Potential Reductions of Suicidal Ideation and Attempts with Adequate Sleep: Estimates from Palau Youth Surveys

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Background

- Palau is a Pacific island country with a population of approximately 20,000.
- In Palau, the average annual suicide rate from 2003-2012 was 21.7 per 100,000, which is about twice the global suicide rate.
- Poor mental health and the high rate of suicidal ideation and attempts among youth are critical public health issues in Palau.
- Sleep duration, a modifiable factor, has been consistently associated with suicide-related behaviors.
- However, evidence from the Pacific region, including Palau, remains limited.
- The population-level impact of adequate sleep is yet to be evaluated among Palauan adolescents.

Objective

- This study aimed to examine the association between sleep duration and suicide-related outcomes and to estimate the population-level impact of adequate sleep among Palauan adolescents.

Methods

- Secondary data analysis: Pooled data of the Palau Youth Survey, a nationwide school-based survey conducted by the Palau MOH in 2020, 2021, 2022, and 2024.
- Study design: Cross-sectional
- Study population: Elementary school (Grades 6-8) and high school (Grades 9-12) students. (1846 boys and 1918 girls)
- Statistical analysis:

  (1) Logistic regression was used to assess associations between short sleep and suicide outcomes

  (2) Counterfactual simulations were conducted to estimate the predicted prevalence of outcomes under a hypothetical scenario in which all students achieved ≥8 hours of sleep.
- **Outcome variables:**

  (1) Suicidal Ideation

  During the past year have you ever seriously considered taking life?

  (2) Suicide Attempt

  During the past year have you ever made a suicidal attempt?
- **Exposure variable:** The primary exposure was short sleep (<8 hours on a school night), consistent with CDC guidelines for insufficient sleep among adolescents.
- **Covariates:** survey year, sex, age, and ethnicity (Palauan/Others)

Logistic Regression for Counterfactual Simulation

Let:

- Y_i = 1 if student *i* reports suicidal ideation or attempts , and 0 otherwise
- X_{1i} = sleep duration indicator (1 if <8 hours, 0 if ≥8 hours)
- $X_{2i}, X_{3i}, \ldots, X_{pi}$ = covariates (survey year, sex, age, sex, ethnicity)

1. Logistic Regression Model

$\text{logit}(P(Y_i = 1)) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots + \beta_p X_{pi}$

where $\text{logit}(P) = \ln(P / (1 - P))$

2. Estimate Coefficients and Predicted Probability for Each Individual

$\hat{P}_i = 1 / [1 + \exp(-(\hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \ldots + \hat{\beta}_p X_{pi}))]$

3. Counterfactual Scenario (All Students Sleep ≥8 hours: X_{1i}=0)

Replace X_{1i} with 0 for all individuals to simulate the hypothetical scenario:

$\hat{P}_i(\text{counterfactual}) = 1 / [1 + \exp(-(\hat{\beta}_0 + \hat{\beta}_1 \times 0 + \hat{\beta}_2 X_{2i} + \ldots + \hat{\beta}_p X_{pi}))]$

4. Predicted Prevalence under Counterfactual

Predicted prevalence (≥8h sleep) = $(1/N) \times \Sigma \hat{P}_i(\text{counterfactual})$

Results

- Across survey years (2020-2024), the prevalence of short sleep (<8h) ranged from 51% to 60%.
- Observed and Simulated Prevalence of Suicidal Ideation and Attempts Under Universal ≥8h Sleep Scenario:

Year	Observed %	Simulated %	Reduction (pp*)	Relative Reduction
Suicidal Ideation				
2020	34.3	27.9	6.4	18.7 %
2021	37.6	31.6	6.0	16.0 %
2022	33.9	27.5	6.4	18.9 %
2024	28.7	23.0	5.7	19.9 %
Suicide Attempt				
2020	26.5	21.3	5.2	19.6 %
2021	22.0	18.1	3.9	17.7 %
2022	20.2	16.0	4.2	20.8 %
2024	15.5	12.5	3.0	19.4 %

*percentage points

Discussion & Conclusions

- Short sleep (<8h) was consistently associated with higher prevalence of suicidal ideation and attempts among school students in Palau.
- Securing sleep ≥8 hours may reduce suicide-related outcomes by nearly 20%, highlighting the value of sleep promotion.
- Future studies should assess how sleep interventions reduce youth suicide in Palau and similar Pacific Island settings.