Sleep-in to stay well: addressing school start times for the health and wellbeing of teens in Aotearoa

Charmaine Barber, Sarah Hetrick, Liza Edmonds, Rachael W Taylor, Mohamed Alansari, Leigh Signal, Jillian Haszard, Jacinta Oldehaver, Barbara Galland and members of the School Start Time Study Advisory Group

ABSTRACT

The under-acknowledged malleability of secondary school start times may be a lever towards addressing poor sleep, particularly the sleep deprivation that many adolescents living in Aotearoa New Zealand experience on a daily basis. Scrutinising morning school start times has not been prioritised in terms of a logical, modifiable way to counteract sleep deprivation in adolescents in Aotearoa. Importantly, later start times align with adolescents' natural sleep-wake biology that shifts at puberty to favour later bedtimes, meaning they naturally need to wake later in the morning. In this viewpoint we argue that a later school start time (no earlier than 9:45 am) every day for senior secondary school students is an attractive, non-stigmatising approach to address adolescent sleep. Increased sleep also has the potential to favourably impact multiple areas of adolescents' health and wellbeing, as well as school success. In fact, we argue that later school start times are a public health imperative to address the sleep and mental health issues faced by youth in Aotearoa today.

We need to talk about sleep and adolescent health in Aotearoa (New Zealand). Sleep is essential for survival as well as being vital for children's health, wellbeing and development. It is well known that insufficient and poor-quality sleep is endemic in adolescents,[1,2] to the detriment of their health and wellbeing, yet we have failed to prioritise the issue. As teenagers have less scope for optimising and controlling their sleep than adults, we urgently need novel ways of ensuring youth get the sleep they need. Furthermore, the detrimental effects that sleep issues have on health and wellbeing is more likely to be experienced by Māori. Therefore, ensuring sleep health equity in Aotearoa is paramount to address.[3,4] Good sleep is a fundamental right and addresses Te Tiriti o Waitangi/Treaty of Waitangi obligations. Improving sleep in durable, community-centred ways is one way forwards to reduce health inequities, as it shifts the focus from sleep being an individual problem to a public health issue.

United States (U.S.) researchers have dominated efforts to introduce school settings as population-based initiatives for improving adolescent sleep health. This is perhaps not surprising, given that school start times are often much earlier in the U.S. than other countries. For example, in 2019 California was the first state to uphold the protection of youth sleep by legislating that senior students must start no earlier than 8:30 am.[5] However, even though schools in Aotearoa do not start before 8:30 am, many teens are still clearly not getting enough sleep.[2,6] We need to go beyond the U.S. research and propose school starts no earlier than 9:45 am as a more appropriate start time for senior high school students in Aotearoa to address their sleep health and wellbeing.

The problem with adolescents' sleep

While insufficient sleep (defined as a sleep quantity inadequate to meet sleep needs) and poor-quality sleep (defined as disturbed sleep, which can include difficulty falling or staying asleep, sleep that is fragmented or the perception of not sleeping well, and includes sleep quantity as a component) promote poorer physical and mental wellbeing at any age, the unique developmental period of adolescence, marked by increased physical changes as well as independence and emergence of new social roles, presents distinct challenges. The ability for adolescents to obtain enough sleep each night is influenced by many factors, such as use of electronic devices

and engagement with social media, after-school activity commitments, homework requirements[7] and differing cultural sleep norms.[8] In addition, dramatic changes in sleep biology are a hallmark of adolescence, whereby their chronotype (sleep timing preference) shifts to become more evening-based, and is a major factor in the argument for later school start times. Across the day, the pressure to sleep builds (termed sleep homeostasis); however, during adolescence that pressure increases more gradually, so that teens stay alert much later into the evening than adults.[9] Further, during this developmental period, sleep and wake timing, primarily influenced by the 24-hour light-dark cycle, changes. There is a delay in the release of the "night" hormone melatonin that aids sleep onset.[9] Prior to sleep onset, electronic device use is rife, providing stimulation and light exposure that also contributes to delayed sleep onset, and also feeding back to the processes that drive sleep and wake regulation.[10] To aid morning waking, melatonin release is suppressed around 3 hours before waking. In adults, this is around 4 am, but in adolescents, this is not until about 7 am. In essence, this means that waking a teen at 7 am every day is similar to waking an adult at 4 am.[11]

