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3 1 **Title:** The prevalence of pain and analgesia use in the Australian population: Findings from
4 2 the 2011-12 Australian National Health Survey

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31 23 **Keywords**

32 24 Opioid, analgesia, chronic pain, pain severity

33 25
34 26 **Key points:**

- 35 27
- 36 28 • Approximately 2.75 million (15.4%) Australians aged ≥ 15 years are estimated to
37 29 have chronic and reoccurring pain (over a six-month period) based on the most
38 30 comprehensive, nationally representative health survey conducted in Australia.
 - 39 31 • Recent use of opioid analgesic medications was reported by 12.0% of males and
40 32 13.4% of females with chronic pain. Persons using opioid analgesia primarily
41 33 reported moderate to very severe pain.

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56 33 **Word count:** 3,592

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3 1 **The prevalence of pain and analgesia use in the Australian population: Findings from the**
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5 2 **2011-12 Australian National Health Survey**

6
7 3 **Abstract**

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9 4 **Background:** Opioid analgesic use and associated adverse events have increased over the
10
11 5 last 15 years, including in Australia. Whether this is associated with increased chronic pain
12
13 6 prevalence in the Australian population is unknown. This study aimed to estimate: (1)
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15 7 prevalence of chronic pain and analgesia use in the Australian population by age and sex; (2)
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17 8 severity of pain in the population with chronic pain by sex; and (3) the distribution of recent
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19 9 pain severity in those using analgesia by age and sex.

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21 10 **Methods:** This study used cross-sectional, nationally representative data collected by the
22
23 11 Australian Bureau of Statistics 2011-12 National Health Survey. A total of n=20,426
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25 12 participants were included with an overall response rate of 84.8%. Weighting procedures
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27 13 were applied to obtain population estimates, confidence intervals and when testing for
28
29 14 statistical significance.

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31 15 **Results:** The prevalence of chronic and reoccurring pain (over a six-month period) was
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33 16 15.4% (2.75 million) for Australians aged ≥ 15 years. Prevalence increased with age for both
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35 17 sexes. Significantly more females reported moderate-to-very severe pain overall ($p < 0.001$),
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37 18 and within most age groups. Recent use of opioid analgesia was reported by 12.0% of males
38
39 19 and 13.4% of females with chronic pain.

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41 20 **Conclusion:** Chronic pain and opioid analgesic use are important public health issues in
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43 21 Australia. Study estimates of chronic pain and recent pain were no greater than earlier
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45 22 estimates. The acknowledged increase of opioid use in the literature thus appears
46
47 23 consistent with changing treatment and/or prescribing patterns over time. Sex differences
48
49 24 regarding pain prevalence, severity and opioid use were apparent.

1. Introduction

Effective management of chronic pain generally encompasses several treatment modalities incorporated within a multi-disciplinary framework [1]. Though efficacy has been debated, opioid analgesic medications have been increasingly prescribed for chronic pain over the last two decades [2]. During this time, numerous studies have identified an escalation in opioid analgesic medication use and associated adverse events, both in Australia and internationally [3-7]. Studies have also noted differences between the sexes in patterns of use, misuse and adverse events associated with opioid analgesic medications [8, 9], with a review by Darnall, Stacey and Chou (2012) recently expressing 'there is a major need for all opioid studies to examine data by sex' [9]. One reason is that, internationally, use of opioid analgesia in women of reproductive age has become an epidemic [10, 11] and if use is continued during pregnancy, this can adversely affect infant outcomes [10, 12]. Further, many studies have indicated that there is an increased frequency of chronic pain [13, 14] and specific chronic pain conditions in females [8, 9]. However, other studies have found no significant differences in the prevalence of chronic pain between males and females [15, 16].

In Australia and elsewhere opioid analgesia is generally indicated for pain that is considered moderate to severe [17-19]. Thus, in addition to pain of extended duration as reflected by chronic pain status, information on pain severity should also be assessed to ensure use is consistent with prescribing recommendations. As a counterpoint, equivalent data on non-opioid analgesia can provide further insight into the use of opioid analgesics in recent pain, by severity and in those with chronic pain. Whether the increased use of opioid analgesia in the Australian population is associated with a change in chronic pain prevalence over time, or is solely associated with other factors is currently unknown. Furthermore, an assessment of the appropriateness of opioid analgesia use in association with pain severity, given current prescribing recommendations, is also needed. Therefore, using the Australian National Health Survey (NHS) this study will (1) estimate current prevalence of chronic pain and analgesia use in the Australian population by and age and sex; (2) determine severity of

1 pain in the population with chronic pain by sex; and (3) assess the distribution of recent pain
2 severity in those using analgesia, by age and sex.

3 **2. Methods**

4 **2.1 Participants**

5 This study used cross-sectional, nationally representative data collected by the Australian
6 Bureau of Statistics (ABS) in the 2011-12 Australian NHS. The 2011-12 Australian NHS is the
7 sixth of its kind conducted by the ABS since 1989, with the aim of establishing national
8 benchmarks on many health related issues and health trends over time [20]. The sample
9 consisted of persons of all ages living in private Australian residences, collected via stratified
10 multistage sampling [20]. The sample design ensured that within each state of Australia,
11 each person had an equal chance of selection. Survey information was obtained for one
12 adult and one child aged 0-17 years (if applicable) in each participating household [20].
13 Face-to-face interviews were conducted by trained ABS interviewers in participants' homes
14 between the periods of March 2011 to March 2012 [20]. The overall response rate was
15 84.8%, with a total of n=20,426 participants from 15,565 private residences [21].

