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ORIGINAL ARTICLE

The prevalence and intensity of pain in older people living in retirement villages in Auckland, New Zealand

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Abstract

Chronic pain is common in older people. However, little is known about how pain is experienced in residents of retirement villages ('villages'), and how pain intensity and associations are experienced in relation to characteristics of residents and village living. We thus aimed to examine pain levels, prevalence and associated factors in village residents. The current paper is a cross-sectional analysis of baseline data from the 'Older People in Retirement Villages' study in Auckland, New Zealand. Between July 2016 and August 2018, 578 village residents were interviewed face-to-face by gerontology nurse specialists, using interRAI Community Health Assessment (CHA) and customised survey. We used a validated pain scale and multivariable logistic regression analyses adjusted for pre-specified confounders. Residents' median age was 82 years; 420 (73%) were female; 270 (47%) exhibited/reported daily pain, and in 11% this was severe. After controlling for confounders, daily pain was positively associated with self-reported arthritis (OR = 3.88, 95% CI = 2.57–5.87), poor/fair self-reported health (OR = 3.19, 95% CI = 1.29–7.93), having no health clinic on-site (OR = 1.76, 95% CI = 1.10–2.83), and minimal fatigue (diminished energy but completes normal day-to-day activities) (OR = 1.77, 95% CI = 1.11–2.81). Similar associations were observed for levels of pain. We conclude that levels of pain and prevalence of daily pain are high in village residents. Self-reported arthritis, self-reported poor/fair health, no health clinic on-site and minimal fatigue are all independently associated with a higher risk of daily pain and with levels of pain. This study suggests potential opportunities for villages to better provide on-site support to decrease prevalence and severity of pain for their residents, and thus potentially increase wellbeing and quality-of-life, though as we cannot prove causality, more research is needed.

KEYWORDS
Community Health, Housing for the Elderly, Older People's Health, pain

1 | INTRODUCTION

Chronic pain is common in older people (Crowe et al., 2017; Eggermont et al., 2009, 2014; Landi et al., 2001; Sawyer et al., 2006) with prevalence estimates of 25% to 76% (British Geriatrics Society, 2013). Aside from the direct suffering caused, its presence in older people is a risk factor for healthcare use, falls, hypertension, insomnia, depression, social dis-connectedness, progressive frailty

and disability, particularly for the older-old and especially for discretionary activities of daily living (Blyth et al., 2001; Blyth et al., 2004; Blyth et al., 2005; Blyth et al., 2007; Crowe et al., 2017; Eggermont et al., 2009; Eggermont et al., 2014; Gibson & Lussier, 2012; Landi et al., 2009; Molton & Terrill, 2014; Olsen et al., 2013; Parkinson et al., 2010; Stephen et al., 2005; Tian et al., 2017; Tse et al., 2019; Vitiello et al., 2014).

The high prevalence of chronic pain in older people may, in addition to comorbidity as a cause, be due to the views many have regarding pain and use of pain medications. Cognitively intact older adults may mistakenly regard pain as a normal feature of ageing, and/or as less important than other symptoms, and thus may be less likely to report it or seek help (Molton & Terrill, 2014). These attitudes to pain may indeed be psychologically protective against the emotional burden commonly associated with chronic pain (Williamson, 2000). It is unclear whether, in older people, pain prevalence increases with further advancing age. Evidence suggests that this depends on pain severity, pain site(s) and the presence of intermittent rather than constant pain (British Geriatrics Society, 2013; Jones et al., 2006; Jordan et al., 2018). Evidence, however, consistently shows that moderately/severely cognitively impaired older people are less likely to report pain, probably, in part, due to impaired communication skills (Ahn et al., 2015; Jordan et al., 2018).

Older people's utilisation of analgesics may differ from that of other prescribed medications; participants in one study claimed they would take analgesics only when pain was 'very bad' (Sale et al., 2006). In another study, 40% of older adults reported daily pain, with under a quarter of these receiving any analgesia, and the 'old-old' (≥85 years) even less likely to receive analgesics (Landi et al., 2001), an observation well (though not universally) recognised (Blyth et al., 2005; Molton & Terrill, 2014; Sawyer et al., 2006). Older people are more likely to have disproportionate concerns about analgesic addiction, and poorer knowledge about pain management, but understandable concerns about side effects and drug interactions (Molton et al. 2104; Yeager et al., 1997). Whatever the reasons, older people are more likely to be reluctant to take analgesics, take inadequate doses and depart from prescription regimens (Bentley, 2003; Molton & Terrill, 2014). Financial restrictions and transport limitations restrict older people's access to adequate assessment and treatment of chronic pain (Janevic et al., 2017; Poleshuck & Green, 2008).

In New Zealand (NZ) and in many other countries including Australia and the United States, there has been a major expansion of continuing care retirement communities or 'retirement villages' ('villages') in recent decades. In 2019 approximately 14% of all NZers aged over 75 years lived in villages (Jones Lang LaSallle, 2020). These villages consist of apartments and/or other dwellings in which the residents live independent lives but have access to variable communal facilities. They do not routinely provide increased access to healthcare support but in some cases, additional services (up to and including home care) can be purchased at additional cost to the resident, and some villages offer a nurse and/or healthcare clinic on site. Older people report that one reason for moving into villages is expectation of greater support with health-related issues, and evidence suggests that health tends to improve after relocation (Croucher, 2006; Holland et al., 2017). Conversely, rural residence, social disadvantage and financial constraints, factors less likely applicable to village residents, are associated with less reporting of pain (Bentley, 2003; Blyth et al., 2001; Sawyer et al., 2006).

The prevalence of chronic pain is greater for those older people living in long-term-care (LTC) facilities, although recent NZ evidence indicates that regular formal assessment may provoke interventions reducing pain (InterRAI New Zealand, 2020). It might thus be postulated that increased levels of pain also exist in village residents, given that the health of village residents lies somewhere between that of LTC residents and those living in their own homes in the community (Broad et al., 2020). NZ's village numbers have grown exponentially in recent decades whilst LTC numbers have not (Broad et al., 2011)—suggesting that villages, not LTC, may now be utilised by those less physically dependent (Boyd et al., 2011).

