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Prevalence and Associations of Vaping in Young People Entering Youth Custody in New South Wales, Australia—A Retrospective Cross-Sectional Study

Leigh Haysom[1,2] | Abdul Nasser[2] | Calla Lee[2] | Anna Barker[1] | Penelope Abbott[1,2]

[1]Justice Health and Forensic Mental Health Network, Malabar, Australia | [2]School of Medicine, Western Sydney University, Campbelltown, Australia

Correspondence: Leigh Haysom (leigh.haysom@health.nsw.gov.au)

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ABSTRACT

Aim: Australia is a leader in rates of youth vaping. Previous research has shown that at-risk youth include young women, cigarette smokers, and young people experiencing mental distress. These risk factors suggest that young people entering custody in New South Wales, Australia, are likely to have high vaping rates, but the research is lacking.

Methods: This retrospective cross-sectional study analysed data from all young people entering the six youth justice facilities in New South Wales, Australia between February 2024 and July 2024 (prior to vape regulations), describing self-reported information about vaping, other smoking behaviours, and mental distress.

Results: 474 young people aged 11 to 20 years participated in an Initial Assessment on reception to custody. Almost two-thirds ($N = 283$, 61.3%) reported current vaping, with almost all vaping daily or on most days ($N = 240$, 84.8%) and more than half being nicotine dependent. Significant associations with vaping were a younger age, being female, living in a metro area, smoking cigarettes and cannabis, and higher levels of mental distress.

Conclusions: Vaping is common in young people entering custody, is more likely in young women, and is associated with other smoking behaviours and higher mental distress. Most vaping young people are nicotine dependent, with many reporting difficulties with quitting. Targeted strategies addressing these factors will better support young people in the smoke-free custodial environment and help prevent their relapse to vaping and smoking in the post-release period.

1 | Introduction

Vaping involves inhaling aerosolised particles produced when an e-liquid is heated by a coil inside the vape (also known as electronic cigarettes or e-cigarettes) [1]. Despite combustible smoking rates declining in most developed countries including Australia, vaping has become increasingly popular over the last decade [2]. Until the recent regulation in Australia, vapes were easily purchased over the counter, containing unknown amounts of toxins and carcinogens, such as polycyclic aromatic hydrocarbons, acrolein, 2-chlorophenol, and acetone [3]. There are acute side effects from vapes such as nicotine toxicity, acute lung injury, and burns; however, the long-term effects from vaping are still being researched [4]. There is evidence to suggest an increased risk of respiratory and cardiovascular disease, rapid development of nicotine dependence, and higher risk for cigarette smoking [5].

According to a systematic review and meta-analysis from 2022, Oceania has one of the highest rates of vaping, with the lifetime prevalence at 25% compared with America 24%, Europe 26%, and Asia 16% [6]. The Australian Institute of Health and

Welfare National Drug Strategy Household Survey (NDSHS) in 2022–2023 showed an almost three-fold increase in daily use and a doubling of ever use since 2019, with 7% of the Australian population currently using vapes and 19.5% having used them at least once in their lifetime [7]. The rates of vaping vary across different Australian geographic contexts, likely reflecting access to vapes, with daily vaping being highest in major cities compared to regional and remote areas. The increase in rates of daily vaping since 2019 has been more than three-fold in major cities and more than two-fold in regional areas, with no increase in remote areas [8].

The 2022–2023 NDSHS highlights Australian population groups of concern including young adults, women who vape and those experiencing high rates of psychological distress [7]. Almost half of young people aged between 18 and 24 years (49%) had ever vaped and 21% reported being current users [7]. According to the 2023 Australian Secondary School Student Use of Tobacco and E-Cigarettes, one third of secondary students (aged 12 to 18 years) had ever vaped and 5% were regular users [9]. Australian women who vape reported a four-fold increase in daily vaping between 2019 and 2023 [7]. Regular vaping rates are increased in Australians reporting psychological distress; 15.8% in individuals experiencing high levels of distress, compared to 3.9% of those experiencing low levels of distress [10].