16 Data are made available by the ABS in the form of a Confidentialised Unit Record File
17 (CURF). The CURF contains detailed, individual participant data which has been collected by
18 the ABS for the purposes of census and population surveys [12]. This data is made available
19 at the discretion of the ABS on the condition that participant identity is not available to
20 users of the CURF and participant confidentiality is always retained [12]. For this reason, not
21 all data collected within a survey may be included in the CURF and there are restrictions on
22 allowable analyses.

23 **2.2 Data and analysis**

24 Chronic pain was defined as self-reported pain which persisted or reoccurred over a six-
25 month period. 'Bodily Pain' was defined as pain experienced within the previous four weeks
26 and measured by severity of pain experienced on a scale from 'no pain' to 'very severe'
27 pain. To reflect prescribing recommendations for opioid analgesic medications (treatment of
28 moderate to very severe pain), pain severity was classified into four groups: no pain, very
29 mild to mild pain, moderate to very severe pain and not applicable or unknown. As chronic

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1 pain gives an indication of pain duration and bodily pain provides information on recent
2 pain severity, use of both variables allowed investigation of the severity of chronic pain and
3 whether opioid analgesia use was appropriately associated with pain severity given
4 prescribing recommendations.

5 Participants were asked for the name or brand of all medication they had taken in the last
6 two weeks and were requested to provide the packages of all recently used medications to
7 the interviewer to assist in the recording process. Medications were classified using the
8 World Health Organisation's Anatomical Therapeutic Chemical (ATC) system. To investigate
9 associations between analgesia use and pain of all severities, both opioid and non-opioid
10 analgesia use were analysed for this study. Opioid analgesia use included the use of any
11 type of opioid analgesia over the previous two-week period. Non-opioid analgesia use
12 included the use of any type of pharmaceutical non-opioid analgesic medications (e.g.
13 paracetamol) and anti-migraine medications. The survey did not differentiate between
14 prescribed or 'over the counter' analgesic medications within the opioid or non-opioid
15 analgesia classifications.

16 Data specific to chronic pain was not available in the CURF and was provided directly from
17 the ABS by special request. This data included Australian population totals (all ages) as well
18 as specific analysis for participants aged ≥ 15 years. All other analyses were based on data
19 extracted from the CURF. Data included individual participants' age, sex, bodily pain
20 (severity), opioid analgesia use and non-opioid analgesia use. These data were analysed for
21 participants aged ≥ 15 years ($n=16,412$, $N=17,894,850$), although detailed bodily pain data is
22 only available for those aged ≥ 18 years ($n=15,475$, $N=17,042,208$).

23 Weighting procedures were applied using STATA v12 to calculate population estimates,
24 associated confidence intervals and to test for statistical significance between proportions.
25 The Jackknife delete-1 weighting method was used to account for the stratified multistage
26 design of the survey, any oversampling and non-response. Differences in proportions of
27 males and females were calculated in each age group for bodily pain (severity), opioid
28 analgesia use and non-opioid analgesia use [9], with p-values of ≤ 0.05 considered a
29 statistically significant difference. No adjustment was made for conducting multiple tests as
30 per Rothman [22].

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3 **1 2.3 Ethics**
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6 2 The interview components of the NHS were conducted by the ABS under the *Census and*
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8 3 *Statistics Act 1905*. Statistical analysis of the chronic pain data was restricted and as a result
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10 4 was conducted directly by the Australian Bureau of Statistics (ABS) for the purposes of this
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12 5 study. All analyses of the CURF data were undertaken by AM and MB who are registered
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14 6 users of the NHS CURF.

15 **7 3. Results**
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18 **8 3.1 Chronic pain and analgesia use**
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20 9 Of the total Australian population (N=22,105,281), an estimated 12.7% (N=2.8 million) live
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22 10 with chronic or reoccurring pain, increasing to 15.4% (N=2.75 million) when those aged <15
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24 11 years were excluded. Of males who were ≥15 years of age, 14.6% were living with chronic or
25
26 12 reoccurring pain, and likewise for 16.1% of females.

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28 13 The distribution of the Australian population aged ≥15 years living with chronic or
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30 14 reoccurring pain and the percentages using opioid analgesia by 10-year age groups by sex is
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32 15 illustrated in Figure 1. The prevalence of chronic or reoccurring pain generally increased
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34 16 with age for both males and females. Over 12% of females ≥85 years reported any opioid
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36 17 analgesia use in the two weeks prior to the survey. There was a trend towards higher opioid
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38 18 use in females than males in every age group.

39
40 **Figure 1**

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42 20 The percentage of those reporting chronic or reoccurring pain *and* taking opioid analgesia
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44 21 are represented in Figure 2a. An estimated 12.0% of males and 13.4% of females with
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46 22 chronic or reoccurring pain aged ≥15 years had taken opioid analgesic medications in the
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48 23 previous two weeks, with the highest percentages of use seen in the youngest (17.0%) and
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50 24 oldest (29.0%) female age groups. The percentages of those reporting chronic or reoccurring
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52 25 pain and taking non-opioid analgesia are represented in Figure 2b. In those aged ≥15 years
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54 26 almost a quarter (23.1%) of males and over a quarter (29.2%) of females with chronic or
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56 27 reoccurring pain had taken non-opioid analgesic medications in the previous two weeks,
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28 with both males (57.6%) and females (63.9%) aged ≥85 years reporting the highest
29 percentages of use.

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Figure 2a and 2b

3.2 Pain severity in persons with chronic pain

The distribution of reported pain severity over the last four weeks in persons aged ≥ 18 years with chronic or reoccurring pain is shown in Table 1. Most males (63.8%) and females (72.2%) with chronic or recurring pain stated their pain was moderate to very severe over the four weeks prior to the survey.