We have recently reported that pain control is a commonly unmet need in village residents (Broad et al., 2020). The current paper, part of the same study of residents' demographics, functional status and healthcare trajectories, expands on the above finding: assessing prevalence, frequency and severity of pain, describing the demographic, medical and associated social factors, and whether there is evidence of it being modulated differently by the village experience.

What is known about this topic?

- Chronic pain is common in older people.
- The presence of chronic pain in older people is a risk factor for healthcare use and for many adverse outcomes.
- Internationally there has been a major expansion of retirement villages in recent decades, but little is known about how pain is experienced in retirement village residents.

What this paper adds

- Nearly half of retirement village residents experience daily pain, often with no therapeutic regimen in place.
- Self-reported arthritis, poor/fair health, fatigue and no on-site health clinic are all independently associated with higher pain burden.
- This suggests opportunities for retirement villages and heathcare providers to provide on-site support to decrease residents' pain burden and improve wellbeing.

2 | METHODS

This was a cross-sectional analysis, reported in accordance with STROBE guidelines (STROBE, 2007) of baseline data from the "Older People in Retirement Villages" study. Methods detailed

elsewhere (Peri et al., 2020), briefly comprised: All villages in Auckland/Waitematā District Health Boards (ADHB/WDHB) were eligible to participate. We planned to survey all villages in both DHBs ($n = 65$ in the study period) that provided housing predominantly for older residents and included shared/ communal facilities. All residents were potentially eligible for recruitment. *Exclusions*: Refusal/ inability to provide informed consent; (Addenbrookes Cognitive Examination Revised (Mioshi et al., 2006) <65 or residents the research Gerontology Nurse Specialist (GNS)/general practitioner felt lacked capacity—to comply with NZ legislation).

In Phase 1 of the study, the basis of the current analysis, GNSs assessed residents' health and function using the interRAI Community Health Assessment (CHA). InterRAI assessments are widely used in NZ, not least because they are mandated in the assessment of eligibility to publicly-funded care provision. Where an interRAI Home Care (HC) assessment had been completed within the previous 6 months, this assessment was used. The interRAI comprehensive geriatric assessment includes domains of function, health, social support and service use. CHA records frequency, intensity, consistency, breakthrough and control of pain.

As part of standard interRAI processes, participants and observers (e.g. family—though as our subjects were not significantly cognitively impaired and thus reliable 'reporters' the opinions of family and others were very rarely required) were asked to comment on pain experience, thus:

a. Frequency with which the person complains/ shows evidence of pain (including grimacing, teeth clenching, moaning, withdrawal when touched, other non-verbal signs). No pain = 0, present but not in last 3 days = 1, exhibited on 1–2 of last 3 days = 2, exhibited daily in last 3 days = 3;
b. Intensity of highest level of pain present: nil = 0, mild = 1, moderate = 2, severe = 3, times when pain is horrible or excruciating = 4.

A pain scale 0–3 (0 = no pain; 1 = less than daily pain; 2 = daily pain but not severe pain; 3 = daily severe pain) was derived by algorithm scores creating an outcome scale (Fries et al., 2001; InterRAI, 2014), with (thus) a threshold of 2 used to identify daily pain. It thus provided a simple method to summarise reported frequency/intensity of pain using routinely collected interRAI Minimum Data Set data.

Any of several interRAI Clinical Assessment Protocols (CAPs) may be triggered indicating potential for improvement or preventing decline. The Informal Support CAP is triggered when residents are: (1) not independent with meals/housework/shopping/transport, (2) alone for long periods or lives alone and (3) no primary informal helper is present. The Mood CAP identifies any immediate threats to wellbeing posed by depression/anxiety and triggers medium-risk when the resident's depression rating scale (DRS) = 1–2, and high-risk when DRS = 3–14. Overall goals of care include optimising activities of daily life, social life and physical activity, relieving suffering and recognising the association of pain with other issues including depression, loneliness and functional decline. Medication data were obtained from the interRAI CHA assessments which recorded all medicines taken in the last 72 h (self-reported by residents). All interRAI data are held by interRAI contracted by NZ's Ministry of Health.

Residents also self-completed an unvalidated, custom-designed questionnaire describing health and functional items, social engagement, decision-making paradigms (e.g. move to village; possible future relocation to LTC); views on village environment.

The study was registered with the Australian New Zealand Clinical Trials Registry (ACTRN12616000685415) and approved by NZ's Health and Disability Ethics Committee (16/CEN/34). All participating residents provided written, informed consent. The project was funded by NZ's National Science Challenge: Ageing Well (UOOX1508, 12,815/1, SUB1301), and by Waitematā District Health Board.

Statistical Analysis: Descriptive results included the number of observations (n) and corresponding percentage (%) for categorical variables, and mean and standard deviation (SD) for continuous variables. One-way analysis of variance (ANOVA) and chi-squared tests were used to detect the difference in pain levels (from the four-group pain scale) and proportion of daily pain among different baseline characteristics. Multivariable logistic regression with odds ratios (ORs) and 95% confidence intervals (CIs) explored factors associated with daily pain. Multivariable linear regression with mean differences (MDs) and 95%CIs explored factors associated with pain levels. Pre-specified co-variables were included based on literature (Kindler et al., 2010; McBeth et al., 2001; Mills et al., 2019; Wong et al., 2021) and study group consensus of opinion. These variables included age, gender, ethnicity, marital status, physical activity in previous 3 days, smoking, drinking, family relationships, informal support CAP, pet ownership, length of stay in village, self-reported health, mood CAP (depression risk), loneliness, difficulty falling asleep, anxiety, fatigue, falls, sensory loss, arthritis, number of prescribed medications, depression medications – selective serotonin reuptake inhibitors (SSRIs), village size, availability of on-site nurse, regular health clinic on-site and resident's satisfaction with living in the village. Living arrangement was not included in multivariable models due to the high correlation with marital status. All analyses were performed with SAS v9.4 (SAS Institute Inc.) and a two-sided p-value < 0.05 was considered statistically significant.