Regular vaping rates in Aboriginal and Torres Strait Islander people are similar to non-Indigenous Australians at 7% [7], ever-use of vapes by Aboriginal and Torres Strait Islander secondary school students is higher compared to non-Indigenous students [9, 11]. This research also demonstrated a strong relationship between student vaping and all levels of smoking [11].

Incarcerated young people have an overrepresentation of risk factors for vaping. The 2015 New South Wales Young People in Youth Custody Health Survey (conducted prior to the emergence of vaping in Australia) demonstrated high rates of daily cigarette smoking (82.2%) and weekly or more cannabis use (76.0%). Psychological disorders were also common, with 83% of young people reporting one disorder and 63% reporting two disorders [12]. Despite these higher risk factors, there is currently no literature on vaping in incarcerated populations in Australia. This study aims to determine the prevalence of vaping in young people entering New South Wales custody and associations of vaping with smoking and other risk factors.

2 | Methods

This retrospective cross-sectional study used STROBE criteria to report on routinely collected reception information for all young people entering the six youth justice centres (three metro and three rural) in New South Wales between February 28, 2024 and July 15, 2024 [13]. On admission to youth custody, a trained registered nurse used an electronic standardised Initial Assessment tool to record self-reported demographic and health-related data from all young people who remained in custody for 24 h or longer. Because of the retrospective study design, the requirement for consent from young people was waived. Ethics approval for this study was obtained from the Justice Health Human Research Ethics Committee (approval G689-23) and the Aboriginal Health and Medical Research Ethics Committee (approval 2092/23). The study was also endorsed by the Baabayn Aboriginal Advisory Group in Western Sydney. Included variables from the Initial Assessment are listed below. A full copy of the Initial Assessment tool can be provided on request.

2.1 | Demographics

Age was calculated from date of birth and the date of Initial Assessment. Sex and Aboriginal and/or Torres Strait Islander status were self-reported. Students were asked if they were Aboriginal or Torres Strait Islander. Those who self-reported as either Aboriginal descent, Torres Strait Islander descent or both were classified as 'Aboriginal and Torres Strait Islander'. Those who selected 'No' were classified as 'non-Indigenous'.

2.2 | Metro, Rural and Remote Place of Residence

The geographical remoteness of the postcode of residence reported by young people (residence prior to entering custody) was determined by the Modified Monash Model 2019 (MMM 2019). The MMM classifies metropolitan, regional, rural, and remote postcodes according to geographical remoteness, as defined by the Australian Bureau of Statistics [14].

2.3 | Vaping Outcomes

Young people were asked 'do you vape?', 'how old were you when you started vaping?' and 'what do you vape?' with choices being nicotine, non-nicotine and other types of vapes. Frequency of vaping categories were 'daily/most days', '2–3 days per week', '1–2 days per week', '2–3 days per month' and 'monthly or less'. Nicotine dependence from vaping was determined by asking, 'how soon after waking do you vape?', 'have you ever tried to stop vaping?' and 'was it hard to stop vaping when you tried?'.

2.4 | Other Smoking Behaviours

Young people were asked, 'do you smoke tobacco/cigarettes?', and 'do you use cannabis?'. Young people with co-smoking behaviours (more than one type of smoking behaviour, i.e., vaping and also smoking cigarettes) were asked, 'what did you start first, tobacco smoking, cannabis use or vaping?'

2.5 | Strengths and Difficulties Questionnaire

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), defines psychological distress as an 'undifferentiated group of symptoms ranging from anxiety and depression symptoms to functional impairment, personality traits and behavioural problems' [15]. The Strength and Difficulties Questionnaire (SDQ) is a validated tool used on admission to custody to screen for psychological and behavioural disorders [16]. SDQ scores greater than 13 are correlated with a higher risk of anxiety/mood disorders, conduct/

oppositional defiant disorders, and attention-deficit/hyperactivity disorder, and this was used as a proxy measure for psychological distress.