Table 1

3.3 Recent pain severity in persons with bodily pain

Over two thirds (68.2%) of Australians aged ≥ 18 years (71.1% of females, 65.2% of males) reported experiencing pain of any severity over the four weeks prior to the survey, with 26.6% reporting moderate to very severe pain, 41.5% very mild to mild pain, and 31.1% reporting no pain. Pain severity was not applicable or was unknown in the remaining 0.7%. One-fifth of those reporting some bodily pain also had chronic or recurring pain.

When broken down by sex, males were significantly more likely overall to report no pain ($p < 0.001$) or be in the not applicable/unknown category ($p < 0.001$), and females were significantly more likely to report moderate to very severe pain ($p = 0.001$). A detailed breakdown of pain severity by age group for both males and females is provided in Table 2.

Table 2

Statistically significant differences were also noted in pain severity experienced by males and females within most age ranges across the lifespan. A significantly higher percentage of females than males reported moderate to very severe pain within almost every age group except 65 to 74 years (15 to 24 years $p = 0.006$; 25 to 34 years $p = 0.008$; 35 to 44 years $p = 0.031$; 45 to 54 years $p = 0.023$; 55 to 64 years $p = 0.001$; 75 to 84 years $p < 0.001$). A

1 significantly higher percentage of males than females reported no pain within ages 45 to 54
2 years ($p = 0.002$), 55 to 64 years ($p < 0.001$) and 75 to 84 years ($p = 0.001$). A significantly
3 higher percentage of males than females aged 65 to 74 years reported very mild to mild
4 pain ($p = 0.004$).

5 **3.4 Distribution of pain severity in persons using analgesia**

6 Figures 3a and 3b illustrate the distribution of pain severity in males and females aged ≥ 15
7 years using opioid analgesia in the previous two weeks. In each age group, except males
8 aged 15 to 24 years, most individuals using opioid analgesia reported moderate to very
9 severe pain, followed by very mild to mild pain. However, in males aged 15 to 24 years the
10 percentage reporting no pain and having used opioid analgesia in the previous two weeks
11 (32.7%) was higher than those reporting very mild to mild pain (13.2%). In no other age
12 range did males (or females) report 'no pain' while also reporting recent opioid use to the
13 extent seen in the youngest male group. There was not enough evidence to reject the null
14 hypothesis of no difference between males and females of each age group using opioid
15 analgesia for any level of pain severity.

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17 **Figure 3a and 3b**
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19 Figures 4a and 4b illustrate the distribution of pain severity in males and females overall
20 using non-opioid analgesia during the previous two weeks. The highest prevalence of non-
21 opioid analgesia use was seen in younger males and females (15 to 44 years) reporting very
22 mild to mild pain, and older males and females (≥ 45 years) with moderate to very severe
23 pain. In both younger and older age groups, a small percentage of males and females who
24 took non-opioid analgesia reported no pain. Males had a significantly greater percentage
25 using non-opioid analgesia in the 45 to 54 year age group reporting no pain ($p = 0.024$), in
26 the 55 to 64 year age group with no pain ($p = 0.016$) and very mild to mild pain ($p = 0.026$),
27 and the 75 to 84 year age group with no pain ($p = 0.006$) and very mild to mild pain ($p =$
28 0.009). A significantly higher proportion of females using non-opioid analgesia reported
29 moderate to very severe pain in the 75 to 84 year age group ($p < 0.001$).

Figure 4a and 4b

4. Discussion

Through the 2011-12 Australian NHS it is estimated that 2.75 million (15.4%) Australians aged ≥ 15 years have chronic or reoccurring pain, comprising 16.1% of females and 14.6% of males. Almost three-quarters of females in the group with chronic or reoccurring pain reported that their pain had been moderate to very severe in the most recent four-week period. Over two thirds of Australians (68.2%) experienced some bodily pain within the most recent four-week period, affecting 71.1% of females and 65.2% of males, with one fifth also reporting chronic pain. Higher percentages of moderate to very severe pain were reported within almost every age group in females compared to males. An estimated one in eight persons with chronic pain had taken opioid analgesic medication within two weeks prior to the survey, with similar rates of overall use in males and females at 12.0% and 13.4% respectively. However, the highest reported percentages of opioid analgesia use were amongst the youngest (17.0%) and oldest (29.0%) females with chronic pain. In contrast, there was a trend of increasing prevalence of chronic pain in persons who reported using non-opioid analgesia with age, for both men and women. Most using opioid analgesia had experienced moderate to very severe pain over the most recent four-week period, except for males aged 15 to 24 years. Pain severity was highly variable in those who used non-opioid analgesia. While moderate to very severe pain was reported by the majority of non-opioid analgesia users in those aged ≥ 45 years, this was not the case in the younger age groups.

The percentages of chronic pain in the Australian population identified in this study are no greater than those reported over 15 years ago in the primary reference for chronic pain prevalence in Australia, Blyth et al. (2001) [14]. The Blyth et al. (2001) study, which was based upon a sample drawn from the state of New South Wales in 1999, reported the overall prevalence of chronic pain as 20% for females and 17% for males aged 15 to 84 years [14]. Similar estimates of chronic pain prevalence, 20% of females and 18% of males, were reported in a recent national study on patients, including children, seeking medical

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1 treatment from a General Practitioner [16]. However, differences in inclusion criteria in the
2 study of general practice patients requires these results to be considered stand-alone.