3 | RESULTS

In 2016–2018, we approached 53 village managers of the 65 villages in ADHB/WDHB catchments. Of these, 34 (64%) agreed to participate. We planned to recruit residents from a random sample of 'units' or apartments in each village. However, this proved difficult in some villages due to access issues detailed elsewhere, and in these, we recruited volunteers (i.e., not randomly sampled) (Connolly et al., 2021; Peri et al., 2020). We recruited 578 residents (361 [62%] volunteers; 217 [38%] residents enrolled from 190 sampled units). An additional 12 residents (9 sampled and 3 volunteers) were excluded as not having legal capacity for consent (Figure 1).

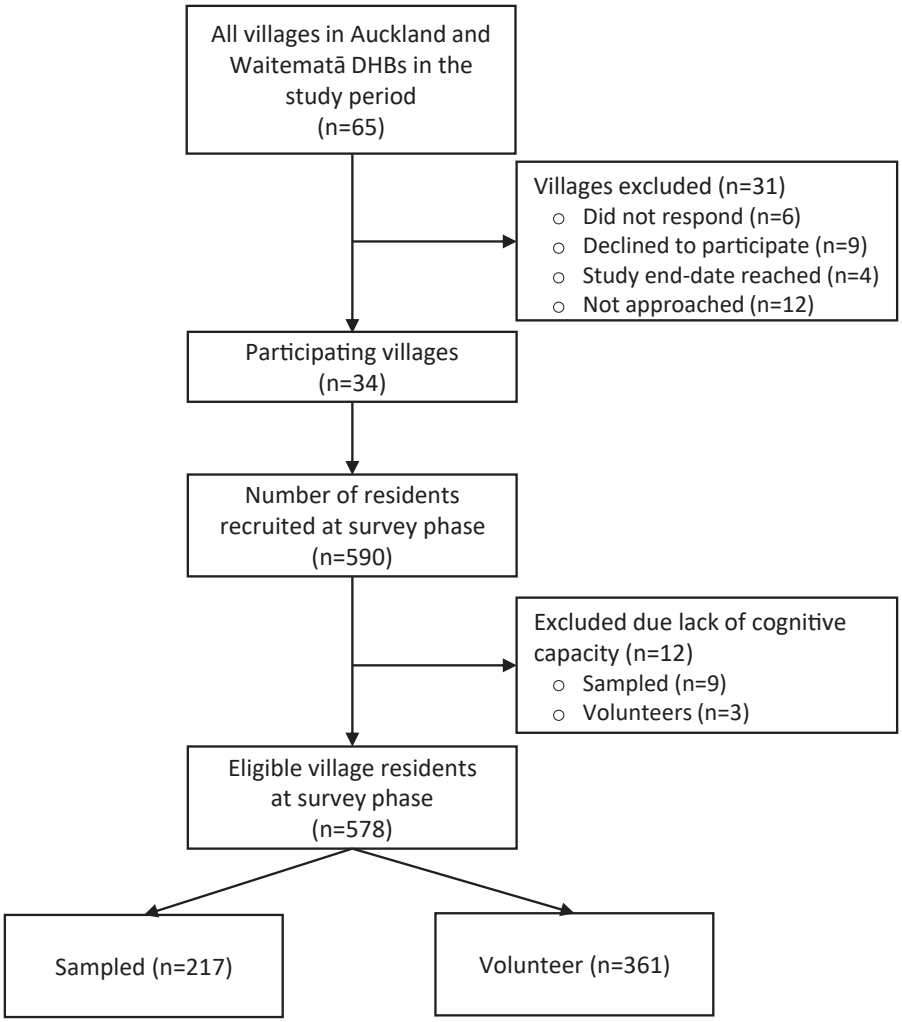

FIGURE 1 Flow diagram of eligible residents

The interRAI CHA was used for 565 (98%) residents; 13 (2%) used an interRAI HC completed within the previous 6 months.

Median age of participants was 82 years (interquartile range 76–87 years), 420 (73%) were women. Two-hundred and fifty-three (44%) were widowed, 247 (43%) married/partnered. Five-hundred and fifty-eight (97%) self-identified as European. Three-hundred and fifty-three (61%) lived alone (Table 1). Five-hundred and sixty-five (98%) residents were independent in personal care; 13 (2%) received 24-h care (within their apartment/unit) from the village, equivalent to LTC support.

On assessment, 197 subjects (34%) had no pain (pain scale = 0); 111 (19%) had less than daily pain (Pain scale = 1); 205 (36%) had daily pain but not severe (Pain scale = 2); 65 (11%) had daily severe pain (Pain scale = 3). Mean (SD) pain levels were 1.2 (1.0). In those residents (n = 230, 47%) living with daily pain, 63 (23%) either had no therapeutic regimen (analgesics, massage, acupuncture, transcutaneous electrical nerve stimulation [TENS] and/or hydrotherapy) or had inadequate pain control despite following a regimen. Further pain measures are shown in Table 2.

Table 1 summarises the characteristics of residents with and without daily pain. Residents with the following characteristics were more likely to have daily pain: to be women, to trigger the informal support CAP, to have household pets, to self-report poor/fair health, to trigger the mood CAP, to self-report arthritis, to be taking ≥9 prescribed medications over a 24-h period, to be taking SSRIs, to be living in a village that did not employ a nurse or have a regular health clinic on-site, to receive home-care and to be living in a large village. Residents with daily pain also participated in fewer hours of exercise/ physical activities in the previous 3 days and reported lower levels of health and higher levels of fatigue. Similarly, continuous pain scale levels showed significant differences on most of the above baseline characteristics as well as marital status, living arrangement, loneliness, difficulty falling asleep and falls.