Bedtimes become later with each passing year during adolescence.[1] Later bedtimes mean adolescents need to wake later in the morning to obtain their full sleep quota, but school start times during the week prevent this. In turn, adolescents accumulate a sleep debt across the weekdays, recovering at the weekends and holidays with more opportunities for "catch-up" sleep in the mornings. However, it is becoming clear that these variable weekday–weekend patterns (also known as social jet lag) can be detrimental, with links to attention problems, depressive symptoms, poorer academic performance, higher risk of substance use, overweight/obesity, self-harm and suicidality.[12] Therefore, later school start times not only accommodate the unique biological needs of all adolescents, they also have the potential to reduce social jet lag.

A stealth approach for sleep health equity

Later school start times are a "stealthy" way to improve the sleep health of our teens as a pathway towards better health and wellbeing for all. Due to teens' changing sleep biology, the later years in the secondary education context provide an unparalleled opportunity to address sleep inequities, reaching adolescents from all ethnicities and socio-economic positions. Like many health issues in Aotearoa, there are inequities in sleep health across all age groups,[2,3,13] and for adolescents, in the many health and developmental outcomes that are a consequence of both insufficient and poor-quality sleep.[7]

Later school start times have the potential to be a component of broader interventions that can be utilised to address health inequities.[14] The approach is one of responsiveness to inequitable health outcomes that exist for Māori, beyond differences in socio-economic position, enabling sleep as the key driver towards a multitude of health and wellbeing benefits for adolescents. Starting school later has the potential to benefit *all* students, rather than the more privileged who all too often benefit the most from interventions (i.e., non-Indigenous). Additionally, the opportunity to activate Matua Moana Jackson's term, re-powering Māori adolescents through increased sleep, could be a factor towards the growth of on-task adolescents and social engagement in school communities.[15]

Pasifika sleep research has started a sleep health conversation,[16,17] although the baton has not yet been ushered forwards by comprehensive adolescent research with the multiplicity of diverse Pasifika peoples in the Aotearoa setting. Beyond national statistics reporting prevalence figures for different ethnic groups meeting public health guidelines for sleep,[6] there is much to explore with Māori and Pasifika teens' sleep in Aotearoa.

In fact, we argue that later school start times are a public health imperative to address the sleep and mental health issues faced by youth in Aotearoa today. Over two thirds of teens growing up in Aotearoa report good overall wellbeing, but many do not.[18] The number with depressive symptoms has risen (increased from 13% in 2012 to 23% in 2019), and disproportionately affects ethnic groups, particularly Māori.[18] Poor sleep and mental health are inextricably linked, with longitudinal and treatment studies suggesting that sleep disturbance could act as a precursor to depression in adolescents.[19] By addressing sleep, we have the opportunity to also impact mental health difficulties.

American National Sleep Health Foundation guidelines suggest that adolescents aged 14 to 18 years require 8 to 10 hours of sleep per night for optimal health and daytime functioning. These guidelines have been adopted by many countries including Aotearoa.[6] However, studies from across the globe continue to report that the aver-

age sleep duration in adolescents is less than these recommended amounts. Aotearoa is no exception, with 39% of teens sleeping less than the recommended hours for their age, and 57% reporting their sleep is of poor quality.[2] The issues of poor sleep are far reaching and adversely impact adolescent health broadly, including across multiple areas like the risk of mood disturbances, depressive symptoms, cognitive and behavioural problems, suicidality, unintentional injuries, motor vehicle accidents and risk of overweight and obesity.[7] In turn, many of these issues have the ability to adversely influence academic achievement, absenteeism rates and school enjoyment.[1] When sleep loss is chronic, associated health issues in adolescents include lowered resistance to common infections and illnesses,[20] and an increased risk of cardiovascular disease in obese teens[21] and type 2 diabetes.[22]

Later school start times for adolescents, a recommendation of the American Academy of Pediatrics (AAP),[23] is highlighted here as one important intervention that addresses the preference for a later sleep onset by aligning students' day activities with their natural biological rhythms, and provides more opportunities for adolescents to get the recommended 8–10 hours of sleep, although the AAP recommendations were made based on 43% of public high schools at the time (in 2014) having a start time before 8 am. A systematic review evaluating six pre-/post-design studies, where school start times were delayed by 25–60 minutes in four different countries (original start times between 7:30 and 8:30 am), reported increases of 25–77 minutes in total sleep time per weeknight with significant reductions in daytime sleepiness and tardiness.[24] While it's commonly assumed that later school start times will encourage teens to just stay up later, in practice there is little evidence for this; most sleep gains are through later wake times,[25] aligning with teens' sleep-wake biology.

