



# The Functional Comorbidity Index is Useful to Predict QOL.

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## INTRODUCTION

- Chronic diseases patients have multiple comorbidities
- Comorbidities alter, or confound, the relationship between a treatment and an outcome
- Comorbidity Indexes adjust for confounding
- Mortality studies: comorbidity indexes to predict survival
  - Charlson Comorbidity Index widely used
- Chronic disease studies: outcome is quality of life (QOL)
  - No comorbidity Index designed for QOL, use Charlson index
- Many comorbidities impact QOL without influencing mortality (e.g., arthritis)
- The Functional Comorbidity Index (Functional Index) designed to predict functional status.
  - Common comorbidities, may predict health status

## AIMS

1- Measure the association between the Functional Index and SF-36 Physical Function domain, PCS, and MCS

2- Assess if Functional Index is a better predictor of health status and physical function than the Charlson Index

## METHODS

### Study Design & Sample

- Cross-sectional Study
- Prospectively collected data
- Adult sleep apnea patients (apnea hypopnea index >5)

### Data Collection

- Exposure Variables:
  - Functional Comorbidity Index- 18 evenly weighted comorbidities that stratify on physical functional status
  - Charlson Comorbidity Index- 19 weighted conditions stratify on mortality
- Outcome Variables (SF-36):
  - Physical Function Domain- daily activities
  - Physical Component Score (PCS)- physical health status
  - Mental Component Score (MCS)- mental health status
- Covariates:
  - Age, gender, race, ethnicity, and sleep apnea severity

### Analysis

- Spearman correlations ( $p < 0.05$  significant)
- Coefficient of determination ( $R^2$ ) compared the strength of association
  - A priori*,  $R^2 = 0.10$  is clinically important (correlation 0.32).
  - Bootstrapping generated distributions of  $R^2$

TABLE 2: Cohort Distribution

| CHARACTERISTIC                       | MEAN  | Std. Deviation |
|--------------------------------------|---|----------------|
| Age (years)                          | 46  | 11             |
| Male (%)                             | 54  |                |
| Race (%)                             | 79 White<br>10 Black<br>3 Asian<br>4 Native American<br>2 Other |                |
| Ethnicity (% Hispanic)               | 4   |                |
| Body Mass Index (kg/m <sup>2</sup> ) | 36  | 13             |
| Apnea Hypopnea Index (events/hour)   | 56  | 34             |
| Lowest Oxygen Saturation (%)         | 84  | 10             |
| Functional Index (0-18 scale)        | 2.4   | 1.7            |
| Charlson Index (0-37 scale)          | 0.7   | 1.4            |
| SF-36 Physical Function (0-100)      | 68  | 30             |
| SF-36 PCS (0-100)                    | 42  | 12             |
| SF-36 MCS (0-100)                    | 42  | 9              |

