

Digital Tracker Data from Over 100,000 Individuals Show Lower Activity Levels in Individuals with Multiple Chronic Conditions

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Objectives: Individuals with multiple chronic conditions (CCs) self-report greater disease burden and lower quality of life than those without. Behavioral data can provide additional insight into how CCs impact an individual's health and wellbeing. We aimed to quantify whether the presence of multiple and different types of CCs are associated with changes in behavior related to physical activity and sleep patterns.

Methods: Members of an online health and activity-tracking community (Achievement, Evidation Health Inc, San Mateo, CA) were asked to participate in a health survey. Participants reported their diagnoses by selecting from a list of 34 CCs. For each participant, we considered the number of CC diagnoses reported, the number of cardiac and metabolic comorbid conditions (CMCC) reported and whether a mental health illness was reported. Data collected from digital trackers over the past year were used to calculate per-participant overall median and Coefficient of Variation (CV) for daily step counts and sleep duration. We examined two cohorts: a Step Cohort of 155,638 individuals who had >10 days of step data, and a Sleep Cohort with 91,995 individuals who had >10 days of sleep data. We considered both median and CV of daily steps and sleep duration as target variables. For each target variable, we ran two models, the first using the number of CCs and the second using the number of CMCCs as explanatory variables. All models controlled for age, sex, education level and race. The CMCC models also controlled for presence of a mental health diagnosis.

Results: On average, participants took 6,708 steps/day and slept 6.8 hours/night. Number of CCs and number of CMCCs were both negatively associated with median daily step count and hours of sleep/night. Each additional CC (any of the 34 conditions) was associated with a decline of 254 steps/day (95% CI [243, 265]; $p < 0.001$), whereas each additional CMCC was associated with almost double that amount, a decline of 493 steps/day (CI [412, 574]; $p < 0.001$). Count of CCs was also associated with less sleep, higher step CV and higher sleep CV, while CMCC count was associated with less sleep and higher sleep CV.

Conclusions: In this analysis, we were able to quantify the decrease in physical activity levels and sleep duration in a population with multiple CCs and CMCCs. Further research should be conducted to determine if this relationship is causal and if tracker-based behavioral data can help detect multiple CCs.