3 In interpreting the results of the current study, it is also important to consider variations in
4 definitions of chronic pain. The ABS defined chronic pain as self-reported pain which
5 persisted or reoccurred over a six month period, similar to the definition used in a recent
6 Danish study of population survey data [23]. In contrast, Blyth et al. (2001) and most other
7 published Australian studies define chronic pain as pain occurring every day, over a three-
8 month period within the most recent six months [14-16, 24]. The ABS definition used for the
9 current study is thus arguably less stringent, which would be expected to lead to higher
10 estimates of prevalence, rather than the lower estimates observed. Thus, it is apparent that
11 the prevalence of chronic pain in the current study is no greater than these earlier
12 estimates. In turn, there is no evidence to support an increase in chronic pain prevalence
13 since the Blyth et al. (2001) study, and certainly not to the extent of the 15-fold increase in
14 opioid analgesia dispensing episodes within the Australian population between 1992 and
15 2012 [4]. Further, the increase in opioid use reported in the literature cannot be ascribed to
16 an increase in the overall proportion experiencing any bodily pain as the percentage of the
17 population aged 18 years and above experiencing any bodily pain has remained constant at
18 68% from the 2007-08 NHS [25], to the current study. However, it is possible that an
19 increase in pain severity in those with chronic pain over time could account for some of the
20 increase in opioid use.

21 Many of the other findings noted above also show similarities to those found in the
22 published literature. First, the estimate of opioid use in the Australian population with
23 chronic pain, at 12% for males and just over 13% for females, and the 12% reported for
24 Denmark[26]. Second, the estimate that just over two thirds of all Australians aged ≥ 18
25 years had experienced some pain during the last four weeks, shows some comparability to
26 the 55.7% reported for the US population in 2012 [13]. Third, the finding that moderate to
27 very severe pain was more prevalent in females across most age groups is consistent with
28 previous findings of epidemiological and experimental research[29]. Nahin (2015) also found
29 that females in the US population had a higher prevalence of more severe pain, but only in
30 specific language and cultural groups [13] Fourth, the majority of those using opioid
31 analgesia also reported recent moderate to very severe pain, similar to a large, cross-

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1 sectional study of n=10,066 participants in Denmark [30]. This is also consistent with current
2 prescribing recommendations in Australia [17] and by the World Health Organisation [18].

3 Also consistent with previous research is the relatively high use of opioid medications in the
4 elderly seen in this study [31]. This earlier research found that between 2002 to 2009
5 buprenorphine, fentanyl, oxycodone (5mg, both immediate and modified release) and
6 tramadol (100mg) dispensing in Australia was highest in females aged 90 to 99 years, even
7 with palliative care excluded [32]. Likewise, opioid prescriptions for both morphine and
8 oxycodone have been reported as most common among elderly Australians aged ≥80 years
9 [3]. Given that opioid use in older people has been associated with an increased risk of
10 medication related hospitalisations and numerous adverse events including falls causing
11 injury, fracture, dizziness and delirium [4, 27, 28], our findings re-emphasise the concerns
12 raised in these previous studies.

13 As differences between male and female use of opioid analgesia in those with chronic pain
14 were very apparent in the current study, we reiterate the call from Darnall, Stacey and Chou
15 (2012) for future research to explore sex differences in more depth and to provide more
16 detailed analysis on these themes[9]. The importance of sex differences is reflected in
17 previous Australian research which demonstrated that females are more likely than males
18 to intentionally overdose on opioid analgesia, specifically codeine [34]. Further, special
19 consideration should be given to women of reproductive age. While it is imperative that
20 females of reproductive age receive analgesic medication as medically indicated, it also is
21 vital to allow them to make an informed decision on the risks and benefits of ongoing use of
22 analgesic medication should pregnancy occur [33]. Additional epidemiological research is
23 also needed to understand treatment option availability and utilisation, including the impact
24 of treatment availability on daily functioning and quality of life of people living with pain
25 conditions in Australia.

26 The strengths of this study include the use of data collected as part of the 2011-12
27 Australian NHS in a robust and rigorous manner by trained staff of the ABS, with a response
28 rate of over 80%. We are limited however, by the fact that this survey relies mainly upon
29 self-reported data. While this may be less of an issue for subjective, pain-related variables
30 where self-report is considered the gold standard [35], self-report of medication use may
31 not be as robust as medical record audit or linkage of prescription data [13]. If so, our

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1 results will likely underestimate the proportion of the Australian population taking opioid
2 and non-opioid analgesia. However, as participants were asked to physically provide the
3 interviewer with all medications taken over the previous two weeks, this study's findings are
4 strengthened compared to self-reported medication use alone. Persons in hospital and
5 other care facilities were not sampled, and the wide confidence intervals for some data are
6 likely reflective of smaller sample sizes in the youngest and oldest age groups. Further
7 analysis of chronic pain data was not possible due to data access restrictions. We were also
8 limited by the specific questions asked within the survey. While chronic pain and medication
9 use was asked of participants of all ages, questions about pain severity were only asked to
10 participants aged ≥ 18 years. We were not able to distinguish whether the reported severity
11 of bodily pain changed due to analgesia use. We were also not able to distinguish whether
12 analgesia taken was prescribed or purchased 'over the counter'. This survey is also unlikely
13 to accurately capture non-adherent or illicit use of analgesic medications.