FIGURE 1: Distribution of Index Scores

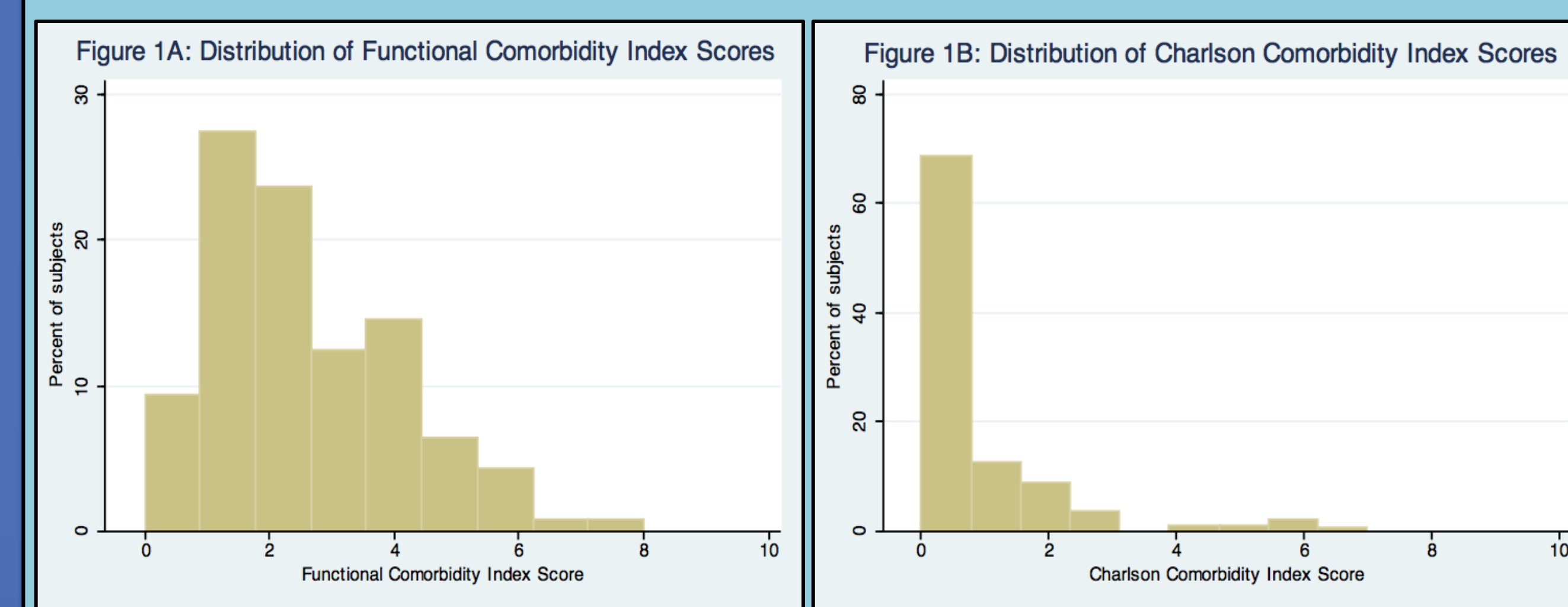


TABLE 3: Comparison of the Functional and Charlson Indexes

|  | Functional Index | Charlson Index |
|--|------------------|----------------|
| <b>PHYSICAL COMPONENT SCORE</b>  |                  |                |
| Spearman Correlation   | -0.44*           | -0.41*         |
| Adjusted R <sup>2</sup>  | 0.23             | 0.17           |
| Bootstrapped distribution of the adjusted R <sup>2</sup> (mean±standard error) | 0.23±0.05**      | 0.17±0.05**    |
| <b>MENTAL COMPONENT SCORE</b>  |                  |                |
| Spearman Correlation   | -0.38*           | -0.07*         |
| Adjusted R <sup>2</sup>  | 0.23             | 0.13           |
| Bootstrapped distribution of the adjusted R <sup>2</sup> (mean±standard error) | 0.23±0.05**      | 0.13±0.05**    |

Table 3 Legend: Spearman correlation between each Index and the SF-36 Physical Function, PCS, MCS. Negative correlations indicate that as the number of comorbidities increases (higher Index score) the level of self-reported health status decreases (lower SF-36 score). Coefficients of determination generated by multiple linear regression, adjusted for age, gender, race, ethnicity, and apnea-hypopnea index.  
\* Each correlation significantly different from zero,  $p < 0.001$ .  
\*\* Difference between Indexes statistically significant,  $p < 0.001$  (Physical Function not shown, similar to PCS results)

## RESULTS

### Descriptive Statistics (Table 2 & Figure 1)

- Cohort characteristics consistent with severe sleep apnea
- Functional Index more widely distributed
  - Better stratification of subjects

### Correlation and Bivariate Analysis (Table 3)

- Functional Index correlates with all outcomes
  - Statistically significant, clinically important correlation
  - Higher (worse) comorbidity associated with lower (worse) status
- Charlson Index correlates with Physical Function, PCS, but not MCS
- Stronger correlation between health status and Functional Index

## DISCUSSION

- Adjusting for comorbidity confounding is important
  - Particularly for self-reported outcomes (health status or QOL)
- Functional Index is a more robust predictor of the variation in the SF-36 Physical Function, PCS, and MCS.
- Our results are similar to comparisons of the Functional Index and Charlson Index in other populations
- The Functional Index may be useful to adjust for comorbidity confounding when health status or QOL.

## LIMITATIONS

- Conservative bias: Some Functional Index comorbidities under reported (lower index score)
- Sleep apnea clinic population, may not be generalizable
- Functional Index might not include all comorbidities relevant to predicting health status (e.g, migraine)

## CONCLUSION

The Functional Index is a valid tool to predict health status in sleep apnea patients and performs better than the Charlson Index. When studying health status or QOL, the Functional Index is a superior tool to adjust for differences in existing comorbidities than is the Charlson Index.

## FUTURE DIRECTIONS

- Modify the functional index to better predict QOL
- This study is being done- Podium presentation 10/1: Development and Validation of a Health Related Quality of Life Comorbidity Index