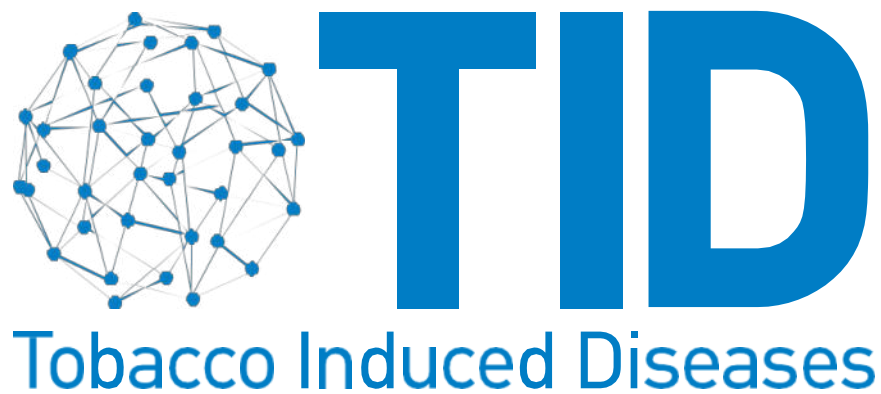




Supplementary file

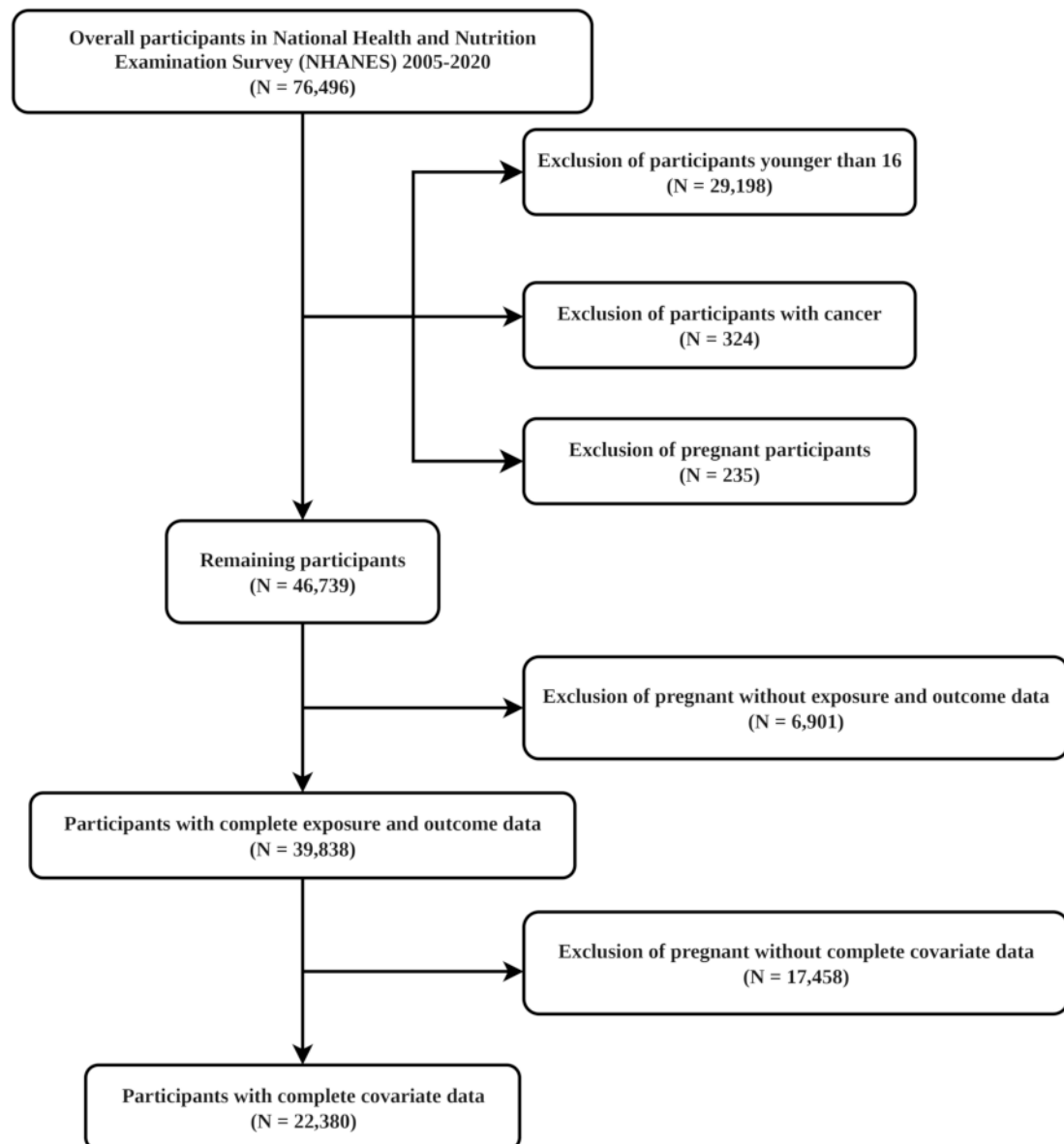
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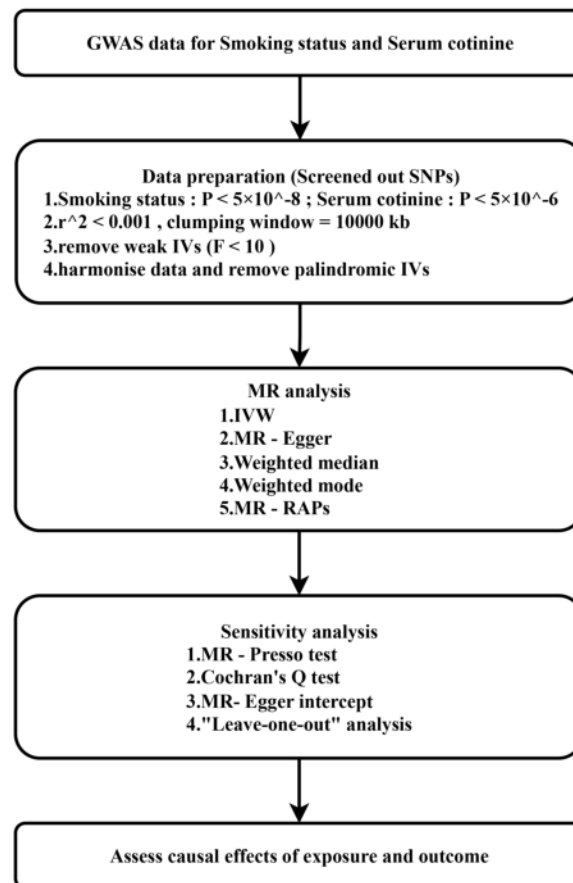
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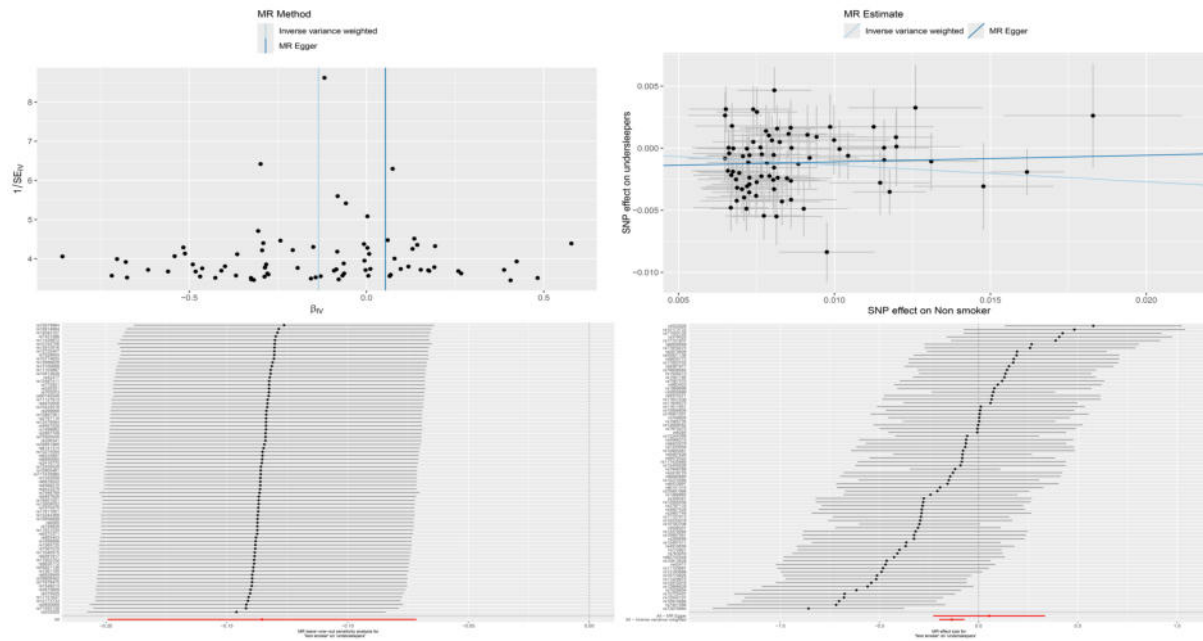
Supplementary Figure1: Participant selection criteria and sample sizes from the NHANES 2005–2020 cycles (final N = 