3 | Analysis

Demographic and other data were stratified according to vaping and non-vaping status. Chi squared analyses were used to compare categorical independent variables, and student *t*-tests were used for continuous independent variables between vaping and non-vaping groups (Microsoft Excel, Microsoft Corporation 2018). Probability values <0.05 were considered significant.

4 | Results

During the study period, 474 young people participated in an Initial Assessment. This represents all young people who remained in custody for 24 h or longer. Twelve young people declined to answer any assessment questions and were excluded from the analysis. There was no difference in age, gender, and Indigenous status between the excluded young people and the overall study cohort. Table 1 shows the characteristics of vaping and non-vaping young people.

Of the 462 included young people, 80.7% were male, 62.3% were Aboriginal and Torres Strait Islander, with an age range of 11 to 20 years and an overall mean age of 15.7 years. There were 42.6% in the youngest age group of 11 up to 16 years, 49.6% in the 16 up to 18 years age group, and 7.8% of young people were 18 years and older. Prior to admission to custody, 27.1% of all young people were living in a metro area, 28.6% were living in rural, regional, and remote areas, and 38.7% had no recorded postcode. Almost one half of all young people reported current cigarette smoking (48.5%), and 61.0% reported current cannabis use. Almost one half of all young people (49.8%) reported a high SDQ score on entry to custody.

Almost two thirds of young people entering custody (61.3%) reported that they currently vaped. When comparing vaping young people to non-vaping young people, vaping youth were significantly younger (15.6 versus 15.9 years, $p=0.02$). There was a higher proportion of young women in the vaping group ($p=0.01$), as well as young people from metro areas ($p=0.002$), young people with high SDQ scores (0.00001) and those who also smoked cigarettes ($p=0.008$) and cannabis ($p=0.02$). There was no difference in the Indigenous status between the vaping and non-vaping groups.

The overwhelming majority of vaping young people vaped daily or on most days (84.8%). Almost all vaping young people used nicotine vapes (91.5%), with more than half of the vaping young people demonstrating nicotine dependency by having their first vape within 30 min of waking (54.5%), with over one third needing to vape within 5 min of waking (38.2%). Over one third (35.7%) of vapers had ever tried to stop vaping, and just over one half of these young people found quitting difficult (52.1%). The overall mean age to start vaping was 13.3 years, with females vaping from a significantly younger age compared to males (12.3 versus 13.5 years, $p=0.0001$). There was no difference in age to start vaping between Aboriginal and Torres Strait Islander and non-Indigenous youth, nor between metro young people and rural/regional/remote young people. Just over one quarter of vaping young people (25.1%) commenced their smoking behaviours through vaping.

5 | Discussion

According to the 2023 Australian Secondary School Student Use of Tobacco and E-Cigarettes study, one third of secondary students had ever vaped, 5% were regular users and 15% of 'never-vaping' students reporting susceptibility to vaping in the next 12 months [9]. Our novel research shows that young people in contact with the criminal justice system have 12 times the rate of regular vaping compared to other adolescent populations [11], with almost two thirds being current vapers on admission to custody, and almost all current users being daily vapers or vaping on most days of the week. Justice-involved young people have high rates of substance use associated with mental illness, trauma, psychological distress, lack of supports and accessibility and normalisation of substance use within families and peer groups [17]. A 2024 Western Australian secondary school student study found that social factors strongly influence rates of vaping in adolescents, with problematic marketing promoting vaping as a normalised and acceptable behaviour in young people. The affordability and easy access of vapes, and confusing health messaging about the safety of vapes have also been identified as contributing to these rates [18].

Vaping was the most popular smoking behaviour among the young people in our study, with almost one quarter of them commencing their smoking behaviours through vaping, with many developing co-smoking behaviours. Compared to the non-vaping group, our study shows a significantly higher rate of co-smoking in the vaping group. School student studies show that one in five (20%) students who had never smoked prior to trying an e-cigarette reported subsequent smoking of cigarettes, and those who regularly vape have a 3.6 times higher risk of smoking cigarettes later in life [9]. Our results also confirm the 'bi-directional gateway effect' between vaping and other smoking behaviours seen in other research. Three-quarters engaged in co-smoking, with one quarter of young people developing co-smoking behaviours through a vaping debut, with many others moving to vapes via either a cigarette smoking or cannabis debut [19]. In keeping with other research, our study found the rate of regular vaping was similar for both the Aboriginal and Torres Strait Islander and non-Indigenous young people [7]. We also found an increased prevalence of vaping in youth from metropolitan backgrounds compared to those living in rural or remote settings. This suggests the lack of access to vapes in non-metro areas can be a protective factor against vaping and supports the regulatory changes to reduce young people's access to vaping products [20, 21].