Are schools' current practices standing in the way of sleep health equities?

Health (including sleep) and education are more intricately intertwined than we often acknowledge. Factors related to adolescent school success are a complicated nexus. Outcomes (defined by and centred in the community and whānau) today are more likely to be associated with the successful weaving of threads in the wellbeing of the whole person, rather than focussing narrowly on academic success.[26] Student engagement and school retention are areas where equity- and population-based approaches to adolescent wellbeing are needed to address issues of progressive student disengagement and dropout/pushout rates. In this way, the organisational and structural features of educational contexts tend to act in concert to the extent that schools can hold responsibilities for barriers to adolescent wellbeing, which also includes sleep.

Non-Māori and non-Pasifika ways of making sense of the world have subordinated the centrality of Māori and Pasifika cultures, leading to environments that still limit Māori students' connectedness and belonging on a daily basis.[27] As a result, schools may have diminishing opportunities to retain students, and their "school holding power" is challenged because the school connectedness that is so valuable for students has either been eroded, or was never adequately fostered. Effective population-based policy, therefore, has an important role to play in the development of interventions that address racial discrimination so that equity-based sleep health and wellbeing is achieved for secondary school students.[3] From the standpoint upheld by Macfarlane et al. (2007),[28] all aspects of Māori students' wellbeing are to be acknowledged and supported at school. Integral to a student's wellbeing so they can thrive at school is the opportunity for a good night's sleep, each and every night.

Concerning downward trends in attendance rates in Aotearoa, heightened by the COVID-19 pandemic, have recently been brought to the attention of the government. Among the options to improve attendance rates are front-line roles for attendance officers to support schools;[29] roles that run the risk of being viewed as service-centred rather than student-centred. Whether school attendance and school retention rates in Aotearoa could be lifted by later school start times remains unknown. Overseas research has documented mixed success,[25] but one study stands out in that it began with school start times similar to ours; a state school in the U.K. shifted from 8:50 am to 10 am starts and reported a significant decline in absenteeism due to illness, starting out well above the national average to below after two years.[30] Culturally sustaining approaches towards school attendance are undoubtedly essential—likely a multi-layered undertaking—but we suggest that for senior students at least, a starting point is the time the school day begins.

In Aotearoa, there is mixed evidence from dif-

ferent age groups regarding associations between ethnicity, socio-economic position and a variety of sleep health issues, with scant data in the adolescent age group.[2,3,13,14,31] Adding another layer of consideration to the issue of student wellbeing is the school decile system in Aotearoa. Even though it is targeted for phasing out, there is some immediacy in relation to the Māori and Pasifika student over-representation in the lower deciles. Importantly, overseas research on later school start times has shown that those who are economically disadvantaged and do not do so well academically benefit the most in terms of improved attendance, lower dropout rates or greater academic gains.[32]

Policy implications and future research

Closer collaboration between the health and education sectors in the endorsement of initiatives to improve sleep and wellbeing could assist community-centred cohesion in various school decile locations. This may also have a positive influence on Māori and Pasifika identities that are sometimes different from traditional cultural markers, such as language and places of worship or meeting. For some students these cultural reference points have shifted so that students' identities can be more of a localised sense of belonging according to the area/s—urban and rural—in which they live.[33] In relation to sleep, this can be multiple home environments and multiple interpretations of ethnicity within the same whānau that teens are navigating, before they then navigate their identities at school.

Therefore, institutions such as schools can be agents that contribute to cultural identity. Educational contexts, as holistic environments, should include sleep health in conjunction with strengths-based approaches that support adolescent wellbeing, identity, achievement and sense of belonging. The pertinent issue is that later school start times are increasingly seen to be a logical, modifiable factor to synchronise schools with adolescent biology in many countries. While some students in the junior high school levels could also benefit, younger teens' chronotypes are more suited to earlier waking than older teens.[2] The hours before school starts when the child could potentially be home alone is also an issue. It is illegal in Aotearoa to leave a child under the age of 14 years home alone without reasonable provision for their care, although this does not always fit with the realities of whānau life.