22,380) :Data were derived from seven NHANES cycles (2005–2020). Inclusion criteria: complete data on smoking status, serum cotinine, sleep disorder, sleep duration, and covariates. Exclusion criteria: missing smoking status/cotinine; incomplete sleep data; missing covariates; cancer diagnosis; or current pregnancy



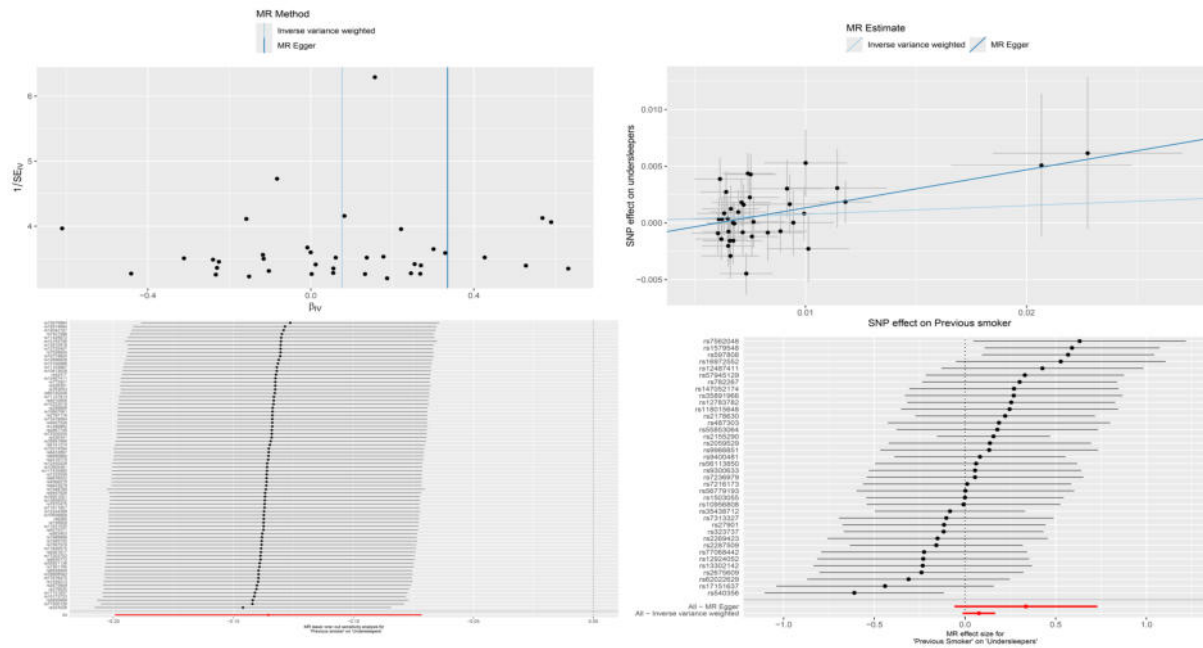
Supplementary Figure2: The overall workflow of the MR analysis: The three core assumptions of Mendelian randomization: (1) relevance—genetic variants are strongly associated with smoking status and serum cotinine; (2) independence—instruments are not associated with confounders; and (3) exclusion restriction—instruments affect sleep outcomes only through smoking status and serum cotinine. These assumptions are essential for valid causal inference in MR analysis.