14 Chronic pain and opioid analgesic medication use are important public health issues in
15 Australia. Approximately 2.75 million Australians aged ≥ 15 years (15.4%) live with chronic or
16 reoccurring pain. As there was no evidence to support an increase in chronic pain within the
17 Australian population compared with previous estimates, the increased use of opioid
18 analgesic medications noted within the literature thus appears consistent with changing
19 treatment and/or prescribing patterns for these medications over time, potentially including
20 for chronic pain. A higher percentage of females experienced chronic pain, moderate to very
21 severe pain and reported use of opioid analgesic medications within almost every age
22 group. We reiterate calls for future research to explore sex differences in the utilisation of
23 analgesia in more depth. We also call for more detailed analysis relating to the use of opioid
24 analgesia in those with chronic pain, including assessment of daily functioning, patient
25 satisfaction and quality of life.

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Author contributions and conflict of interest statement

AM, KS, RB and AN designed the analysis and wrote the manuscript, AM and MB conducted the statistical analysis. All authors discussed the results, edited the manuscript and approved the final draft. Statistical analysis of the chronic pain data was conducted by the Australian Bureau of Statistics (ABS). KS, AM and MB have no conflicts of interest to declare. AN lives with a chronic pain condition. RB has been an investigator on untied investigator-driven educational grants from Reckitt Benckiser and has received an untied educational grant from Mundipharma for post-marketing surveillance studies of Reformulated OxyContin®. These untied grants are all unrelated to the current study.

References

1. Turk, D.C., H.D. Wilson, and A. Cahana, Treatment of chronic non-cancer pain. *Lancet*, 2011. 377; (9784): p. 2226-35.
2. Chou, R., et al., Clinical guidelines for the use of chronic opioid therapy in chronic noncancer pain. *J Pain*, 2009. 10; (2): p. 113-30.
3. Roxburgh, A., et al., Prescription of opioid analgesics and related harms in Australia. *Med J Aust*, 2011. 195; (5): p. 280.
4. Blanch, B., S.A. Pearson, and P.S. Haber, An overview of the patterns of prescription opioid use, costs and related harms in Australia. *Br J Clin Pharmacol*, 2014. 78; (5): p. 1159-66.
5. Breivik, H. and A. Stubhaug, Burden of disease is often aggravated by opioid treatment of chronic pain patients: Etiology and prevention. *Pain*, 2014. 155; (12): p. 2441-2443.
6. Manchikanti, L., et al., Opioid epidemic in the United States. *Pain Physician*, 2012. 15; (3 Suppl): p. Es9-38.
7. Leong, M., B. Murnion, and P.S. Haber, Examination of opioid prescribing in Australia from 1992 to 2007. *Intern Med J*, 2009. 39; (10): p. 676-81.
8. Hassan, S., A. Muere, and G. Einstein, Ovarian hormones and chronic pain: A comprehensive review. *Pain*, 2014. 155; (12): p. 2448-2460.
9. Darnall, B.D., B.R. Stacey, and R. Chou, Medical and psychological risks and consequences of long-term opioid therapy in women. *Pain Med*, 2012. 13; (9): p. 1181-211.
10. Patrick, S.W., et al., Prescription opioid epidemic and infant outcomes. *Pediatrics*, 2015. 135; (5): p. 842-50.
11. Tolia, V.N., et al., Increasing Incidence of the Neonatal Abstinence Syndrome in U.S. Neonatal ICUs. *New Engl J Med*, 2015. 372; (22): p. 2118-2126.
12. Broussard, C.S., et al., Maternal treatment with opioid analgesics and risk for birth defects. *Am J Obstet Gynecol*, 2011. 204; (4): p. 314.e1-314.e11.
13. Nahin, R.L., Estimates of Pain Prevalence and Severity in Adults: United States, 2012. *J Pain*, 2015. 16; (8): p. 769-780.
14. Blyth, F.M., et al., Chronic pain in Australia: a prevalence study. *Pain*, 2001. 89; (2-3): p. 127-34.
15. Currow, D.C., et al., Chronic pain in South Australia—population levels that interfere extremely with activities of daily living. *Aust N Z J Public Health*, 2010. 34; (3): p. 232-239.
16. Henderson, J.V., et al., Prevalence, causes, severity, impact, and management of chronic pain in Australian general practice patients. *Pain Med*, 2013. 14; (9): p. 1346-61.
17. *Australian Medicines Handbook 2015*, Adelaide: Australian Medicines Handbook Pty Ltd.
18. Kumar, N., WHO normative guidelines on pain management. 2007.
19. Rosenblum, A., et al., Opioids and the Treatment of Chronic Pain: Controversies, Current Status, and Future Directions. *Exp Clin Psychopharmacol*, 2008. 16; (5): p. 405-416.