The vaping group in this study was significantly younger than the non-vaping group, and this may reflect the increasing attraction and accessibility to vapes in younger adolescents. Over time, vapes have become smaller, disposable, and more discrete,

TABLE 1 | Characteristics of vaping and non-vaping young people entering NSW Youth Custody from February 2024 to July 2024.

Characteristics ($N=462$)	Vaping ($N=283$, 61.3%)	Non-Vaping ($N=179$, 38.7%)	p
Gender			
Female ($N=89$, 19.3%)	65 (23.0%)	24 (13.4%)	0.01
Male ($N=373$, 80.7%)	218 (77.0%)	155 (86.6%)	
Indigenous status			
Aboriginal ($N=288$, 62.3%)	176 (62.2%)	112 (62.6%)	0.79
Non-Indigenous ($N=166$, 30.1%)	103 (36.4%)	63 (35.2%)	
Declined to answer ($N=8$, 1.8%)	4 (1.4%)	4 (2.2%)	
Mean age (years ± SD)			
15.71 (1.45)	15.58 (1.43)	15.91 (1.45)	0.02
Age range 11 to 20 years	12 to 20 years	11 to 18 years	
Age groups (years)			
11.0 to 15.9 ($N=197$, 42.6%)	134 (47.3%)	63 (35.2%)	0.01
16.0 to 17.9 ($N=229$, 49.6%)	129 (45.6%)	100 (55.9%)	
18.0 + ($N=36$, 7.8%)	20 (7.1%)	16 (8.9%)	
MM Category of residence prior to custody			
Metro ($N=125$, 27.1%)	89 (31.5%)	36 (20.1%)	0.002
Rural/regional/remote ($N=158$, 34.2%)	81 (28.6%)	77 (43.0%)	
No postcode available ($N=179$, 38.7%)	113 (39.9%)	66 (36.9%)	
Cigarette smoking			
Yes ($N=224$, 48.5%)	151 (53.4%)	73 (40.8%)	0.008
No ($N=238$, 51.5%)	132 (46.6%)	106 (59.2%)	
Cannabis use			
Yes ($N=282$, 61.0%)	185 (65.4%)	97 (54.2%)	0.02
No ($N=34$, 7.4%)	22 (7.8%)	12 (6.7%)	
Declined to answer ($N=146$, 31.6%)	76 (26.8%)	70 (39.1%)	
High SDQ (SDQ score > 13)			
Yes ($N=230$, 49.8%)	154 (54.4%)	76 (42.5%)	0.00001
No ($N=94$, 20.3%)	26 (9.2%)	68 (38.0%)	
Declined to answer ($N=138$, 29.9%)	103 (36.4%)	35 (19.5%)	
Types of vapes			
Nicotine	259 (91.5%)	—	—
Non-nicotine	19 (6.7%)	—	
Other	5 (1.8%)	—	
Frequency of vaping			
Daily/most days	240 (84.8%)	—	—
2–3 days per week	17 (6.0%)	—	
1–2 days per week	11 (3.9%)	—	
2–3 days per month	12 (4.2%)	—	

(Continues)

TABLE 1 | (Continued)