Multi-disciplinary and multi-method approaches to research in adolescent sleep health ought to alleviate an acknowledged under-valuing of similar nuanced social and policy determinants. Areas of analyses where data may be under-utilised in terms of outcomes include motor vehicle crashes, rates of substance abuse, after-school crime, mental health and youth employment. Aspects that could also be examined further are school violence and its association with poor sleep and family conflict over bedtimes with the potential to impact adolescents' sleep and mental health.

Research also needs to also explore the barriers and facilitators to later school start times as perceived by different stakeholders in different communities to understand specifics about the various levels of engagement that need to be involved in co-designing sleep interventions to assist in decisions regarding implementation. Qualitative research approaches may be best for this, enabling heterogeneous groups to contribute in substance, rather than just form, and are particularly important for developing community sleep interventions. Although there are many stakeholders with a vested interest, ensuring the participation and the hearing the voices of adolescents as key stakeholders is essential and important for expansiveness and sustainability in each context.

After much-needed conversations, and consultation within communities, a process of change may also be assisted by the Board of Trustee regulations that from 2016 enabled individual schools to make decisions regarding school start times. Few schools in Aotearoa, however, have overtly explored a later school start time in order to amplify student success inclusive of health outcomes. It seems likely that minimal numbers of students, parents, teachers or administrators are aware of the malleability of daily scheduling in secondary schools. The concept of a later school start time for Year 12 and 13 students in Aotearoa is still relatively new despite one school—Wellington High School—having offered later scheduling every day (9:45 am Monday to Friday, with the exception of 10:20 am on a Wednesday) for senior students since 2006, with research suggesting benefits to students' sleep and alertness levels.[34] What is also important to note is that the school has managed to adapt their timetables so as not to change the school finishing time. We are aware of several high schools in Aotearoa that offer a later start one day a week. While this is a positive initiative, if offered on a midweek day this could compound social jet lag as

the student has to adapt to three, instead of two, changes in their sleep-wake schedule across a full week. A Monday or Friday later start, adjoined to the weekend days, would offer the most benefit for teenagers' sleep health.

Conclusion

Later school start times are a "no-brainer" to the authors of this commentary, in order to address the poor sleep of adolescents as a pathway towards the better health and wellbeing of senior high school students in Aotearoa. While we are not dismissing the importance of healthy sleep behaviours for addressing sleep health issues (e.g., avoiding light and screen time before bed, and stimulant drinks), later starts offer a non-stigmatising approach to benefit all. It could be argued that an increased understanding of the role of sleep for overall adolescent health needs to be reinforced to all key stakeholders, inclusive of policy makers, especially as students in Years 12 and 13 benefit from later waking since their sleep-wake biology has shifted. Further dimensions of sleep health related to ethnicity and societal changes with the COVID-19 pandemic may compel schools to investigate later start times.[35] Quantitative and qualitative data would be valuable resources for informing school communities on the benefits of trialling later school start times. Such resources would also be a reminder that social determinants of health include sleep health. Rather than later school starts playing an under-recognised role in improving adolescent sleep health, a systems-based approach to school start change that reinforces "culture is not static" has the potential to benefit a vast range of communities both locally and globally, and in a measurable way.

COMPETING INTERESTS
Nil.

ACKNOWLEDGEMENTS
School Start Time Study Advisory Group: Dr Sarah Fortune, Department of Social and Community Health, School of Population Health, The University of Auckland, Auckland, New Zealand; Dr Nicola Ludin, Department of Psychological Medicine, The University of Auckland, Auckland, New Zealand; Ms Alison Jeffery, Wellington High School, Wellington, New Zealand; Ms Sarah Bartley, Bayfield High School, Dunedin, New Zealand.

