

# What are the demographic, clinical and lifestyle factors associated with Unhealthy Days among a working population?

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## Background

Employers have an interest in the health-related quality of life (HRQOL) and consequent productivity of their employees. Factors that determine HRQOL can inform employee wellness programs and other interventions. Previous research based on claims data alone has evaluated risk factors as determinants of employee health and healthcare expenditures.<sup>1,2,3</sup> Other research has separately evaluated how workers’ relationship to their jobs predicts ill health, life satisfaction and job performance.<sup>4</sup> However, the worker characteristics that determine a global, self-reported measure of HRQOL have not been studied.

## Objective

To identify factors associated with HRQOL in an employed population and to identify subpopulations with significantly poorer or better HRQOL.

## Methods

**Study Design:** Cross-sectional

**Data Sources:**

- Employment data
- Claims-based medical conditions occurring October 1, 2012 – September 30, 2014
- September 2014 Associate Total Well-being Survey (response rate, 46%), which included:
  - Well-Being Index (36 items addressing Belonging, Health, Purpose, and Security)
  - Kessler Psychological Distress Scale (K10)
  - Questions related to sources of stress, work issues, and physical activity limitations
  - Biometric data collected clinically around the time of the Well-being Survey
  - HRQOL (Healthy Days)

**Study Population:** Two-thirds of survey respondents were randomly selected as a training set for a decision tree model.

**HRQOL Measure:** Number of physically or mentally unhealthy days (PUHDs/MUHDs) in the previous 30 days using 2 questions from the Center for Disease Control and Prevention (CDC) Healthy Days survey:

- Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?
- Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?

**Statistical Analyses:** All predictor variables were tested one at a time for association with total unhealthy days (UHDs):

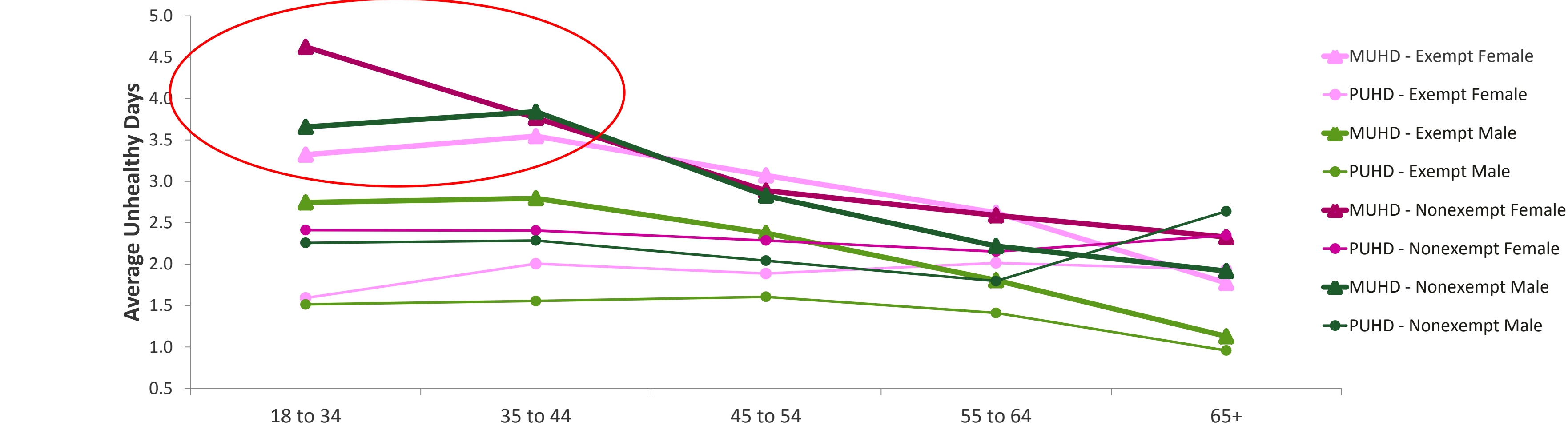
- Biometric risks and medical conditions: Wilcoxon rank-sum test, with Benjamin-Hochberg adjustment of p-value to correct for multiple testing.
- Kessler Psychological Distress Scale score: Kruskal-Wallis test
- Well-Being Index items and mental stressors: Spearman’s Rank Correlation Coefficient

Decision tree software was used to construct a model of the medical and biometric factors most predictive of UHDs after adjustment for age, sex, and exemption status. Included variables had a statistically significant association with UHDs, yielded leaves with a minimal size of 50, and split the model into 2 branches at each level. Based on initial findings, a second decision tree for MUHDs in nonexempt employees aged <45 years was constructed to explore the most predictive sources of stress, accounting for age and sex. Although researchers typically cap total UHDs at 30 per individual, a simple PUHD+MUHD total was considered more useful to this exploratory analysis for an employee well-being program.

