201	108 (54)	82 (41)	60 (30)

Abbreviations: NZDep, New Zealand's Deprivation Index; URPC, Urban-Rural Profile Classification.

completeness and validity. The national coverage of this study ensures the representativeness of our findings to the total New Zealand lung cancer population, since all incident cases were included along with all relevant data from the study follow-up period. To the best of our knowledge, this is the first study of its kind to provide national-level evidence regarding Indigenous access to pain medication following a diagnosis of cancer and how this compares with non-Indigenous populations.

We note that the current study examines community dispensings of pain medicines only (ie, excludes hospital and some hospice dispensings, where medicines were supplied in bulk, as well as privately funded medicines). This is a limitation, since around half of New Zealand patients with cancer will die in either a hospital or hospice 1—with the ramification that we may be missing data for those patients who first accessed pain medication very shortly before death in a hospital or hospice. There is also the plausibility that this could lead to differential misclassification between Māori and non-Māori in terms of access to medicine (particularly opioids) in the weeks before death. Recent (currently unpublished) observations within the Trajectories at the End of Life study in New Zealand suggest that Māori with cancer may be marginally more likely to die within hospital or hospice compared with non-Māori patients (Heather McLeod, personal communication). This suggests that we may be underestimating the proportion of Māori patients who receive pain medication shortly before death relative to non-Māori. This will only be important for those who have not received such medication before that point, so we expect any such bias to be minimal.

We also note that pain may not be the only indication for a prescription of opioids in patients with lung cancer: they might also be prescribed to control breathlessness.[19] It is not possible based on the available data to disentangle the indication for the prescription from the prescription itself; however, we do note that equity of access to these medicines between Māori and non-Māori remains equally important regardless of whether the predominant indication was for pain or breathlessness.

Finally, we did not examine dosage and/or mechanism of medicine delivery in this study. Since parenteral administration might be indicated for those nearing end of life, future studies may examine disparities in access to parenteral opioids in the weeks before death to establish whether Māori are less likely to access this best practice treatment. We also did not examine the concurrent use of more than one type of opioid or nonopioid medicine.

In conclusion, we found that the majority of patients with lung cancer are accessing some form of pain medicine and there do not appear to be differences between Māori and non-Māori in terms of overall access. More than half of all patients accessed some form of pain medicine within 4 weeks of diagnosis, with no pronounced difference in the timing of first medicine access following diagnosis between Māori and non-Māori. However, we did observe that Māori appear more likely to first access pain medicine in the 2 weeks before death and commensurately less likely to have first access more than 24 weeks before death. Given the plausibility that there are differences in first access to pain medicines (particularly opioid medicines) among Māori approaching end of life, further investigation of the factors contributing to this disparity is required.

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST
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