After adjusting for the pre-specified confounders (Table 3), daily pain was significantly and positively associated with self-reported arthritis (OR = 3.88, 95% CI = 2.57–5.87, $p < 0.001$), poor/fair self-reported health (OR = 3.19, 95% CI = 1.29–7.93, $p = 0.01$), large village size (OR = 2.17, 95% CI = 1.20–3.94, $p = 0.01$), having no regular health clinic on-site (OR = 1.76, 95% CI = 1.10–2.83, $p = 0.02$), and with minimal fatigue (OR = 1.77, 95% CI = 1.11–2.81, $p = 0.02$). No significant relationship was observed with hours of

TABLE 1 Characteristics of eligible residents stratified by daily pain group

	All participants ($n = 578$)	Daily pain ($n = 270$), *n* (%)	p value for group difference[a]	Continuouspain scale (0–3), mean (SD)	*p* value for group difference[a]
Age categories (year), *n* (%)					
60–74	106 (18.3)	45 (42.5)	0.50	1.1 (1.0)	0.50
75–79	142 (24.6)	75 (52.8)		1.3 (1.1)	
80–84	139 (24.0)	62 (44.6)		1.2 (1.0)	
85–89	144 (24.9)	65 (45.1)		1.3 (1.0)	
90–100	47 (8.1)	23 (48.9)		1.2 (1.1)	
Gender, *n* (%)					
Men	158 (27.3)	60 (38.0)	0.01	1.0 (1.0)	<0.001
Women	420 (72.7)	210 (50.0)		1.3 (1.0)	
Ethnicity, *n* (%)					
NZ European	411 (71.1)	191 (46.5)	0.96	1.2 (1.1)	0.94
Other European	147 (25.4)	70 (47.6)		1.2 (1.1)	
Non-European	20 (3.5)	9 (45.0)		1.2 (0.8)	
Marital status, *n* (%)					
Married/Civil Union/ Defacto	247 (42.7)	105 (42.5)	0.21	1.1 (1.1)	0.002
Widowed	253 (43.8)	125 (49.4)		1.4 (1.0)	
Separated/Divorced/ Never Married/ Other	78 (13.5)	40 (51.3)		1.4 (1.0)	
Living arrangement, *n* (%)					
Alone	353 (61.1)	173 (49.0)	0.17	1.3 (1.0)	0.002
Others	225 (38.9)	97 (43.1)		1.1 (1.0)	
Total hours of exercise or physical activity in last 3 days, *n* (%)					
None	87 (15.1)	50 (57.5)	<0.001	1.4 (1.1)	0.003
Less than 1 h	166 (28.7)	90 (54.2)		1.4 (1.0)	
1–2 h	165 (28.5)	65 (39.4)		1.1 (1.0)	
3–4 h	118 (20.4)	55 (46.6)		1.2 (1.1)	
More than 4 h	42 (7.3)	10 (23.8)		0.8 (1.0)	
Smokes tobacco daily, *n* (%)					
No	570 (98.6)	265 (46.5)	0.48	1.2 (1.0)	0.29
Yes	8 (1.4)	5 (62.5)		1.6 (1.2)	
Highest number of drinks in any 'single sitting' in last 14 days, *n* (%)					
None	189 (32.7)	98 (51.9)	0.09	1.4 (1.0)	0.13
1	266 (46.0)	123 (46.2)		1.2 (1.0)	
2–4	122 (21.1)	48 (39.3)		1.1 (1.0)	
5 or more	1 (0.2)	1 (100.0)		2.0 (NA)	
Strong and supportive relationship with family, *n* (%)					
No	30 (5.2)	19 (63.3)	0.06	1.5 (0.9)	0.11
Yes	548 (94.8)	251 (45.8)		1.2 (1.1)	
CAP: informal support, n (%)					
Not triggered	378 (65.4)	160 (42.3)	0.004	1.1 (1.0)	<0.001
Triggered	200 (34.6)	110 (55.0)		1.5 (1.1)	

TABLE 1 (Continued)

	All participants ($n = 578$)	Daily pain ($n = 270$), n (%)	p value for group difference[a]	Continuouspain scale (0–3), mean (SD)	p value for group difference[a]
Do you currently have a pet in your household? n (%)					
No	505 (87.4)	224 (44.4)	0.003	1.2 (1.0)	0.01
Yes	73 (12.6)	46 (63.0)		1.5 (1.0)	
Length of stay in village (years), n (%)					
<1	90 (15.6)	37 (41.1)	0.18	1.1 (1.0)	0.16
1 to <5	277 (47.9)	136 (49.1)		1.3 (1.0)	
5 to <10	116 (20.1)	47 (40.5)		1.2 (1.1)	
≥10	95 (16.4)	50 (52.6)		1.4 (1.1)	
Self-reported health, n (%)					
Excellent	60 (10.4)	13 (21.7)	<0.001	0.6 (0.9)	<0.001
Good	382 (66.1)	175 (45.8)		1.2 (1.0)	
Fair	118 (20.4)	69 (58.5)		1.6 (1.1)	
Poor	18 (3.1)	13 (72.2)		1.9 (1.1)	
CAP: mood (depression risk), n (%)					
Not triggered (DRS = 0)	449 (77.7)	197 (43.9)	0.03	1.2 (1.0)	0.01
Medium risk (DRS = 1–2)	106 (18.3)	62 (58.5)		1.5 (1.0)	
High risk (DRS = 3–14)	23 (4.0)	11 (47.8)		1.3 (1.1)	
Lonely: says or indicates that he/she feels lonely, n (%)					
No	429 (74.2)	191 (44.5)	0.07	1.2 (1.1)	0.03
Yes	149 (25.8)	79 (53.0)		1.4 (1.1)	
Difficulty falling asleep, n (%)					
Not present	385 (66.6)	165 (42.9)	0.06	1.1 (1.0)	0.001
Present but no exhibited in last 3 days	40 (6.9)	21 (52.5)		1.4 (1.1)	
Exhibited on 1 of last 3 days	20 (3.5)	14 (70.0)		1.9 (0.8)	
Exhibited on 2 of last 3 days	18 (3.1)	10 (55.6)		1.4 (1.1)	
Exhibited daily in last 3 days	115 (19.9)	60 (52.2)		1.5 (1.1)	
Felt anxious restless/uneasy					
Not in the last 3 days	524 (90.7)	247 (47.1)	0.82	1.3 (1.0)	0.72
Not in the last 3 days - but often feel that way	13 (2.2)	5 (38.5)		1.1 (1.2)	
In 1–2 of the last 3 days	16 (2.8)	8 (50.0)		1.3 (0.9)	
Daily in the last 3 days	25 (4.3)	10 (40.0)		1.0 (1.1)	
Fatigue: inability to complete normal daily activities, n (%)					
None	273 (47.2)	101 (37.0)	<0.001	1.0 (1.0)	<0.001
Minimal	244 (42.2)	136 (55.7)		1.4 (1.0)	
Moderate	58 (10.0)	31 (53.4)		1.3 (1.1)	
Severe	3 (0.5)	2 (66.7)		2.0 (1.0)	
CAP: falls, n (%)					
Not triggered	517 (89.4)	242 (46.8)	0.08	1.2 (1.0)	0.05
Medium risk	54 (9.3)	22 (40.7)		1.1 (1.1)	
High risk	7 (1.2)	6 (85.7)		2.1 (0.7)	

