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HOURLY AND ANNUAL OBJECTIVE PRODUCTIVITY (PRESENTEEISM) ACROSS SEVERAL DISEASES: BIPOLAR DISORDER, OTHER MENTAL DISORDERS, CHRONIC CONSTIPATION, FUNCTIONAL DYSPEPSIA, GERD, GOUT, AND INSOMNIA

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ABSTRACT

OBJECTIVE: To compare the at-work productivity (presenteeism) among employees with bipolar disorder (BPD), other mental disorders (OMD), chronic constipation (CC), functional dyspepsia (FD), gastroesophageal reflux disease (GERD), gout, and insomnia.

BACKGROUND: Medical conditions impact employee productivity in differing ways. Little is known on the productivity of persons using objectively measured data. Self-assessed productivity impairments are not always validated with objective measures.

METHODS: A 2001-2007 US employee database was used to identify subjects with BPD, OMD, CC, FD, GERD, gout, and insomnia (based on medical claim ICD9s) using objective electronically collected productivity data for employees in task-oriented positions. All studies used regression models to control for demographic differences between subjects with the condition and control groups of subjects without the condition. For all subjects (by study), the controls used the average index date of the subjects with the disease. Hourly productivity was units produced per hour worked during the year. Annual productivity was total units produced during the year. Incremental productivity=adjusted differences between the disease cohort and the controls and considered significant at P<=0.05.

RESULTS: Employees with productivity eligibility for the disease/controls were: BPD 59/27,574; OMD 1,382/25,268; CC 82/27,276; FD 73/27,513; GERD 541/26,775; gout 86/27,472; and insomnia 415/26,240. Hourly productivity results (incremental units per hour worked; percent disease/control;significance) were: CC (1.26;106.6%;P>0.05); insomnia (0.46;102.5%;P>0.05), OMD (0.41;102.0%P>0.05), GERD (-0.849;95.6%;P=0.0481), gout (-0.65;96.5%;P>0.05), BPD (-1.35;93.5%;P>0.05); and FD (-1.73;90.8%;P>0.05). Annual productivity results (incremental units per year; percent disease/control;significance) were: GERD (-1754;94%;P=0.0391), OMD (414;101.2%;P>0.05); CC (194;100.7%;P>0.05); gout (-566;98.0%;P>0.05), insomnia (-925;96.8%;P>0.05), FD (-3,022;89.1%;P>0.05); and BPD (-7,103;79.9%;P<0.0001).

CONCLUSION: Employees with GERD have significant decreases in both annual and hourly productivity. Employees with BPD experienced a significant decrease in annual productivity but not in hourly productivity. Many comparisons were not significant, which contradicts some self reported data indicating impairment due to the conditions.

# HOURLY AND ANNUAL OBJECTIVE PRODUCTIVITY (PRESENTTEEISM) ACROSS SEVERAL DISEASES: BIPOLAR DISORDER, OTHER MENTAL DISORDERS, CHRONIC CONSTIPATION, FUNCTIONAL DYSPEPSIA, GERD, GOUT, AND INSOMNIA

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## BACKGROUND

- Medical conditions impact employee productivity in differing ways.
- Objectively measured work output productivity data are uncommon in the literature.
- Self-assessed productivity impairments are not always validated with objective measures.
- Lerner<sup>1</sup>, found a 2:1 (two-to-one) relationship between illness-related self-reported productivity loss while at work and objectively measured productivity loss.

## OBJECTIVES

- To compare the at-work productivity (objectively measured work output) among employees with bipolar disorder (BPD), other mental disorders (OMD), chronic constipation (CC), functional dyspepsia (FD), gastroesophageal reflux disease (GERD), gout, and insomnia.

