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Tobacco smoking in an Australian university sample and implications for health promotion.

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From 2001-2007, smoking among 18-24 year old Australians declined from 31% to 23% (ABS, 2009). The proportion of this age group who were current smokers in the USA in 2007 was 22% (CDCP, 2007). A literature review identified no studies of the prevalence of smoking among Australian university students.

University life provides a period of transition when health behaviour patterns such as tobacco and alcohol consumption become established (Ling and Glantz, 2002). It is an important time for young people to be exposed to environments that discourage smoking and support cessation. We estimated the prevalence of smoking in a diverse university population and reflected on implications for tobacco control.

In April 2007, a random sample of 13,000 undergraduates was invited to complete an online survey, including questions on smoking and alcohol consumption (Kypri et al, 2009). Respondents were asked to indicate whether they “never smoked”; “do not smoke but used to”; “occasionally smoke”; or “currently smoke”. The last three groups are hereafter referred to as ‘Ex-smokers’, ‘Occasional smokers’ and ‘Daily smokers’ respectively (Kypri and Baxter, 2004).

The University identified all full-time undergraduates aged 17-24 years. A letter was sent to each student, inviting them to participate and noting they would soon receive an e-mailed hyperlink to the questionnaire. Confidentiality was assured and it was emphasised that the research was independent of the university administration. Non-respondents were sent up to two reminder e-mails and a reminder letter in the following month (Hallett et al., 2009).

Over 55% (n=7211) of the sample responded to the smoking questions, 57% were women (n=4108) and 84% were Australian or New Zealand (NZ) residents (n=6049; Table 1). The mean age of respondents was 19.5 years (SD 1.9) and 10.2% were current smokers (occasional or daily; Table 1). Students with Australian/NZ residency were significantly less likely to be current smokers than on-campus international students (9.0% versus 16.9%,  $p<0.001$ ). Men were significantly more likely to be current smokers than were women (12.9% versus 8.3%,  $p<0.001$ ).

Mann-Whitney U tests showed significant differences in the number of cigarettes smoked on a typical day by current smokers, with males (Median=3, IQR 1-8) smoking 50% more than females (Median=2, IQR 0-6;  $p<0.001$ ) and international students (Median=5, IQR 2-10) smoking more than residents (Median=2, IQR 0-6;  $p<0.001$ ).

There were small differences in demographic variables for respondents compared to the overall demographic profile of undergraduate students at the university. Respondents were younger, more often Australian/NZ citizens, and female ( $p < 0.001$ ). There was no difference between the early and late respondent in current smoking or in quantity of cigarettes consumed. The interaction between age and residence status on current smoking status was significant ( $p < 0.001$ ). Among males, international students were 2.13 (95% CI: 1.66 -2.73) times more likely to be current smokers than residents. Among females, however, there were no differences ( $p = 0.766$ ) between international and Australian/NZ residents in smoking status. The 20-25 year group was 1.87 (95% CI: 1.58-2.20) times more likely to be current smokers compared to 17-19 year olds.

The prevalence of smoking in this population is one of the lowest reported among university students of any English speaking country (Steptoe et al., 2002; Kypri and Baxter, 2004). This is consistent with the low prevalence of smoking in Western Australia (WA), where 14.8% of those aged 14 years and over are daily smokers, compared with 16.6% Australia-wide (AIHW, 2008; Somerford, 2008). It is probable that longstanding quit campaigns in WA have been effective (Somerford, 2008). In addition, the surveyed university was the first in Australia to enact significant smoke free policies in 1987 (Howat et al., 1990). Varying student demographics across universities limit the generalization beyond this institution however the survey approach (Hallet et al 2007) is easily replicable and would build comparable datasets to enhance tobacco use surveillance.

Our estimates may be slightly biased by selective non-response and under-reporting. Men and international students were under-represented among the respondents. A previous study using the procedures in a university sample (Kypri and Baxter, 2004) suggested that non-respondents are somewhat more likely to be smokers than respondents. Accordingly, the true prevalence of smoking is probably higher than we estimated. Underestimation may be small given the similarity between early and late survey respondents in smoking behaviour.