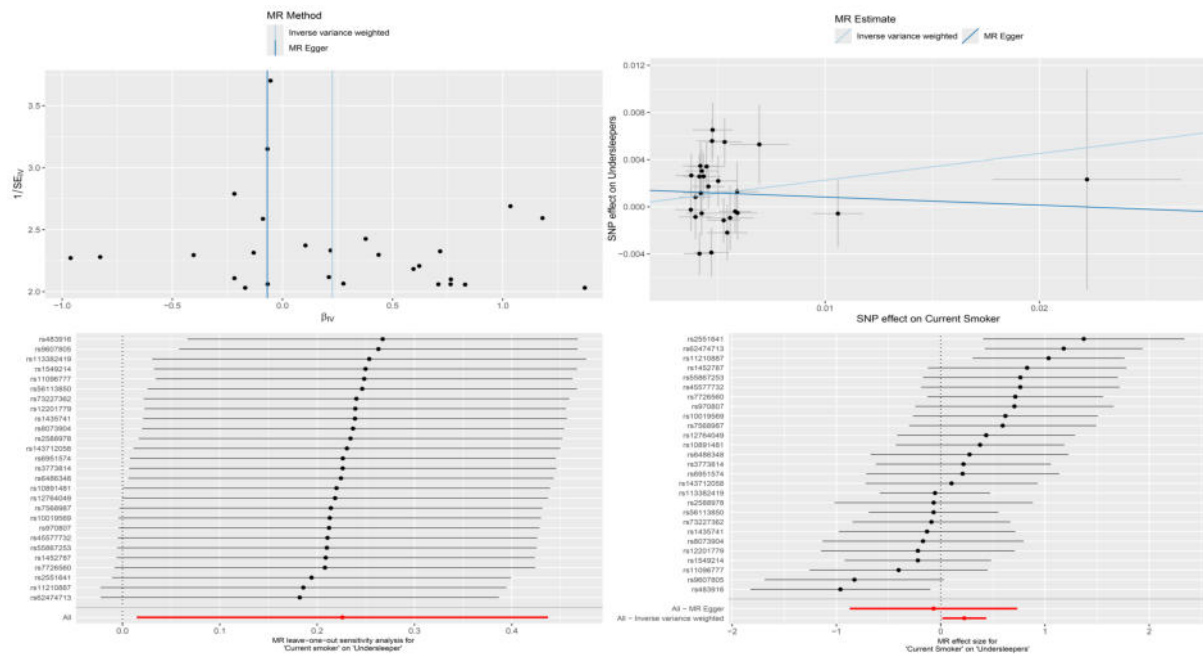
Supplementary Figure3: Supplementary Figure 3: funnel plots, leave-one-out sensitivity analysis, forest plots, and scatter plots(MR analysis of Non smoker and Undersleepers)



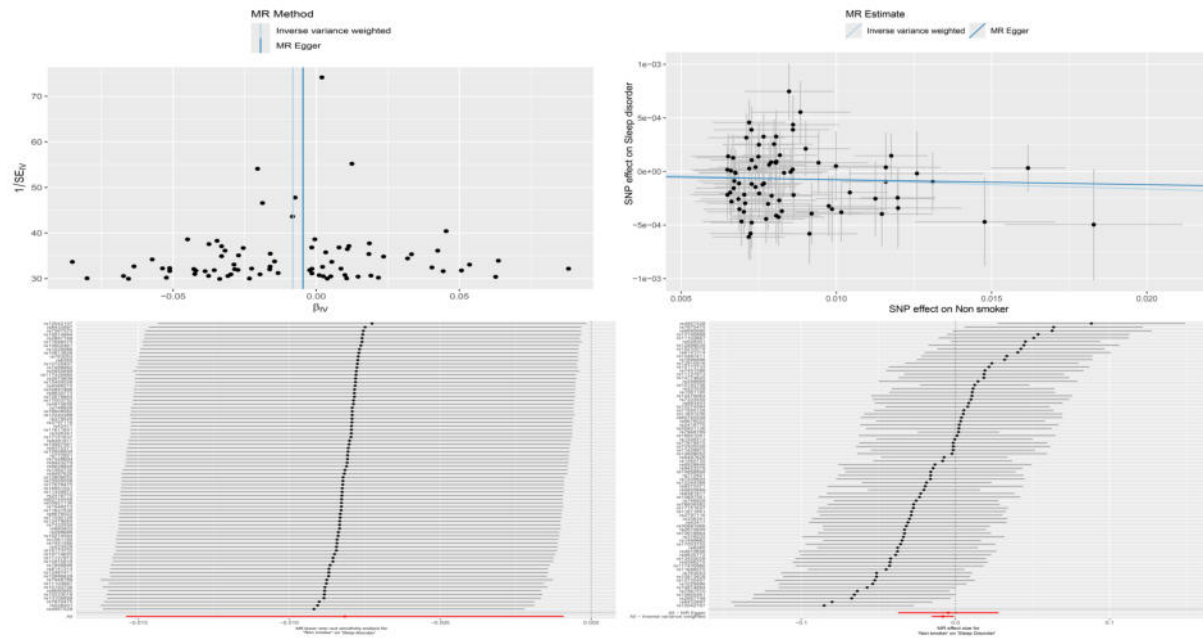
Supplementary Figure4: Supplementary Figure 4: funnel plots, leave-one-out sensitivity analysis, forest plots, and scatter plots(MR analysis of Former smoker and Undersleepers)