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1 20. Australian Bureau of Statistics. Australian Health Survey: Users' Guide, 2011-13
2 Structure of the Australian Health Survey. 2013 5 March 2015 [cited 2015 10
3 October]; Available from: [http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/74D87E30B3539C53CA25](http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/74D87E30B3539C53CA257BBB0014BB36?opendocument)
4 [7BBB0014BB36?opendocument](http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/74D87E30B3539C53CA257BBB0014BB36?opendocument).
5
6 21. Australian Bureau of Statistics. Australian Health Survey: Users' Guide, 2011-13
7 Response Rates. 2013 5 March 2015 [cited 2015 July 25]; Available from: [http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/F87826FDF716EB94CA25](http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/F87826FDF716EB94CA257B8D00229E83?opendocument)
8 [7B8D00229E83?opendocument](http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/F87826FDF716EB94CA257B8D00229E83?opendocument).
9
10 22. Rothman, K.J., No adjustments are needed for multiple comparisons. *Epidemiology*,
11 1990. 1; (1): p. 43-6.
12 23. Ekholm, O., et al., Chronic pain, opioid prescriptions, and mortality in Denmark: A
13 population-based cohort study. *Pain*, 2014. 155; (12): p. 2486-2490.
14 24. Blyth, F.M., L.M. March, and M.J. Cousins, Chronic pain-related disability and use of
15 analgesia and health services in a Sydney community. *Med J Aust*, 2003. 179; (2): p.
16 84-87.
17 25. Australian Bureau of Statistics. Characteristics of bodily pain in Australia. 2012 24
18 July 2012 [cited 2015 21 April]; Available from: <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4841.0Chapter12011>.
19
20 26. Harker, J., et al., Epidemiology of Chronic Pain in Denmark and Sweden. *Pain Res*
21 *Treat*, 2012. 2012: p. 30.
22 27. Bartley, E.J. and R.B. Fillingim, Sex differences in pain: a brief review of clinical and
23 experimental findings. *Br J Anaesth*, 2013. 111; (1): p. 52-58.
24 28. Eriksen, J., et al., Critical issues on opioids in chronic non-cancer pain: an
25 epidemiological study. *Pain*, 2006. 125; (1-2): p. 172-9.
26 29. Cherubino, P., et al., The management of chronic pain in important patient
27 subgroups. *Clin Drug Investig*, 2012. 32 Suppl 1: p. 35-44.
28 30. Hollingworth, S.A., et al., Opioid analgesic prescribing in Australia: a focus on gender
29 and age. *Pharmacoepidemiol Drug Saf*, 2015. 24; (6): p. 628-36.
30 31. Vozoris, N.T., et al., Incident opioid drug use among older adults with chronic
31 obstructive pulmonary disease: a population-based cohort study. *Br J Clin*
32 *Pharmacol*, 2015.
33 32. Buckeridge, D., et al., Risk of injury associated with opioid use in older adults. *J Am*
34 *Geriatr Soc*, 2010. 58; (9): p. 1664-1670.
35 33. Roxburgh, A., et al., Trends and characteristics of accidental and intentional codeine
36 overdose deaths in Australia. *Med J Aust*, 2015. 203; (7): p. 299.
37 34. Uhl, K., D.L. Kennedy, and S.L. Kweder, Information on medication use in pregnancy.
38 *Am Fam Physician*, 2003. 67; (12): p. 2476, 2478.
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Table 1: Severity of pain over the last four weeks in Australians aged ≥18 years^a with chronic pain. Supplied by the Australian Bureau of Statistics, customised report 2015.

Pain severity in the last four weeks	Females	Males
	Estimate '000 (%)	Estimate '000 (%)
None	34.9 (2.4 ^b)	38.0 (3.0)
Very mild - Mild	337.3 (23.4)	403.8 (31.6)
Moderate - Very Severe	1,042.7 (72.2)	814.3 (63.8)
Total	1414. ^c	1,256. ^c

Notes:

^a Bodily pain data only available for those aged 18 years and over

^b Relative Standard Error between 25- 50%

^c Totals do not equal 100%, data for persons who responded 'not applicable' or were unknown were not provided

Table 2: Pain severity in all Australians by age group (aged ≥15 years)

		%		95% CI				%		95% CI	
Females	15 to 24 years	No pain	25.24	(21.46-29.01)	Males	15 to 24 years	No pain	29.03	(25.49-32.57)		
		Very mild to mild pain	30.07	(25.88-34.27)			Very mild to mild pain	32.21	(28.50-35.92)		
		Moderate to very severe pain	16.22	(13.31-19.14)			Moderate to very severe pain	10.28	(7.63-12.92)		
		Not asked/not known	28.47	(27.76-29.18)			Not asked/not known	28.49	(28.05-28.92)		
	25 to 34 years	No pain	36.00	(32.61-39.40)		25 to 34 years	No pain	38.22	(33.94-42.50)		
		Very mild to mild pain	44.47	(41.11-47.84)			Very mild to mild pain	45.79	(41.68-49.91)		
		Moderate to very severe pain	19.49	(17.30-21.69)			Moderate to very severe pain	15.35	(12.84-17.87)		
		Not asked/not known	0.03	(0.00-0.10)			Not asked/not known	0.63	(0.00-1.26)		
	35 to 44 years	No pain	30.05	(27.02-33.09)		35 to 44 years	No pain	32.74	(29.56-35.91)		
		Very mild to mild pain	43.00	(39.70-46.30)			Very mild to mild pain	44.58	(41.46-47.69)		
		Moderate to very severe pain	26.85	(23.74-29.95)			Moderate to very severe pain	22.32	(19.47-25.17)		
		Not asked/not known	0.10	(0.05-0.30)			Not asked/not known	0.37	(0.00-0.74)		
	45 to 54 years	No pain	25.17	(22.09-28.24)		45 to 54 years	No pain	33.46	(29.76-37.15)		
		Very mild to mild pain	45.21	(42.49-47.94)			Very mild to mild pain	41.28	(37.56-45.01)		
		Moderate to very severe pain	29.45	(26.68-32.21)			Moderate to very severe pain	24.50	(20.91-28.09)		
		Not asked/not known	0.17	(0.00-0.42)			Not asked/not known	0.76	(0.03-1.49)		
	55 to 64 years	No pain	21.27	(18.62-23.92)		55 to 64 years	No pain	29.87	(26.40-33.35)		
		Very mild to mild pain	39.72	(36.99-42.45)			Very mild to mild pain	40.04	(36.11-43.97)		
		Moderate to very severe pain	38.12	(35.09-41.16)			Moderate to very severe pain	29.50	(25.57-33.43)		
		Not asked/not known	0.89	(0.08-1.69)			Not asked/not known	0.58	(0.00-1.28)		
	65 to 74 years	No pain	23.67	(20.02-27.32)		65 to 74 years	No pain	27.72	(24.26-31.17)		
		Very mild to mild pain	35.04	(31.39-38.70)			Very mild to mild pain	35.83	(32.12-39.54)		
		Moderate to very severe pain	40.48	(36.79-44.17)			Moderate to very severe pain	35.70	(31.84-39.57)		
		Not asked/not known	0.81	(0.00-1.85)			Not asked/not known	0.75	(0.05-1.45)		
	75 to 84 years	No pain	21.55	(17.71-25.38)		75 to 84 years	No pain	34.61	(27.90-41.32)		
		Very mild to mild pain	27.01	(23.52-30.50)			Very mild to mild pain	37.11	(31.15-43.07)		
		Moderate to very severe pain	49.94	(45.34-54.54)			Moderate to very severe pain	25.84	(20.68-31.01)		
		Not asked/not known	1.51	(0.00-3.28)			Not asked/not known	2.43	(0.74-4.12)		
	85 years +	No pain	24.61	(17.21-32.01)		85 years +	No pain	25.87	(14.87-36.86)		
		Very mild to mild pain	25.59	(18.61-32.56)			Very mild to mild pain	32.37	(20.74-44.00)		
		Moderate to very severe pain	41.83	(33.12-50.55)			Moderate to very severe pain	34.95	(21.87-48.04)		
		Not asked/not known	7.97	(0.00-16.74)			Not asked/not known	6.81	(0.00-14.20)		