Characteristics ($N=462$)	Vaping ($N=283$, 61.3%)	Non-Vaping ($N=179$, 38.7%)	p
Monthly or less	3 (1.1%)	—	
First vape use after waking			
Within 5 min of waking	108 (38.2%)	—	—
6 to 30 min of waking	46 (16.3%)	—	
More than 30 min	129 (45.5%)	—	
Ever tried to stop vaping			
Yes	101 (35.7%)	—	
No	170 (60.1%)	—	
Declined to answer	12 (4.2%)	—	
Hard to stop vaping when you tried?			
Yes	53 (52.5%)	—	
No	45 (44.6%)	—	
Declined to answer	3 (2.9%)		
Mean age started vaping (years ± SD)			
Males	13.48 (1.61)	—	0.0001
Females	12.28 (1.56)	—	
Aboriginal	13.22 (1.62)	—	0.49
Non-Indigenous	13.36 (1.67)		
Metro	13.33 (1.64)	—	0.61
Rural/regional/remote	13.20 (1.64)	—	
Vaping debut before other smoking			
Yes	71 (25.1%)	—	—
No	202 (71.4%)	—	
Declined to answer	10 (3.5%)	—	

Abbreviations: MM, modified Monash; SD, standard deviation; SDQ, strengths and difficulties questionnaire.

marketed to children with youth-friendly designs that make them easily hidden in a pencil case or pocket [2]. The recent regulatory changes in Australia (commencing after this study) to ban disposable vapes, limit flavours, and restrict access will likely address some of these concerns [21]. This study also found an overrepresentation of females in the vaping cohort, with young women commencing vaping at a younger age compared to male vapers. Similarly, young women were found to be an emerging group of particular concern in the 2022–2023 NDSHS, with 13.5% of those aged 14 to 17 years ever using a vape in the past year compared with 7.1% of young men, and daily use of vapes in young women being 5.7% compared with 1.8% of young men [7]. The different motivations to vape may be influencing these outcomes, with women reporting vape use to deal with stress, weight control, and to regulate mood, and men reporting positive attributes such as taste, energy, and social facilitation [22].

Almost all the vaping young people used nicotine vapes, with high rates of nicotine dependence. A significant number of the young people had tried to quit vaping, with many reporting this to be difficult. Vape addiction among young people develops rapidly, with vaping being possible in most settings and some vapes containing thousands of 'hits' [23]. Nicotine withdrawals are also well described, with many adolescents having significant nicotine withdrawals despite not having a long history of vaping [24]. Withdrawals on attempting to quit vaping may lead to relapse to vaping or progression to tobacco smoking [25].

This study also found significantly higher rates of mental distress in the vaping young people. In other research, young people mentioned stress relief as a motivating factor for trying vaping, continuing to vape, and future intentions to vape [26]. Young people may not recognise symptoms of nicotine withdrawal and interpret the immediate relief from withdrawal symptoms upon vaping as 'stress-relief' [23]. However, in the longer term, vaping may accentuate stress and mental distress; a 2017 study involving 2500 ninth graders in Los Angeles found that vape users exhibited increased levels of mental distress. These included feelings of sadness and crying spells, which were more pronounced a year later among the vaping group [27].

6 | Limitations

Our study had several limitations. Sampling bias may have occurred by not including those young people entering youth custody for only a short period of time (i.e., less than 24 h) who did not undergo health assessments, and by the missing data of those who declined to answer questions, particularly for the category of residence and SDQ data. Self-reporting of data may have introduced measurement bias. As a cross-sectional study, there was no capacity to analyse long-term trends or changes in vaping behaviours in young people over time. This study was conducted prior to the 2024 Australian legislation to regulate vapes, when access to vapes was relatively easy. A follow-up study since the vaping regulations may show different rates of all smoking behaviours in these youth.

7 | Conclusion

This study highlights that vaping and nicotine dependence in young people in NSW custody are common. Youth-centred, evidence-based strategies are required to support these young people in vaping and smoking cessation during their custodial stay, and to prevent relapse to vaping and smoking in the post-release period. Health promotion, brief interventions, and treatments should consider younger women as a particular target group of concern and incorporate psychological supports. Given the high numbers of Aboriginal and Torres Strait Islander youth in custody, culturally appropriate initiatives are needed. A follow-up study to investigate changes in vaping since the 2024 regulations is an important area of future research.

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Conflicts of Interest

The authors declare no conflicts of interest.

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