## METHODS

- A 2001-2007 US employee database was used to identify subjects with objective productivity data and the following conditions of interest: BPD<sup>2</sup>, OMD<sup>2</sup>, CC<sup>3,4</sup>, FD<sup>5,6</sup>, GERD<sup>7,8</sup>, gout<sup>9</sup>, and insomnia<sup>10</sup> based on any primary, secondary, or tertiary diagnosis for International Classification of Diseases, Ninth Edition (ICD-9) diagnostic codes (**Table 1**).
- Productivity was measured in terms of units-processed-per-hour-worked by using real, day-to-day, person-level work output data collected electronically by the employers. These data were only available for a subset of the study population who worked in a task-oriented environment.
- All studies used regression models to control for demographic differences between subjects with the condition and control groups of subjects without the condition.
- Generalized linear models with gamma distribution and log link or log-linear models were used.
- For all subjects (by study), the controls used the average index date of the subjects with the disease.
- Hourly productivity was units produced per hour worked during the year:
  - Total Units / Total Hours Worked.
- Annual productivity was total units produced during the year and is impacted by absences:
  - Total Units (over the course of the year)
- Incremental productivity = adjusted difference between the disease cohort and the controls and considered significant at  $P \leq 0.05$ .
- Hourly and Annual Impairments were calculated as the disease cohort's productivity divided by the corresponding control group's productivity. Condition cohorts with impairment values less than 100% had impaired productivity.

## RESULTS

- Employees with productivity eligibility for the disease and control cohorts are shown in **Table 2**.
- Hourly productivity results for each pair of disease and control cohorts are shown in **Table 3**, and only GERD was significant.
  - Hourly impairment due to each condition is shown in **Figure 1**.
- Annual productivity results for each pair of disease and control cohorts are shown in **Table 4**, and only GERD and BPD were significant.
  - Annual impairment due to each condition is shown in **Figure 2**.

## STRENGTHS

- These objective productivity measures have advantages over self-reported productivity measures:
  - Employees are not asked to remember past performance when completing a questionnaire, thus eliminating recall bias.
  - The electronic tracking system reduces the response bias of individual employees that may be present in self-reported results.

## LIMITATIONS

- Employees in these studies must have visited the doctor and received a condition specific ICD-9 diagnosis (or prescription for Insomnia) during the study timeframe to be included in the cohort of employees with the condition.
- The productivity data are from a subset of employees who work in task-oriented positions and may not be easily generalized to other employee populations.
- These studies only address productivity losses at work, not impairments to other "outside-of-work" activities.
- The quality of work performed was addressed only to the extent that employers require employees to redo poor quality work.

## CONCLUSIONS

- It is possible to objectively measure work performance.
- Employees with GERD had significant decreases in both annual and hourly productivity.
- Employees with BPD experienced a significant decrease in annual productivity but not in hourly productivity.
- Many comparisons were not significant, which contradicts some self reported data indicating impairment due to the conditions.

Table 1: ICD-9 codes used in the study

| Condition                              | ICD-9 descriptions and codes   |
|--|--|
| Bipolar disorder (BPD)                 | Manic Disorders: 296.0x, 296.1x; Bipolar Affective Disorders: 296.4x, 296.5x, 296.6x, 296.7x; Manic-depressive psychosis, other, and unspecified: 296.8x                     |
| Other Mental Disorders (OMD)           | Codes within the Agency for Healthcare Research and Quality (AHRQ) diagnosis chapter 'Mental Disorder', excluding codes for BPD  |
| Chronic Constipation (CC)              | Constipation: 564.0; Constipation, unspecified: 564.00; Slow transit constipation: 564.01; Other constipation: 564.09  |
| Functional Dyspepsia (FD)              | 536.8x   |
| Gastroesophageal Reflux Disease (GERD) | Hypersecretory condition: 251.5; Esophagitis: 530.10, 530.11, 530.12, 530.19; Esophageal reflux: 530.81; Heartburn: 787.1; Dysphagia - Complete: 787.2                       |
| Gout                                   | 274.xx   |
| Insomnia                               | Transient disorder of initiating or maintaining sleep: 307.41; Persistent disorder of initiating or maintaining sleep: 307.42; Subjective insomnia: 307.49; Insomnia: 780.52 |

Table 2: Employees with Objective Productivity Data by Condition

| Condition                              | Study cohort | Controls |
|--|--------------|----------|
| Bipolar disorder (BPD)                 | 59           | 27,574   |
| Other Mental Disorders (OMD)           | 1,382        | 25,268   |
| Chronic Constipation (CC)              | 82           | 27,276   |
| Functional Dyspepsia (FD)              | 73           | 27,513   |
| Gastroesophageal Reflux Disease (GERD) | 541          | 26,775   |
| Gout                                   | 86           | 27,472   |
| Insomnia                               | 415          | 26,240   |