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7 **Figure 1:** Distribution of Australians aged ≥ 15 years with chronic or reoccurring pain
8 compared to those using opioid analgesic medications, by 10-year age group and sex.
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10 Supplied by the Australian Bureau of Statistics, Customised report 2015. Confidence
11 intervals are not available for chronic pain data.
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15 **Figure 2:** Distribution of analgesic medication use by Australians aged ≥ 15 years with chronic
16 or reoccurring pain, by 10-year age group and sex, a) Opioid analgesia use, b) Non-opioid
17 analgesia use. Supplied by the Australian Bureau of Statistics, Customised report 2015.
18 Confidence intervals are not available for chronic pain data.
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23 **Figure 3:** Pain severity in Australians aged ≥ 15 years using opioid analgesic medications, by
24 10-year age group and sex, a) Females b) Males. Error bars represent 95% confidence
25 intervals
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29 **Figure 4:** Pain severity in Australians aged ≥ 15 years using non-opioid analgesic medications,
30 by 10-year age group and sex, a) Females b) Males. Error bars represent 95% confidence
31 intervals.
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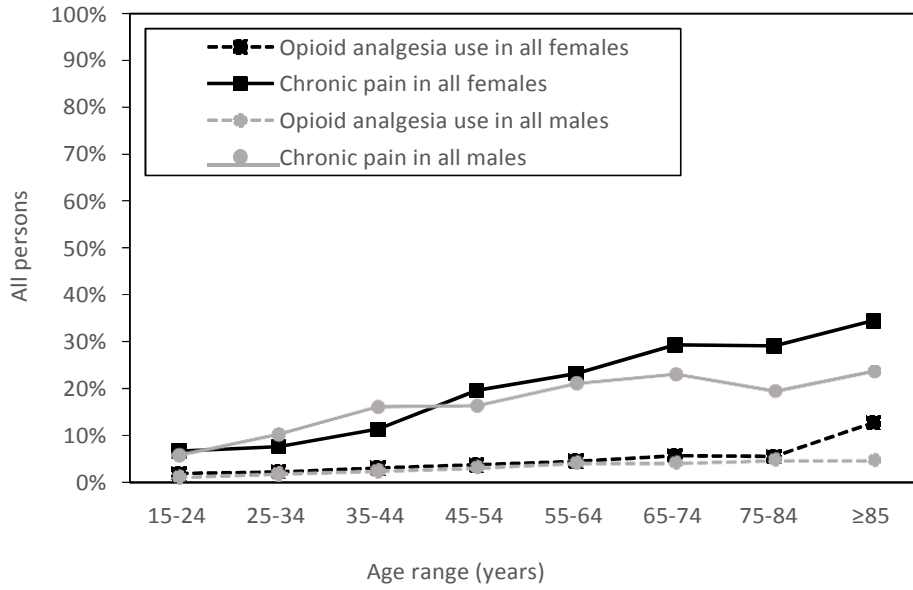
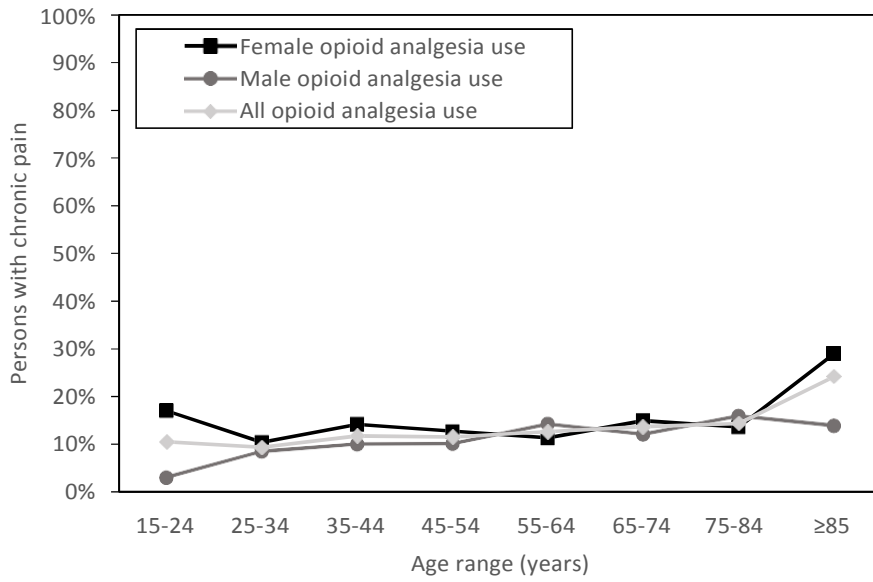


