SHHS Manuscript/Abstract Proposal Format

1.a. Full Title: Association of Usual Sleep Time with Weight Gain: The Sleep Heart Health Study
b. Abbreviated Title [Length, total of 26 letters + spaces]: Sleep Time and Weight Gain

2. Lead Author: Daniel J. Gottlieb, MD, MPH

3. Timeline: Draft to co-authors 1/06; to P&P 3/06; submission 6/06.

4. Rationale: Numerous studies have found a cross-sectional association of short sleep time with obesity. There is little data on the relation of habitual sleep duration to weight change.

5. Hypotheses: Sleep time <7 hours is associated with increased weight gain over time, after adjustment for age, sex, race, AHI, baseline body habitus and other covariates.

6. Data [variables, time window, source, inclusions/exclusions]:
   Data from SHHS-1, SHHS-FU1, and SHHS-2, including usual sleep time from SHQ and measured weight at each; height and neck circumference at SHHS-1 and SHHS-2; age, sex, race, AHI, alcohol, caffeine, and tobacco use, depression measures from SF-36 at SHHS-1. All subjects with SHQ data on usual sleep time and weight at baseline and at least one subsequent time point will be included.

7. Type of Study: Secondary Study

8. Type of Publication: Journal Article

9. Analysis Responsibility: Central or Distributed Analysis, depending upon analyst availability at the CC.

10. Introduction:
    Typical daily sleep duration has been declining among U. S. adults for more than a generation, with median sleep time falling from 8 hours/night in the 1950’s to 7 hours/night in recent years, with more than one-third now sleeping fewer than seven hours per night\(^1\). Much of this reduction in sleep time reflects voluntary sleep restriction, with nearly half of individuals reporting that they restrict sleep in order to watch television, use the Internet, or work\(^3\). Numerous studies have found a cross-sectional association of sleep time with obesity in both adults and children\(^4\)\(^-\)\(^8\). A single study has found that short sleep is associated with subsequent weight gain in a sample of children and adults at high risk of psychiatric disease, although that
study found the association to decrease with age, being absent in those older than age 30\(^9\). Experimental sleep deprivation in healthy young adults has been found to cause decreased serum leptin and increased serum ghrelin levels, with associated increases in hunger and appetite\(^{10}\), suggesting a possible mechanism for the association of short sleep time with obesity. A small association of short sleep with leptin and ghrelin levels has also been observed in the Wisconsin Sleep Cohort\(^{11}\). In this analysis, we will examine the relation of self-reported usual sleep time to subsequent weight gain in a large, community-based sample of middle-aged and older adults.

11. Brief Analysis Plan:
   Sleep time will be defined as the usual number of hours slept per weeknight obtained from SHQ at each visit. The dependent variable will be annualized change in weight over the interval between visits, with either one or two observations per subject, depending on number of follow-up visits completed. Differences in weight gain across categories of sleep time will be analyzed using generalized estimating equations (implemented using PROC GENMOD in SAS), in order to utilize all of the weight and sleep time measurements while adjusting for relevant covariates. Unadjusted baseline differences in continuous and categorical variables across sleep time categories will be presented. Covariates to be included in the main model are age, sex, race, AHI, with or without adjustment for baseline obesity. Additional analyses will assess the impact of caffeine and alcohol consumption, smoking status, depressive symptoms, and insomnia symptoms on the association of sleep time with weight gain. A secondary outcome of interest will be change in neck girth. Analyses stratified on sex, age, AHI, and presence of insomnia symptoms will be performed to assess the consistency of results across the study sample and to assess the contribution of insomnia to the observed effects.

12. Summary Section
   This analysis will determine whether sleep restriction to levels occurring commonly in the adult population are associated with a subsequent increased rate of weight gain.

13. References


14. Proposed writing group:
   Daniel J. Gottlieb, MD, MPH (chair), Ann B. Newman, MD, MPH, others as proposed by PI's.