AUTHOR INFORMATION
Charmaine Barber: Post-Doctoral Fellow, Department of Women's & Children's Health, University of Otago, Dunedin, New Zealand.
Sarah Hetrick: Associate Professor in Youth Mental Health, Department of Psychological Medicine, Faculty of Medical and Health Sciences, Waipapa Taumata Rau, Auckland, New Zealand, and A Better Start E Tipu E Rea National Science Challenge.
Liza Edmonds: Clinical Senior Lecturer, Department of Women's & Children's Health and Kōhatu (Centre for Hauora Māori), University of Otago, Dunedin, New Zealand.
Rachel Taylor: Research Professor, Department of Medicine, University of Otago, Dunedin, New Zealand.
Mohamed Alansari: Senior Researcher, New Zealand Council for Educational Research, Wellington, New Zealand.
Jacinta Oldehaver: Lecturer and Co-Associate Dean Pacific, School of Curriculum and Pedagogy, Faculty of Education and Social Work, Waipapa Taumata Rau, Auckland, New Zealand.
Leigh Signal: Professor of Fatigue Management and Sleep Health, Sleep/Wake Research Centre, School of Health Sciences, College of Health, Massey University, Wellington, New Zealand.
Jillian Haszard: Senior Research Fellow, Biostatistics Centre, University of Otago, Dunedin, New Zealand.
Barbara Galland: Research Professor, Department of Women's & Children's Health, University of Otago, Dunedin, New Zealand.

CORRESPONDING AUTHOR
Barbara Galland: Department of Women's & Children's Health, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand. Ph: +64 212468700.
E: barbara.galland@otago.ac.nz

REFERENCES
1. Gradisar M, Gardner G, Dohnt H. Recent worldwide sleep patterns and problems during adolescence: a review and meta-analysis of age, region, and sleep. Sleep Med. 2011;12(2):110-18.
2. Galland BC, de Wilde T, Taylor RW, Smith C. Sleep and pre-bedtime activities in New Zealand adolescents: differences by ethnicity. Sleep Health. 2020;6(1):23-31.
3. Paine SJ, Harris R, Cormack D, Stanley J. Racial Discrimination and Ethnic Disparities in Sleep Disturbance: the 2002/03 New Zealand Health Survey. Sleep. 2016;39(2):477-85.
4. Harris RB, Cormack DM, Stanley J. Experience of racism and associations with unmet need and healthcare satisfaction: the 2011/12 adult New Zealand Health Survey. Aust N Z J Public Health. 2019;43(1):75-80.
5. California Legislative Information. SB-328 Pupil attendance: school start time 2019-2020. Available at: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB328_ [accessed 2022 Sep 18].
6. Ministry of Health. New Zealand Health Survey Annual Data Explorer. 2021. Available at: https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/surveys/new-zealand-health-survey [accessed 2022 Sep 18].
7. Owens JA, Weiss MR. Insufficient sleep in adolescents: causes and consequences. Minerva Pediatr. 2017;69(4):326-36.
8. Vaipuna T. Sleep in Pasifika Adolescents Bachelor of Medical Science with Honours thesis. Dunedin: University of Otago; 2017. https://ourarchive.otago.ac.nz/handle/10523/10510.
9. Carskadon MA. Sleep in adolescents: the perfect storm. Pediatr Clin North Am. 2011;58(3):637-47.
10. Crowley SJ, Wolfson AR, Tarokh L, Carskadon MA. An update on adolescent sleep: New evidence informing the perfect storm model. J Adolesc. 2018;67:55-65.
11. Carrell SE, Maghakian T, West JE. A's from Zzzz's? The Causal Effect of School Start Time on the Academic Achievement of Adolescents. Am Econ J Econ Policy. 2011;3:62-81.
12. Sun W, Ling J, Zhu X, Lee TM, Li SX. Associations of weekday-to-weekend sleep differences with academic performance and health-related outcomes in school-age children and youths. Sleep Med Rev. 2019;46:27-53.
13. Muller D, Paine SJ, Wu LJ, Signal TL. Sleep timing and sleep problems of preschoolers in Aotearoa/New Zealand: relationships with ethnicity and socioeconomic position. Sleep Med. 2020;76:1-9.
14. Paine SJ, Gander PH. Explaining ethnic inequities in sleep duration: a cross-sectional survey of Māori and non-Māori adults in New Zealand. Sleep Health.