(Continues)

TABLE 1 (Continued)

	All participants ($n = 578$)	Daily pain ($n = 270$), n (%)	p value for group difference[a]	Continuouspain scale (0–3), mean (SD)	p value for group difference[a]
Some level of dual sensory loss (Deaf/Blind severity ≥3), *n* (%)					
No	530 (91.7)	244 (46.0)	0.28	1.2 (1.0)	0.61
Yes	48 (8.3)	26 (54.2)		1.3 (1.1)	
Arthritis, *n* (%)					
No	357 (61.8)	125 (35.0)	<0.001	1.0 (1.0)	<0.001
Yes	221 (38.2)	145 (65.6)		1.7 (1.0)	
Prescribed medications over a 24-h period, *n* (%)					
<9	500 (86.5)	225 (45.0)	0.04	1.2 (1.0)	0.02
≥9	78 (13.5)	45 (57.7)		1.5 (1.1)	
Taking anti-depressant medicines (SSRIs), *n* (%)					
No	457 (79.1)	200 (43.8)	0.006	1.2 (1.0)	0.002
Yes	121 (20.9)	70 (57.9)		1.5 (1.1)	
Over the past 2 weeks received home care, *n* (%)					
No	380 (65.7)	166 (43.7)	0.05	1.2 (1.1)	0.02
Yes	198 (34.3)	104 (52.5)		1.4 (1.1)	
Village size (units), *n* (%)					
<60	84 (14.5)	31 (36.9)	0.05	1.2 (1.0)	0.49
≥60	494 (85.5)	239 (48.4)		1.3 (1.1)	
A nurse available to independent or serviced unit residents, *n* (%)					
No	179 (31.0)	87 (60.0)	0.001	1.3 (1.0)	0.16
Yes	399 (69.0)	137 (41.8)		1.2 (1.1)	
Does the village have a regular health clinic, on site, for independent or serviced unit residents? *n* (%)					
No	237 (41.0)	128 (54.0)	0.003	1.4 (1.0)	0.001
Yes	341 (59.0)	142 (41.6)		1.1 (1.1)	
Overall, how satisfied are you with living in this retirement village, *n* (%)					
Very dissatisfied/ dissatisfied	17 (2.9)	9 (52.9)	0.48	1.2 (10)	0.50
Neutral, unsure	23 (4.0)	11 (47.8)		1.3 (1.2)	
Satisfied	189 (32.7)	96 (50.8)		1.3 (1.0)	
Very satisfied	349 (60.4)	154 (44.1)		1.2 (1.0)	

Abbreviations: CAP, interRAI Clinical Assessment Protocol; DRS, depression rating scale; SD, standard deviation; SSRIs, selective serotonin reuptake inhibitors.

[a]p value for differences in average pain levels among different baseline characteristics.

exercise/ physical activity in previous 3 days ($p = 0.37$). Higher levels of pain severity (continuous scale, 0 to 3) were significantly associated with higher risk falls risk (MD = 0.82, 95% CI = 0.10–1.54, $p = 0.03$), poor/fair self-reported health (MD = 0.76, 95% CI = 0.42–1.10, $p < 0.001$), self-reported arthritis (MD = 0.61, 95% CI = 0.45–0.78, $p < 0.001$), difficulty falling asleep one of last 3 days (MD = 0.59, 95% CI = 0.16–1.03, $p = 0.01$), no regular health clinic on-site (MD = 0.32, 95% CI = 0.13–0.52, $p = 0.001$), being women (MD = 0.19, 95% CI = 0.00–0.38, $p = 0.05$), and minimal fatigue (MD = 0.20, 95% CI = 0.01–0.39, $p = 0.04$). After further adjusting for other diagnoses potentially associated with pain, results were similar.

4 | DISCUSSION

To our knowledge, this study is the first study to report daily pain prevalence and levels, and associated factors in village residents.