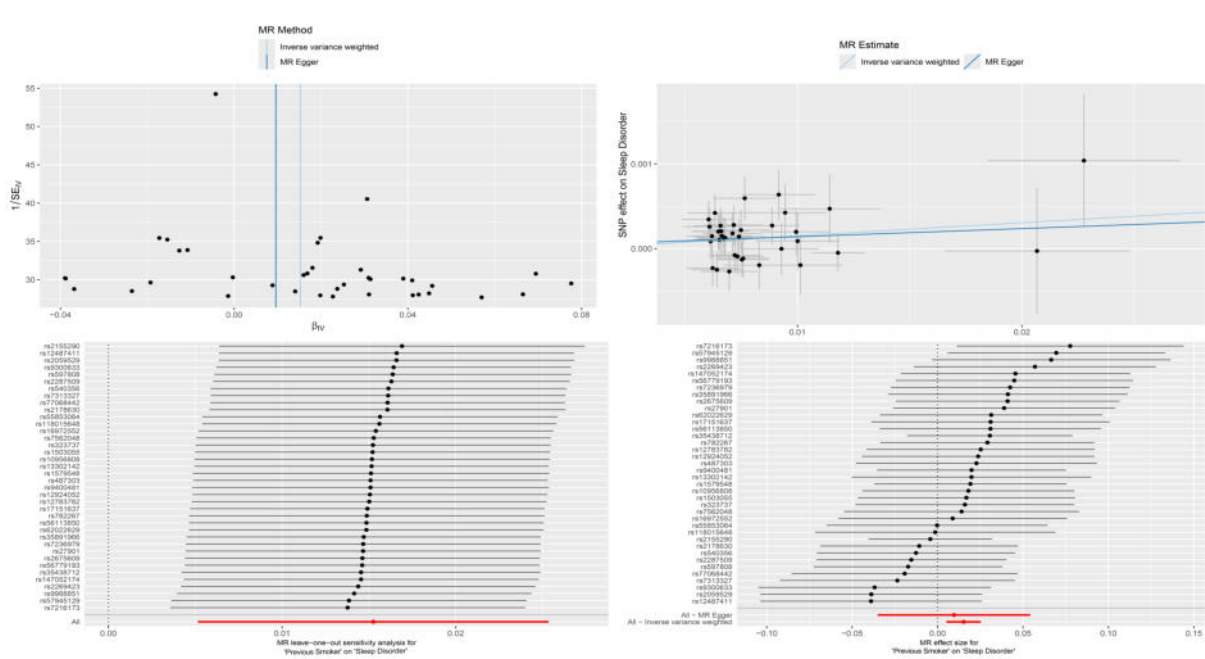
Supplementary Figure5: Supplementary Figure 5: funnel plots, leave-one-out sensitivity analysis, forest plots, and scatter plots(MR analysis of Current smoker and Undersleepers)



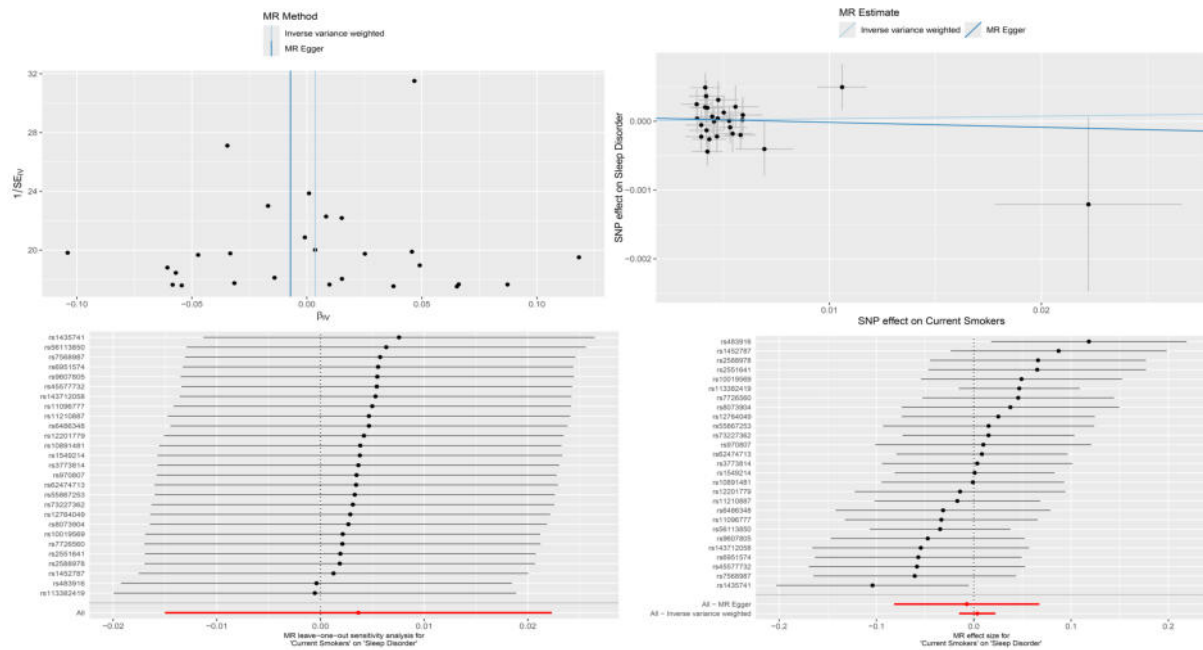
Supplementary Figure6: Supplementary Figure 6: funnel plots, leave-one-out sensitivity analysis, forest plots, and scatter plots(MR analysis of Non smoker and Sleep disorder)