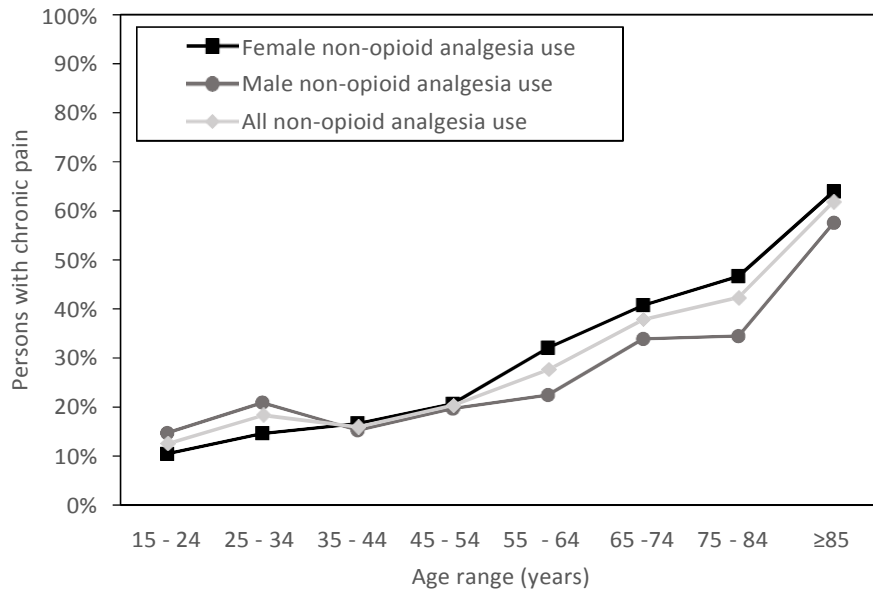
Figure 1

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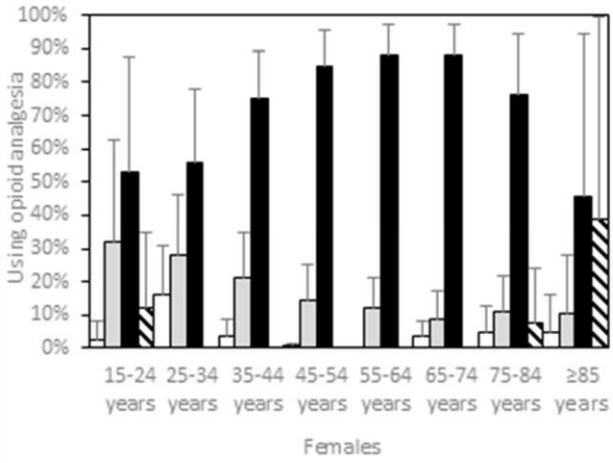


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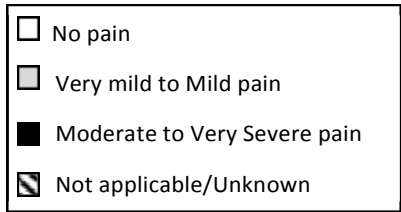
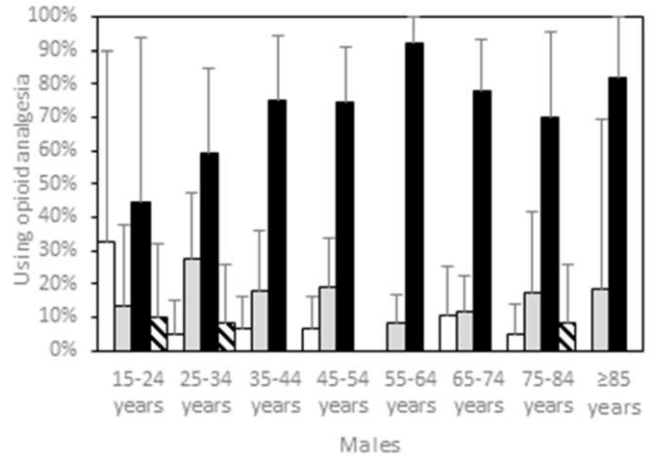


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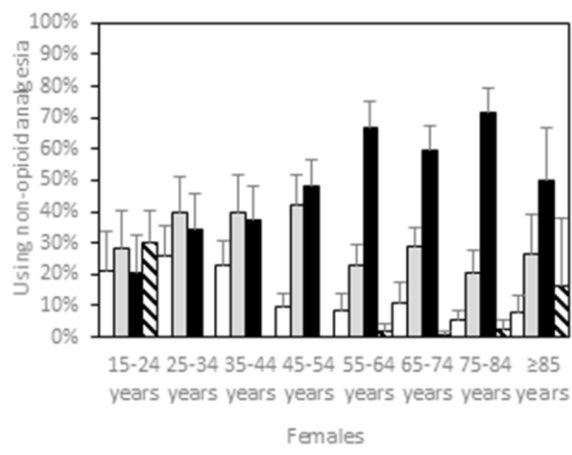


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