Our results indicate that, despite their expectations of better healthcare (and thus better health experience) on moving into villages (Croucher, 2006), many older people in villages live with high levels of pain: nearly half of our cohort experience daily pain, and about one in ten live with daily severe or excruciating pain. Furthermore, nearly a quarter of residents living with daily pain are either following an inadequate therapeutic regimen or appear to have no regimen. This represents a significant level of unmet need and is

TABLE 2 Pain symptoms of eligible residents

Pain symptoms	Residents, *n* (%)
Frequency with which person complains or shows evidence of pain	
No pain	197 (34.1)
Present but not exhibited in last 3 days	44 (7.6)
Exhibited on 1–2 of last 3 days	67 (11.6)
Exhibited daily in last 3 days	270 (46.7)
Intensity of highest level of pain present	
No pain	197 (34.1)
Mild	147 (25.4)
Moderate	158 (27.3)
Severe	56 (9.7)
Times when pain is horrible or excruciating	20 (3.5)
Consistency of pain	
No pain	197 (34.1)
Single episode during last 3 days	3 (0.5)
Intermittent	281 (48.6)
Constant	97 (16.8)
Breakthrough pain (times in last 3 days when person experienced sudden, acute flare-ups of pain)	
No	538 (93.1)
Yes	40 (6.9)
Pain scale (range 0–3),	
0 (no pain)	197 (34.1)
1 (less than daily pain)	111 (19.2)
2 (daily pain but not severe pain	205 (35.5)
3 (daily severe pain)	65 (11.2)
Pain scale (range 0–3), mean (SD)	1.2 (1.0)
Daily pain, *n* (%)	
No	308 (53.3)
Yes	270 (46.7)
Therapeutic regimen followed, but pain control was not adequate	49 (8.5)
No therapeutic regimen is being followed for pain; pain is not adequately controlled	14 (2.4)
Pain CAP	
Not triggered	297 (51.4)
Medium priority (L1)	205 (35.5)
High priority (L2)	76 (13.1)

CAP, interRAI Clinical Assessment Protocol.

consistent with findings reported elsewhere for older adults in general (British Geriatrics Society, 2013; Crowe et al., 2017; Eggermont et al., 2009; Eggermont et al., 2014; Landi et al., 2001; Sawyer et al., 2006). One might, nonetheless, regard this figure as unexpectedly high given that known predictors of pain include geographical isolation and financial deprivation—factors not generally applicable to village residents (Boyd et al., 2011). However, we have previously shown that despite lack of *geographical* isolation, many residents in the current study report loneliness constantly or frequently (Boyd et al., 2020). Current reports suggest levels of pain in community-dwelling older adults living in their own homes experience similar levels of pain (around 12% with severe or excruciating pain) to those in villages (interRAI New Zealand et al., 2020). Therefore, it does not appear that pain levels are any worse or better for village residents. Given the growth of retirement villages internationally, these finding have potential implications outside New Zealand, and would merit replication in other jurisdictions.

In addition, we identified multiple factors independently associated with daily pain and/or with continuous pain levels, some of which are not previously described. Notably, having a regular health clinic available on-site was significantly associated with both lower risk of daily pain and lower levels of pain (Table 3).

The literature suggests that discretionary, physical activities of daily living appear most affected for older people in pain (Blyth et al., 2001; Blyth et al., 2004; Blyth et al., 2005; Blyth et al., 2007; Crowe et al., 2017; Eggermont et al., 2009; Eggermont et al., 2014; Gibson & Lussier, 2012; Landi et al., 2009; Molton & Terrill, 2014; Olsen et al., 2013; Parkinson et al., 2010; Stephen et al., 2005; Tian et al., 2017; Tse et al., 2019; Vitiello et al., 2014), but we did not confirm this. The literature is mixed on whether, in an older population, the oldest-old have more pain (British Geriatrics Society, 2013; Jordan et al., 2018). Again, we found no evidence for this in our cohort. We did confirm the associations previously described between the presence of pain and falls, but not any association with depression (Welsh et al., 2019; Zis et al., 2017). The relatively strong positive association between pain and living in a *large* village, even after adjustment for the availability of a clinic and other variables, is not previously reported. One might speculate that smaller villages facilitate greater staff awareness of the medical (and other) problems of their residents, and/or that larger facilities are more likely to attract those already experiencing pain/associated morbidity, but we have no evidence to support either suggestion.

Previous literature suggests that a reason commonly given for moving into a village is to gain assistance with health issues (Croucher, 2006; Holland et al., 2017; Buys 2000; Dodds, 2018). In the current study 61% of participants said a reason for moving into a village was for healthcare assistance, anticipating declining functional ability (Broad et al., 2020). However, a substantial proportion reported no nurse or health clinic was available on-site (Table 1), a finding confirmed in our separate unpublished survey of village managers. Crowe et al. (2017) have suggested that nurse-led pain assessments should be routinely conducted in older community-dwellers to improve pain control and quality-of-life, and reduce morbidity associated with chronic pain. It is thus interesting that our results indicate that the absence of regular clinic availability is very strongly associated with the presence of pain. There seems to be a discrepancy between what services potential future residents and current residents feel are, or should be provided in villages, and the services available (Broad et al., 2020). We believe this discrepancy needs addressing, though caution is needed: it is important not to extrapolate the *associations* seen in the present study and,

TABLE 3 Multivariable logistic regression and linear regression models for binary daily pain and continuous pain scale outcomes