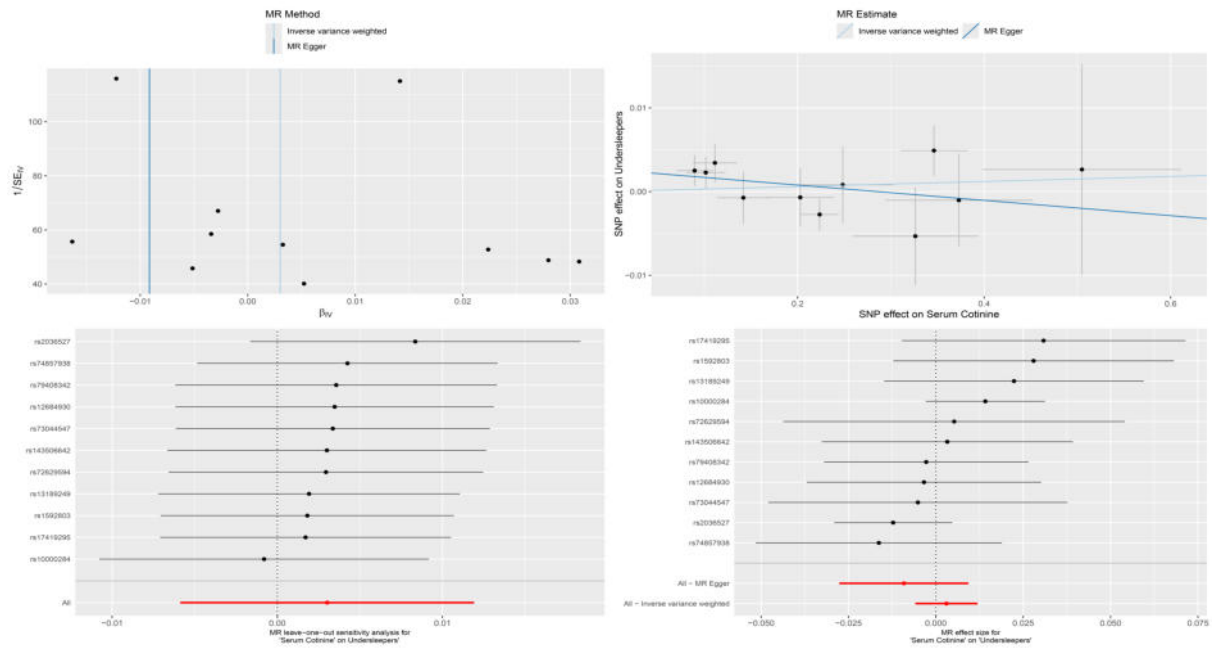
Supplementary Figure7: Supplementary Figure 7: funnel plots, leave-one-out sensitivity analysis, forest plots, and scatter plots(MR analysis of Former smoker and Sleep disorder)



Supplementary Figure8: Supplementary Figure 8: funnel plots, leave-one-out sensitivity analysis, forest plots, and scatter plots(MR analysis of Current smoker and Sleep disorder)



Supplementary Figure9: Supplementary Figure 9: funnel plots, leave-one-out sensitivity analysis, forest plots, and scatter plots(MR analysis of Serum Cotinine and Undersleepers)



Supplementary Figure10: Supplementary Figure 10: funnel plots, leave-one-out sensitivity analysis, forest plots, and scatter plots(MR analysis of Serum Cotinine and Sleep disorder)

