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Explaining ethnic inequities in sleep duration: a cross-sectional survey of Māori and non-Māori adults in New Zealand



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ABSTRACT

Objectives: The aims were: (1) to investigate the independent associations between suboptimal sleep duration and neighborhood deprivation, employment status, self-rated general health, overweight/obesity, and preferred sleep timing (chronotype); and (2) to determine the statistical contribution of socioeconomic, health, and chronotype factors to ethnic inequities in suboptimal sleep duration.

Participants: Mail-out survey to a stratified national sample of 5100 Māori (indigenous New Zealanders) and 4000 non-Māori adults (20–59 years) randomly selected from the electoral rolls (54% response rate).

Measurements: Data on usual sleep duration were obtained using a NZ version of the Munich Chronotype Questionnaire. A range of sociodemographic and health-related variables were also available.

Results: The prevalence of insufficient (≥ 2 hours difference in average sleep duration on free days versus scheduled days), short (< 7 hours) and long sleep durations (≥ 9 hours) were consistently higher for Māori than non-Māori. For insufficient sleep, the inequity was partly explained by greater socioeconomic deprivation and more night work among Māori, and further attenuated after adjustment for health-related factors and chronotype. In contrast, ethnic inequities in short and long sleep durations remained, even in the fully adjusted models.

Conclusions: Ethnic inequities in insufficient and suboptimal sleep duration narrowed but were not fully explained by differences in socioeconomic position and health status between Māori and non-Māori. Growing evidence suggests that poor sleep may mediate ethnic inequities in other areas of health, therefore, actions that target the basic causes of sleep health inequities should be considered as part of broader population health policies and interventions.

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Introduction

A new multidisciplinary consensus report recommends 7 to 9 hours of sleep per night for healthy adults.¹ However, epidemiological evidence suggests that suboptimal sleep durations (ie, < 7 hours or ≥ 9 hours) are common, with a recent study showing that 29.2% of adults in the United States (US) report sleeping ≤ 6 hours/24-hour period and 8.6% report sleeping ≥ 9 hours/24-hour period.² Further, there is strong evidence of ethnic inequities in sleep duration, with several US studies showing that Black adults and those from other ethnically-non-dominant groups are more likely to report suboptimal sleep durations than White adults.^{3–9} Using 2004–2007 National Health Interview Survey (NHIS) data ($n = 110,441$ aged ≥ 18 years), 34.8% of non-Hispanic Black adults report sleeping < 7 hours in a

usual 24-hour period compared with 27.5% of non-Hispanic White adults.⁵ Ethnic inequities in sleep duration have also been found in New Zealand (NZ), with data from a national sleep timing survey ($n = 9100$ aged 20–59 years) indicating that 28.6% of the indigenous Māori population and 22.1% of non-Māori report 'short' sleep on scheduled days (ie, days with regular work, family or other commitments) and 15.8% of Māori and 11.5% of non-Māori report 'long' sleep on scheduled days.¹⁰ These data contribute to a large evidence base detailing significant and concerning inequities in health between Māori and non-Māori across a range of morbidity and mortality indicators.^{11,12}

As with other health problems, ethnic inequities in sleep duration are often thought to reflect differences in socioeconomic position and/or health status and behaviors between groups.¹³ However, few studies have specifically investigated the potential mediating effects of these factors on ethnic inequities in sleep. In the large NHIS study, adjustment for socioeconomic status, family structure, and health behaviors narrowed the Black/White disparity in short sleep; however, the relative independent contribution of each of these factors was not examined.⁵ Others have found that

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socioeconomic status attenuates the Black/White disparity in suboptimal sleep more than either health or neighborhood variables.^{3,6} Among socioeconomic variables, educational attainment has been found to explain more of the Black/White disparity in suboptimal sleep durations than either income or employment status.¹⁴ Interestingly, in each of these studies the ethnic disparity in suboptimal sleep remained even after adjustment for socioeconomic position and health, suggesting that other factors are likely to be involved.

How much an individual sleeps depends, at least in part, on the timing of their sleep, which in turn is influenced by a range of biological and societal factors. For example, work schedules are a key driver of sleep timing and duration, with sleep on 'free days' typically longer than sleep on work, or scheduled days.¹⁵ Work patterns are also important, with night shift workers more likely to report short sleep duration than dayshift workers.¹⁶ The impact of work schedules on sleep duration may also depend on an individual's circadian phenotype (ie, 'chronotype'), with early work start times typically forcing late-type people (those who prefer to go to bed and wake late) to cut back on their sleep as they are required to wake up earlier than preferred. The relationship between night work¹⁷ or chronotype¹⁵ and suboptimal sleep durations has received little attention. Further, no study has investigated the potential contribution of these factors to ethnic inequities in suboptimal sleep duration or examined whether the associations differ on scheduled versus free days.