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## Results

Figure 1. Physically and Mentally UHD by Sex, Exemption Status\* and Age



Participant Characteristics by Age Group (N)

	18 to 34	35 to 44	45 to 54	55 to 64	65+
Exempt Females	1,097	1,646	1,636	1,029	91
Nonexempt Females	1,062	848	777	549	53
Exempt Males	607	733	615	399	52
Nonexempt Males	281	185	122	92	15

\*Defined by Fair Labor Standards Act classifications: Exempt = not entitled to overtime pay, Nonexempt=entitled to overtime pay

Figure 2. Biometric Risks and UHDs

- Except for high total cholesterol and LDL, biometric values signifying a health risk were associated with more UHDs.
- The largest increases in UHDs in the risk group was for factors associated with weight (body mass index [BMI], waist circumference).

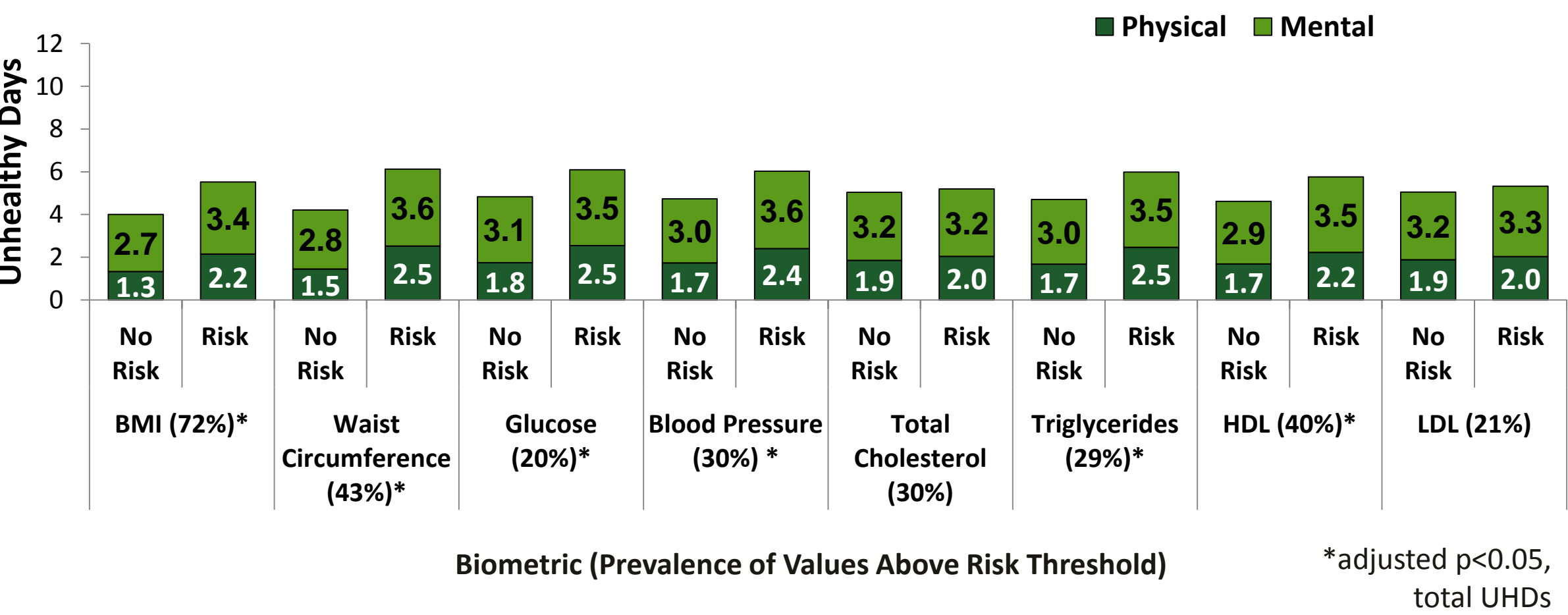


Figure 3. Medical Conditions and UHDs

- Individuals with a medical condition reported more UHDs (significant associations except in the case of cancer and renal disease, likely influenced by low prevalence of these conditions).
- The largest difference in total UHDs was associated with diagnosis of depression.