Table 3: Hourly Objective Productivity

| Condition                              | Study cohort Adjusted Units | Study cohort S.E. | Controls Adjusted Units | Controls S.E. | Δ in Adjusted Units |
|--|-----------------------------|-------------------|-------------------------|---------------|---------------------|
| Bipolar disorder (BPD)                 | 19.34                       | 1.52              | 20.69                   | 0.27          | -1.35               |
| Other Mental Disorders (OMD)           | 21.08                       | 1.78              | 20.67                   | 0.27          | 0.41                |
| Chronic Constipation (CC)              | 20.26                       | 1.08              | 19.01                   | 0.06          | 1.26                |
| Functional Dyspepsia (FD)              | 17.12                       | 0.97              | 18.85                   | 0.05          | -1.73               |
| Gastroesophageal Reflux Disease (GERD) | 18.31                       | 0.41              | 19.15                   | 0.06          | -0.84*              |
| Gout                                   | 17.85                       | 0.93              | 18.50                   | 0.05          | -0.65               |
| Insomnia                               | 18.73                       | 0.40              | 18.27                   | 0.05          | 0.46                |

S.E. Standard Error  
\* Significantly different between cohorts ( $P < 0.05$ )

Table 4: Annual Objective Productivity

| Condition                              | Study cohort Adjusted Units | Study cohort S.E. | Controls Adjusted Units | Controls S.E. | Δ in Adjusted Units |
|--|-----------------------------|-------------------|-------------------------|---------------|---------------------|
| Bipolar disorder (BPD)                 | 28,205                      | 2,300             | 35,309                  | 584           | -7,104*             |
| Other Mental Disorders (OMD)           | 35,705                      | 3,352             | 35,291                  | 601           | 414                 |
| Chronic Constipation (CC)              | 28,217                      | 2,052             | 28,023                  | 112           | 194                 |
| Functional Dyspepsia (FD)              | 24,706                      | 1,903             | 27,728                  | 110           | -3,022              |
| Gastroesophageal Reflux Disease (GERD) | 27,421                      | 814               | 29,175                  | 123           | -1,754*             |
| Gout                                   | 27,482                      | 1,963             | 28,049                  | 112           | -567                |
| Insomnia                               | 28,188                      | 792               | 29,113                  | 103           | -925                |

S.E. Standard Error  
\* Significantly different between cohorts ( $P < 0.05$ )

Figure 1: Hourly Objective Productivity Impairment

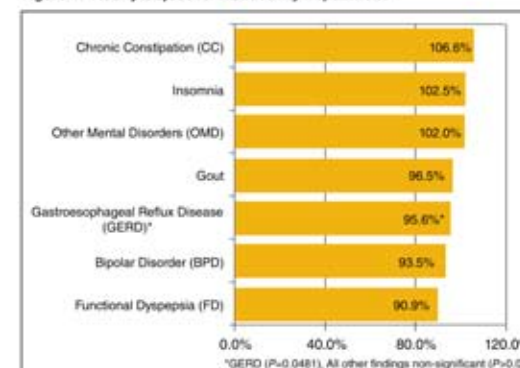
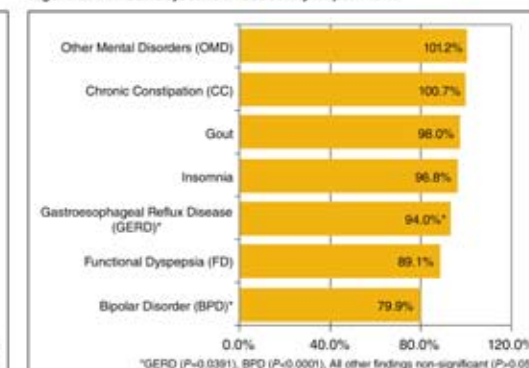


Figure 2: Annual Objective Productivity Impairment



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