The present study was designed to address important gaps in our understanding of the social determinants of sleep, paying particular attention to suboptimal sleep durations (<7 hours sleep and ≥9 hours sleep) and insufficient sleep (defined as ≥2 hours sleep extension on free days compared with scheduled days). The aims were to: (1) investigate the independent associations between measures of sleep duration on scheduled and free days separately, and ethnicity, gender, age, socioeconomic deprivation, employment status, self-rated general health, body mass index (BMI), and chronotype; and (2) determine the statistical contribution of socioeconomic, health, and sleep timing factors to ethnic inequities in measures of sleep duration.

Methods

The New Zealand Sleep Timing Study

The NZ Sleep Timing Study was a national postal survey of an age-stratified sample of 5,100 Māori and 4,000 non-Māori aged 20–59 years, randomly selected from the Māori and general NZ Electoral rolls. Data collection occurred between October 2008 and March 2009. Sociodemographic, sleep and self-rated health information were collected using a three-page self-administered questionnaire based on the Munich Chronotype Questionnaire (MCTQ¹⁸). Excluding ineligible responses (e.g. wrong person completed the questionnaire, outside the age-range) and questionnaires returned to sender, the overall adjusted response rate was 48% for Māori and 62% for non-Māori. Detailed survey methods have been reported elsewhere, however, there was a trend for increasing response rates with increasing age and a higher likelihood of non-response associated with being Māori and living in a more socioeconomically-deprived area of New Zealand.¹⁹ Ethics approval was granted by the Massey University Human Ethics Committee (MUHEC 08/18) with the study conforming to the principles embodied in the Declaration of Helsinki.

Outcome measures

Sleep duration was determined by a question that asked: "How many hours sleep do you usually get in 24-hours (counting all naps and sleeps)?" Responses were provided separately for scheduled

days (defined on the questionnaire as "days in which work, study or other regular commitments determined the daily routine") and free days. The analysis presented here is restricted to sleep durations between 2.5 hours and 20 hours in a 24-hour period,²⁰ which includes 99% of the available observations.

Three measures of sleep duration were investigated for this study. *Short sleep* was defined as <7 hours sleep and *long sleep* as ≥9 hours sleep. We also created an *insufficient sleep* variable that was defined as an extension of sleep duration by ≥2 hours on free days compared with scheduled days.²¹ Insufficient sleep is defined in a variety of ways in the sleep literature. However, according to the definition used in this study, a positive response for insufficient sleep captures those individuals who experience sleep debt on scheduled days and use the free days to catch-up on their lost sleep. Responses were dichotomized for the analysis (yes versus no).

Independent variables

Independent variables included in our models were selected based on the data available from the NZ Sleep Timing study and a priori evidence. Information on self-identified ethnicity, age and gender was gathered using the 2006 NZ Census questions (www.stats.govt.nz/Census/about-2006-census.aspx). The ethnicity question allows people to identify with one or more ethnic groups.²² For this study, any participants who identified themselves as Māori, either alone or as one of multiple ethnicities, were classified as Māori, with everyone else categorized as non-Māori. This is the recommended standard for the health and disability sector in NZ.²³ Age was calculated using date of birth and analyzed in decades.

Socioeconomic deprivation was determined using a validated small-area index (NZDep Index)²⁴ based on nine variables taken from the population Census, which provides a deprivation score for each mesh-block (geographical units containing a median of 87 people), with higher scores indicating greater material deprivation. Participants were assigned to an NZDep2006 decile according to their current residential address. In this study, NZDep2006 was analyzed as quintiles (quintile 1 = least deprived areas to quintile 5 = most deprived areas).

Employment status was determined using the 2006 Census question that asked whether respondents were currently employed for pay, profit or income, or in a family business or farm. Positive responses were coded as 'employed' and negative responses coded as 'unemployed'. Anyone who answered positively was then asked to report for the last four weeks: (a) how many hours in total they worked; (b) how many times they went to bed after midnight because of their work; (c) how many times they got up before 05:00 am because of their work; and (d) how many times they did not sleep at night because of their work.²⁵ Responses to parts (b) through (d) were combined to generate a night work exposure variable ranging from 0 (no night work) to 9 (extremely high exposure to night work). A score between 1 and 9 on this variable was coded as 'night work' whereas a score of 0 was coded as 'employed, with no night work'. For this analysis, employment status was analyzed using the categories of employed with no night work; employed with night work; and unemployed.

Body mass index (kg/m²) was estimated using self-reported weight and height data, which was categorized for analysis using the following cut-offs: overweight/obese (BMI ≥25 to BMI <55) versus normal/underweight (BMI ≥15 to BMI <25).²⁶ Self-rated health was measured using the general health question taken from the 36-item Short Form Health Survey (SF-36), which asks respondents to rate their health on a 5-point Likert scale with responses dichotomised for analysis as fair/poor versus excellent/very good/good.²⁷

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