Characteristic	Daily pain OR (95% CI), *p* value	Covariate adjusted *p* value	Pain scale (0–3) MD (95% CI), *p* value	Covariate adjusted *p* value
Age at interview (years)	0.99 (0.96, 1.03), 0.61	0.61	0.00 (−0.02, 0.01), 0.78	0.78
Gender				
Men	1.00	0.23	0.00	0.05
Women	1.34 (0.83, 2.14), 0.23		0.19 (0.00, 0.38), 0.05	
Ethnicity				
NZ European	1.00	0.72	0.00	0.59
Other European	0.89 (0.56, 1.41), 0.61		−0.09 (−0.27, 0.09), 0.34	
Non-European	1.38 (0.47, 4.01), 0.56		0.07 (−0.37, 0.50), 0.77	
Marital status				
Married/civil Union/defacto	1.00	0.79	0.00	0.20
Widowed	0.97 (0.56, 1.70), 0.93		0.12 (−0.11, 0.34), 0.31	
Separated/divorced/never married/other	1.20 (0.63, 2.32), 0.58		0.24 (−0.03, 0.51), 0.08	
Total hours of exercise or physical activity in previous 3 days				
None	1.00	0.37	0.00	0.85
Less than 1 h	1.11 (0.59, 2.11), 0.75		0.09 (−0.17, 0.35), 0.50	
1–2 h	0.79 (0.40, 1.56), 0.50		0.01 (−0.26, 0.29), 0.92	
3–4 h	0.98 (0.46, 2.09), 0.96		0.01 (−0.29, 0.32), 0.93	
More than 4 h	0.46 (0.17, 1.29), 0.14		−0.09 (−0.48, 0.29), 0.63	
Smokes tobacco daily				
No	1.00	1.00	0.00	0.94
Yes	1.00 (0.17, 6.07), 1.00		0.03 (−0.67, 0.73), 0.94	
Highest number of drinks in any 'single sitting' in last 14 days				
None	1.00	0.80	0.00	0.87
1	1.07 (0.68, 1.68), 0.78		0.05 (−0.14, 0.23), 0.62	
2 or more	0.89 (0.50, 1.57), 0.69		0.01 (−0.22, 0.24), 0.93	
Strong and supportive relationship with family				
No	1.00	0.30	0.00	0.34
Yes	0.62 (0.25, 1.53), 0.30		−0.17 (−0.52, 0.18), 0.34	
CAP: informal support				
Not triggered	1.00	0.44	0.00	0.76
Triggered	1.27 (0.70, 2.29), 0.44		0.04 (−0.20, 0.28), 0.76	
Do you currently have a pet in your household?				
No	1.00	0.08	0.00	0.24
Yes	1.72 (0.93, 3.16), 0.08		0.14 (−0.10, 0.38), 0.24	
Length of stay in village (years)	1.00 (0.96, 1.04), 0.88	0.88	0.01 (−0.01, 0.02), 0.38	0.38
Self-reported health				
Excellent	1.00	0.04	0.00	<0.001
Good	2.13 (0.98, 4.60), 0.06		0.43 (0.15, 0.70), 0.002	
Poor/fair	3.19 (1.29, 7.93), 0.01		0.76 (0.42, 1.10), <0.001	
CAP: mood (depression risk)				
Not triggered (DRS = 0)	1.00	0.18	0.00	0.23
Medium risk (DRS = 1–2)	1.57 (0.91, 2.69), 0.10		0.18 (−0.04, 0.39), 0.11	
High risk (DRS = 3–14)	0.77 (0.26, 2.30), 0.64		−0.06 (−0.50, 0.39), 0.81	

TABLE 3 (Continued)

Characteristic	Daily pain OR (95% CI), *p* value	Covariate adjusted *p* value	Pain scale (0–3) MD (95% CI), *p* value	Covariate adjusted *p* value
Lonely: says or indicates that he/she feels lonely				
No	1.00	0.69	0.00	0.70
Yes	1.11 (0.68, 1.81), 0.69		0.04 (−0.16, 0.24), 0.70	
Difficulty falling asleep				
Not present	1.00	0.37	0.00	0.05
Present but no exhibited in last 3 days	1.34 (0.61, 2.94), 0.47		0.13 (−0.18, 0.45), 0.42	
Exhibited on 1 of last 3 days	3.11 (1.01, 9.58), 0.05		0.59 (0.16, 1.03), 0.01	
Exhibited on 2 of last 3 days	1.29 (0.43, 3.88), 0.65		0.16 (−0.29, 0.61), 0.49	
Exhibited daily in last 3 days	1.13 (0.69, 1.84), 0.63		0.18 (−0.02, 0.38), 0.08	
Felt anxious restless/uneasy				
Not in the last 3 days	1.00	0.14	0.00	0.07
Not in the last 3 days - but often feel that way	0.27 (0.07, 1.05), 0.06		−0.54 (−1.09, 0.00), 0.05	
In 1–2 of the last 3 days	1.02 (0.31, 3.30), 0.98		−0.05 (−0.54, 0.44), 0.83	
Daily in the last 3 days	0.46 (0.16, 1.32), 0.15		−0.41 (−0.82, 0.01), 0.06	
Fatigue: inability to complete normal daily activities				
None	1.00	0.04	0.00	0.06
Minimal	1.77 (1.11, 2.81), 0.02		0.20 (0.01, 0.39), 0.04	
Moderate–severe	1.16 (0.56, 2.44), 0.69		−0.01 (−0.32, 0.29), 0.93	
CAP: falls, *n* (%)				
Not triggered	1.00	0.11	0.00	0.04
Medium risk	0.65 (0.33, 1.28), 0.21		−0.17 (−0.44, 0.11), 0.23	
High risk	6.83 (0.69, 67.70), 0.10		0.82 (0.10, 1.54), 0.03	
Some level of dual sensory loss (deaf/blind severity ≥3)				
No	1.00	0.78	0.00	0.55
Yes	1.11 (0.54, 2.27), 0.78		−0.09 (−0.38, 0.20), 0.55	
Arthritis				
No	1.00	<0.001	0.00	<0.001
Yes	3.88 (2.57, 5.87), <0.001		0.61 (0.45, 0.78), <0.001	
Prescribed medications over a 24-h period				
<9	1.00	0.25	0.00	0.18
≥9	1.43 (0.78, 2.62), 0.25		0.17 (−0.08, 0.41), 0.18	
Taking anti-depressant medicines (SSRIs)				
No	1.00	0.31	0.00	0.41
Yes	1.31 (0.77, 2.23), 0.31		0.09 (−0.12, 0.30), 0.41	
Over the past 2 weeks received home care				
No	1.00	0.82	0.00	0.79
Yes	1.07 (0.62, 1.85), 0.82		0.03 (−0.19, 0.25), 0.79	
Village size (units)				
<60	1.00	0.01	0.00	0.13
≥60	2.17 (1.20, 3.94), 0.01		0.18 (−0.05, 0.42), 0.13	
A nurse available to independent or serviced unit residents				
No	1.74 (1.06, 2.86), 0.03	0.03	0.11 (−0.10, 0.31), 0.30	0.30
Yes	1.00		0.00	