2016;2(2):109-15.
15. Reid P, Paine SJ, Curtis E, et al. Achieving health equity in Aotearoa: strengthening responsiveness to Māori in health research. N Z Med J. 2017;130(1465):96-103.
16. George M TR, Richards R, Galland B, Taylor R, Matahaere M, et al. Moe Kitenga: a qualitative study of perceptions of infant and child sleep practices among Māori whānau. AlterNative. 2020;16(2):153-60.
17. Vaipuna TFW, Williams SM, Farmer VL, et al. Sleep patterns in children differ by ethnicity: cross-sectional and longitudinal analyses using actigraphy. Sleep Health. 2018;4(1):81-6.
18. Fleming T, Peiris-John R, Crengle S, et al. Youth19 Rangatahi Smart Survey, Initial Findings: Introduction and Methods. The Youth19 Research Group, The University of Auckland and Victoria University of Wellington, New Zealand; 2020.
19. Lovato N, Gradisar M. A meta-analysis and model of the relationship between sleep and depression in adolescents: recommendations for future research and clinical practice. Sleep Med Rev. 2014;18(6):521-9.
20. Orzech KM, Acebo C, Seifer R, Barker D, Carskadon MA. Sleep patterns are associated with common illness in adolescents. J Sleep Res. 2014;23(2):133-42.
21. Iglayreger HB, Peterson MD, Liu D, et al. Sleep duration predicts cardiometabolic risk in obese adolescents. J Pediatr. 2014;164(5):1085-90.
22. Dutil C, Chaput JP. Inadequate sleep as a contributor to type 2 diabetes in children and adolescents. Nutr Diabetes. 2017;7(5):e266.
23. Adolescent Sleep Working Group; Committee on Adolescence; Council on School Health. School start times for adolescents. Pediatrics. 2014;134(3):642-9.
24. Minges KE, Redeker NS. Delayed school start times and adolescent sleep: A systematic review of the experimental evidence. Sleep Med Rev. 2016;28:86-95.
25. Marx R, Tanner-Smith EE, Davison CM, et al. Later school start times for supporting the education, health, and well-being of high school students. Cochrane Database Syst Rev. 2017;7(7):CD009467.
26. Thrupp M, Lupton R. Taking school contexts more seriously: the social justice challenge. Br J Educ Stud. 2006;54(3):308-328.
27. Webber M, Macfarlane A. Mana Tangata: The Five Optimal Cultural Conditions for Māori Student Success. JAIE. 2020;59(1):26-49. https://www.muse.jhu.edu/article/798554.
28. Macfarlane A, Glynn T, Cavanagh T, Bateman S. Creating Culturally-Safe Schools for Māori Students. Aust J Indig Educ. 2007;36:65-76.
29. Ministry of Education New Zealand. Attendance and Engagement Strategy. https://www.education.govt.nz/our-work/overall-strategies-and-policies/attendance-and-engagement-strategy/ [accessed 2022 Sep 18.]
30. Kelley P, Lockley SW, Kelley J, Evans MDR. Is 8:30 a.m. Still Too Early to Start School? A 10:00 a.m. School Start Time Improves Health and Performance of Students Aged 13-16. Front Hum Neurosci. 2017;11:588.
31. Muller D, Paine SJ, Wu LJ, Signal TL. How long do preschoolers in Aotearoa/New Zealand sleep? Associations with ethnicity and socioeconomic position. Sleep Health. 2019;5(5):452-8.
32. Lenard M, Morrill MS, Westall J. High school start times and student achievement: Looking beyond test scores. Econ Educ Rev. 2020;76:101975. https://doi.org/10.1016/j.econedurev.2020.101975 [accessed 2022 Dec 7].
33. Funaki H. "At least I have a house to live in": Māori and Pacific young people's hopes and fears about the future. [thesis.] Te Herenga Waka – Victoria University of Wellington. https://doi.org/10.26686/wgtn.17060876.v1 [accessed 2022 Dec 7].
34. Borlase BJ, Gander PH, Gibson RH. Effects of school start times and technology use on teenagers' sleep 1999-2008. Sleep Biol Rhythms. 2013;11:46-54.
35. McLeod M, Gurney J, Harris R, Cormack D, King P. COVID-19: we must not forget about Indigenous health and equity. Aust N Z J Public Health. 2020;44(4):253-6.