Background
The prevalence of mental and behavioral health (BH) conditions (e.g., depression, substance use disorders) are greater among those with chronic illness than among the general population. In order to provide necessary, comprehensive care to patients with congestive heart failure (CHF), we must first learn how their complex conditions are related, and how those conditions influence other health outcomes.

Objective
To examine the relationship between BH conditions and various health outcomes among patients with CHF.

Methods
Study Design: Historical cohort design

Data Source: Administrative medical, pharmacy and enrollment data for individuals with Medicare Advantage Prescription Drug plan coverage from Humana Inc., a healthcare company providing insurance for 13.8 million individuals in all 50 states (2014).2

Study Period: January 1, 2013 to December 31, 2014

Inclusion and Exclusion Criteria:
• The study included adults ≥18 years of age with a CHF diagnosis as of January 1, 2013, at least one medical or pharmacy claim and continuous enrollment during the study period.
• CHF diagnosis was indicated in claims data using International Classification of Diseases, 9th Revision (ICD-9) codes: 111.38, 112.02, 112.05, 112.19, 112.39, 112.44, 112.51, 114.21, 116.45-116.78, 334.21, 335.78, 351.58, 516.62, 552.08-552.20.
• Those deceased, pregnant or in hospice during the study period were excluded from the analysis.

Outcomes:
• Differences in medication adherence and healthcare resource utilization (HRU) between patients with and without BH conditions were measured.
• Medication adherence was measured using proportion of days covered (PDC), those with PDC ≥80% were considered adherent.
• Health care utilization was measured by the following:
  - Inpatient days (IP) and hospitalizations per 1,000
  - Preventable hospitalizations; defined using Agency for Healthcare Research and Quality's Prevention Quality Indicators Technical Specifications.
  - Emergency department (ED) visits per 1,000
  - Total cost per patient per month (PPPM)

Statistical Analyses:
Proportional hazards models (1:1) groups with and without BH conditions were compared. BH groups were matched on age, sex, and Deyo-Charlson Comorbidity Index (CCI) score.3 Unadjusted healthcare resource utilization (HRU) was reported. Logistic regression modeling was used to determine the impact of BH conditions on medical adherence and preventable hospitalizations. Covariates included demographic variables (Table 1), baseline HRU, and CHF severity.
• Baseline HRU included inpatient days, hospital admissions, and ED visits between January 1, 2013 to December 31, 2013.
• Severity of CHF was measured using a claims-based approximation of the New York Heart Association Functional Classification system, which ranged from A (no evidence of CHF) to D (evidence of severe CHF).
• For medication adherence, BH groups were also stratified by the most prevalent BH conditions (i.e., depression, anxiety, substance use).

Results

Table 1. Patient Demographics for Matched Sample

<table>
<thead>
<tr>
<th>Measure</th>
<th>Total</th>
<th>No</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>118,228</td>
<td>59,114</td>
<td>59,114</td>
</tr>
<tr>
<td>Age, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;65</td>
<td>12,254</td>
<td>5,911 (10)</td>
<td>5,911 (10)</td>
</tr>
<tr>
<td>65-74</td>
<td>38,744</td>
<td>19,508 (33)</td>
<td>19,508 (33)</td>
</tr>
<tr>
<td>&gt;75</td>
<td>67,230</td>
<td>33,695 (57)</td>
<td>33,695 (57)</td>
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<tr>
<td>Sex, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>54,036</td>
<td>27,192 (46)</td>
<td>24,845 (46)</td>
</tr>
<tr>
<td>Female</td>
<td>64,192</td>
<td>31,922 (54)</td>
<td>31,922 (54)</td>
</tr>
<tr>
<td>Geographic Region, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>2,069</td>
<td>1,009 (2)</td>
<td>1,060 (2)</td>
</tr>
<tr>
<td>South</td>
<td>81,861</td>
<td>41,573 (70)</td>
<td>40,288 (68)</td>
</tr>
<tr>
<td>Mid-West</td>
<td>26,614</td>
<td>12,931 (22)</td>
<td>13,683 (12)</td>
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<tr>
<td>West</td>
<td>5,826</td>
<td>2,847 (5)</td>
<td>2,979 (5)</td>
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<td>Disability, n (%)</td>
<td>6,219</td>
<td>3,388 (22)</td>
<td>12,804 (15)</td>
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<td>Medicaid, n (%)</td>
<td>22,022</td>
<td>12,882 (23)</td>
<td>9140 (22)</td>
</tr>
<tr>
<td>Low Income Subsidy, n (%)</td>
<td>3,836</td>
<td>1,983 (3)</td>
<td>1,853 (3)</td>
</tr>
</tbody>
</table>

Figure 1. Likelihood of Medication Adherence by Behavioral Health Condition Type

Figure 2. Likelihood of Preventable Hospitalization

Figure 3. Total Costs PPPM by Presence of Behavioral Health Condition

Figure 4. Healthcare resource utilization by Presence of Behavioral Health Condition

Conclusions
• Patients with CHF and BH conditions are less adherent to medications, and more likely to be hospitalized and visit the ED, than those with CHF and no BH conditions.
• Based on these findings, practitioners caring for patients with CHF should be prepared to treat a variety of BH conditions and manage related health behaviors.

Limitations
• Limitations common to claims data are applicable to this study (e.g., coding errors, missing data, fixed variables).
• This study utilized data for a population insured by a single health plan and may not be generalizable to other populations.
• Medical diagnoses were identified only to the extent such information is available from administrative claims.
• The design of this study prevents inference of a causal relationship between the variables.

References