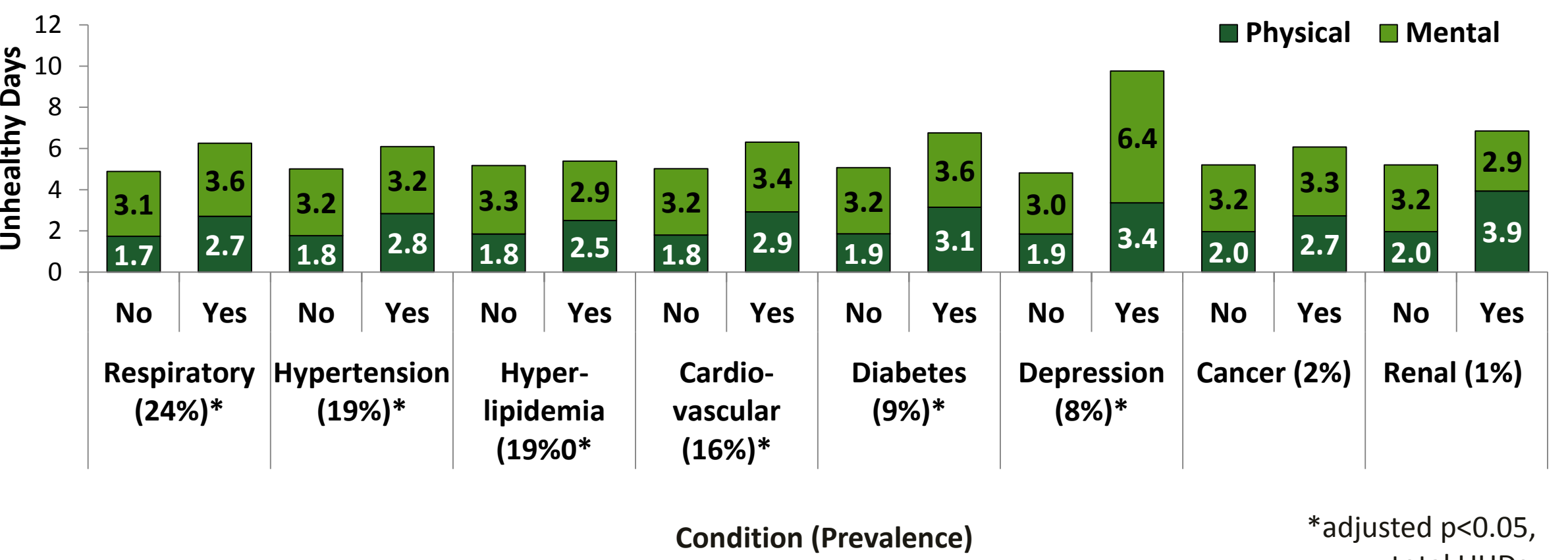


Figure 4. Psychological Distress and UHDs

As psychological distress increased, reported UHDs increased (p<0.05 for association of score category with total UHDs).