The relatively low prevalence of smoking in this population is not a justification for ceasing efforts to reduce smoking in this setting. On the contrary, ongoing education and smoke-free policies are desirable in universities as: increasing proportions of young Australian adults are attending universities; many graduates will occupy influential positions where their smoking status can influence community norms and policy; ongoing interventions via education and policy are required to maintain the downward prevalence; and they reinforce the quit message and the benefits of not smoking (AIRC, 2007; Polednack, 2009). Also, universities have a duty of care, especially to international students.

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## References

Australian Institute of Health and Welfare, 2008. 2007 National drug strategy household survey: State and territory supplement. Drug statistics series no.21. Cat.no. PHE 102. Canberra, Australia: Australian Institute of Health and Welfare.

Australian Bureau of Statistics, 2009. National health survey: summary of results 2007-2008, Cat. No. 4364.0. Canberra, Australia: Australian Bureau of Statistics.

Centers for Disease Control and Prevention, Office of Smoking and Health, 2008. Cigarette smoking among adults – United States, 2007. MMWR 57,1221-1226.

Hallett, J., Maycock, B., Kypri, K., Howat, P., McManus, A., 2009. Development of a web-based alcohol intervention for university students: processes and challenges. *Alc & Drug Rev.* 28, 31-39.

Howat, P., Frizzell, S., Jackson, G., Lee, S., Lo, K., Robinson, S., Rose, J., Sauer, K., 1990. The influence of health promotion on drug use of tertiary students in Western Australia. *Drug Ed J Aust.* 4,87-92.

International Agency for Research on Cancer & World Health Organization, 2007. Evaluating the effectiveness of smoke-free policies. IARC Handbooks on Cancer Prevention in Tobacco Control, Volume 13. Geneva: International Agency for Research on Cancer, & World Health Organization.

Kypri, K., Baxter, J., 2004. Smoking in a New Zealand university sample. *NZ Med J.* 117,1-6.

Kypri, K., Hallett, J., Howat, P., McManus, A., Maycock, B., Bowe, S., 2009. Universal web-based alcohol screening and brief intervention for university students: a randomized controlled trial. *Annals of Int Med.* 169,1508-1514.

Ling, P.M., Glantz, S.A., 2002. Why and how the tobacco industry sells cigarettes to young adults: evidence from industry documents. *AJPH.* 92,908-16.

Polednack, A.P., Smoke-free laws and cigarette excise taxes in the U.S. States with highest vs. lowest adult smoking rates in 2007. *Prev. Med.*49,558-559.

Somerford, P., 2008. Tobacco use and health. In: Cancer Council Western Australia. The progress of tobacco control in Western Australia: achievements, challenges and hopes for the future. Perth, Australia: Cancer Council Western Australia.

Steptoe, A., Wardle, J., Cui, W., Baban, A., Glass, K., Pelzer, K., Tsuda, A., Vinck, J., 2002. An international comparison of tobacco smoking, beliefs and risk awareness in university students from 23 countries. *Addiction.* 97,1561-1571.

Table 1

University student responses to the question 'Which best describes your use of cigarettes?' (Perth, Australia 2007).

| Response            | Women(%)    | Men (%)     | Aust/NZ (%) |         | International (%) | All (%)     |
|---------------------|-------------|-------------|-------------|---------|-------------------|-------------|
|                     |             |             | Resident    | Student |                   |             |
| Never smoked        | 3606 (87.8) | 2583 (83.2) | 5287 (87.4) |         | 902 (77.6)        | 6189 (85.8) |
| Used to smoke       | 163 (4.0)   | 119 (3.8)   | 218 (3.6)   |         | 64 (5.5)          | 282 (3.9)   |
| Occasionally smoked | 213 (5.2)   | 230 (7.4)   | 361 (6.0)   |         | 82 (7.1)          | 443 (6.1)   |
| Smoke daily         | 126 (3.1)   | 171 (5.5)   | 183 (3.0)   |         | 114 (9.8)         | 297 (4.1)   |
| Totals              | 4108        | 3103        | 6049        |         | 1162              | 7211        |