(Continues)

TABLE 3 (Continued)

Characteristic	Daily pain OR (95% CI), *p* value	Covariate adjusted *p* value	Pain scale (0–3) MD (95% CI), *p* value	Covariate adjusted *p* value
Does the village have a regular health clinic, on site, for independent or serviced unit residents? *n* (%)				
No	1.76 (1.10, 2.83), 0.02	0.02	0.32 (0.13, 0.52), 0.001	0.001
Yes	1.00		0.00	
Overall how satisfied are you with living in this retirement village, *n* (%)				
Very dissatisfied/dissatisfied	0.96 (0.26, 3.52), 0.95	0.95	−0.20 (−0.71, 0.32), 0.45	0.80
Neutral, unsure	1.30 (0.46, 3.70), 0.63		0.12 (−0.29, 0.54), 0.56	
Satisfied	1.09 (0.70, 1.69), 0.70		−0.01 (−0.19, 0.17), 0.92	
Very satisfied	1.00		0.00	

95% CI, 95% confidence interval; CAP, interRAI Clinical Assessment Protocol; DRS, depression rating scale; MD, mean difference; OR, odds ratio; SSRIs, selective serotonin reuptake inhibitors.

potentially falsely, imply causality. Further prospective research is needed into the effect of on-site clinics before firm recommendations can be made. Similarly, the association we have demonstrated between village size and pain frequency needs independent confirmation. Given that It can be hypothesised that adequate pain control in specific diseases, such as arthritis, allows people to maintain their functional status, further research is also needed to establish if mitigation of pain promotes the prevention of residents' disability.

The neoliberal western model of care construct for affluent, mainly European, residents in villages (Dodds, 2018), suggests that older adults want to maintain independence at least in part so that they are perceived by themselves, and others, as 'ageing successfully' and not 'a burden to family'. 'Successful agers' are reluctant to show vulnerability or less-than-good health. This construct implies that someone not successfully ageing is personally at fault (Dodds, 2018). Potentially in a similar vein, evidence confirms that, in older people, adherence to pain medication is less complete than that to other prescribed medications, and perceptions/ attitudes to pain play a role in such adherence (Sale et al., 2006).

Typically, village operators focus on the idea of promoting independence, active lifestyles and 'low care' for residents. Our study shows the need for new discourse to address unmet needs along the continuum of being independent and needing care (Bevin, 2017). At present, there is a mismatch between the ideology of independence and residents' expectations of their healthcare and delivery of support services.

Study strengths and weaknesses: with 578 participants, our study was relatively large, adjusted for a large range of potential confounders, in a defined village resident cohort, previously little studied. It employed a validated, widely-used interRAI assessment (Fries et al., 2001; Verhaak et al., 1998) providing a multidisciplinary, multidimensional comprehensive geriatric assessment which is now mandated in NZ for eligibility to publicly funded care provision. Thus, our findings are amenable to validation by others. Using face-to-face pain assessments means that there is potential to develop relationships which may negate reluctance to disclose pain, and it allows recognition of facial expressions during the assessment.

InterRAI data allow comparisons across the interRAI suite of HC, CHA and Long-Term Care Facilities (LTCF) assessment, thus it would be possible to compare pain prevalence/ intensity in villages in different settings, regionally, nationally and internationally. In addition, trend analyses will be conducted for a longitudinal study of our own prospective data, in subsequent publications.

One study weakness was that we were unable to recruit a fully representative sample of village residents, potentially limiting generalizability of the findings—as detailed elsewhere (Connolly et al., 2021). Further, our recruited population is almost exclusively of European ethnicity, hence comparisons of pain levels and frequency with those in the general population in this age group are likely to be imperfect. In addition, we excluded subjects without legal capacity to consent – and more may have 'self-excluded' (Connolly et al., 2021) - and thus were unable to address whether those with moderate/severe dementia suffer higher levels of pain (Ahn et al., 2015). We did not collect data on non-pharmacological pain management strategies or specific site(s)—pain in multiple sites is recognised as more likely associated with reduced lower limb performance and with its decline (Eggermont et al., 2009; Eggermont et al., 2014). We acknowledge that even a validated pain scale is unlikely to fully capture the nuances and complexities of the experience of pain, and these may not be fully elucidated in our examination of the associated variables (Table 3). Further, we did not formally investigate diagnosed *causes* of pain. However, apart from the relatively strong and unsurprising association with self-reported arthritis, we found no statistical associations between the presence of pain and a wide variety of diagnoses *present* in our cohort (interRAI assessment), suggesting pain, in this cohort, has a multitude of causes.

5 | CONCLUSION

Self-reported levels of pain and daily pain are high in retirement village residents. Conglomerate housing gives opportunities for health services and supports such as community nursing, physiotherapist and exercise programmes and self-management advice. Only some villages offer such schemes.

In this population, self-reported poor/fair health, self-reported arthritis and minimal fatigue are associated with higher levels of pain and risk of daily pain. A regular on-site health clinic available to residents is independently associated with less risk of daily pain and lower levels of pain (though we cannot claim causality). Early intervention in this population may not only provide relief at an individual level but may putatively lead to reduction in service demand (e.g. hospitalisation and LTC admission). This will be examined in our future work.

This study is a clear signal that villages have opportunity to provide increased supports to decrease the prevalence and severity of pain for their residents.

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CONFLICT OF INTEREST

All the authors confirm they have no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are not publicly available due to privacy or ethical restrictions.

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ENDNOTE

[a] *p* value for differences in proportion of daily pain among different baseline characteristics.

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