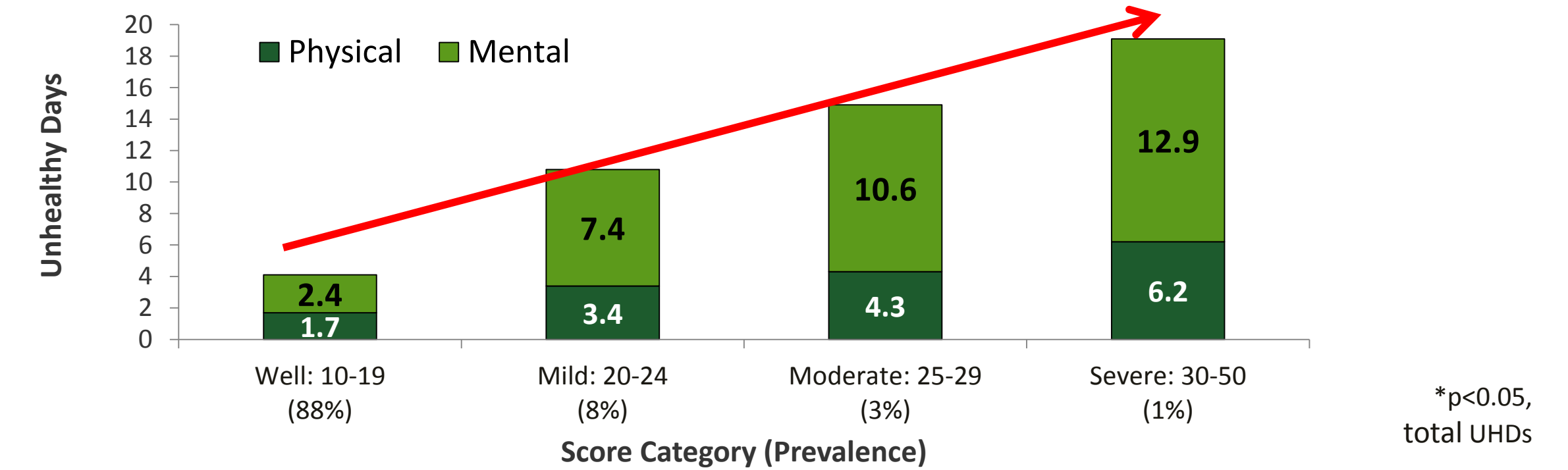
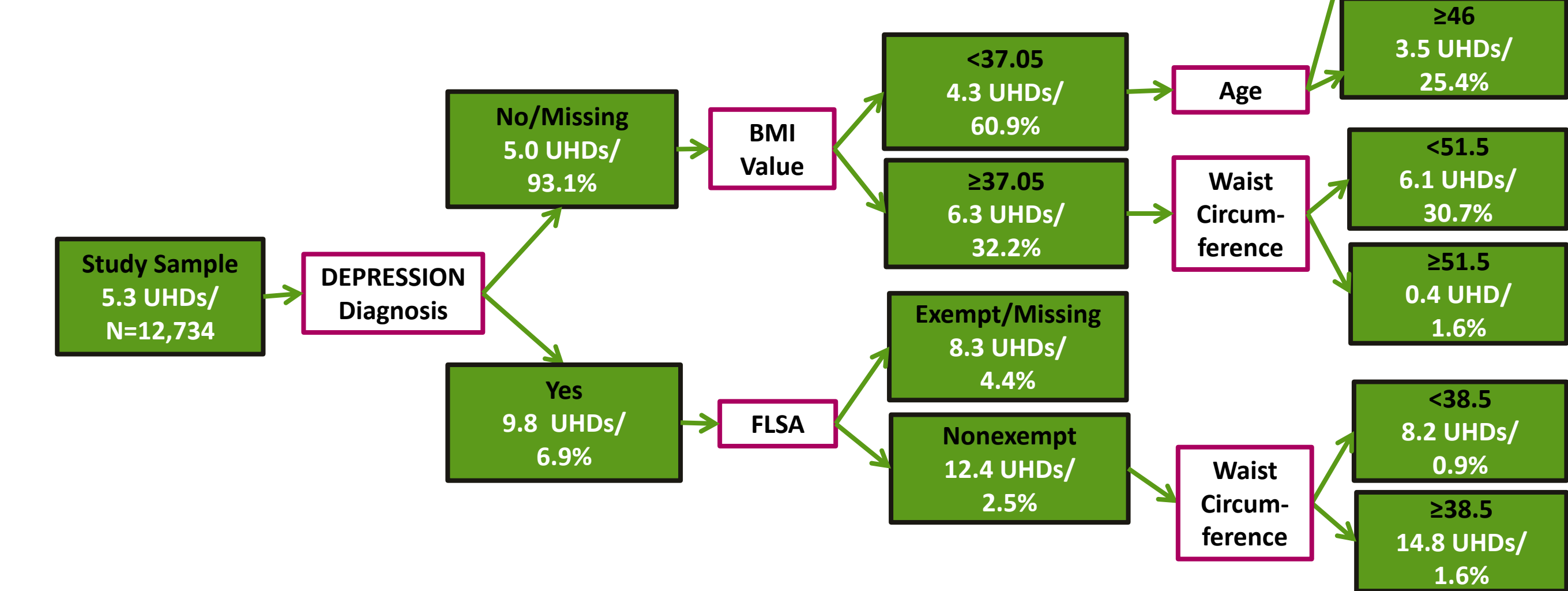


Figure 5. Decision Tree: Prediction of Total UHDs\*

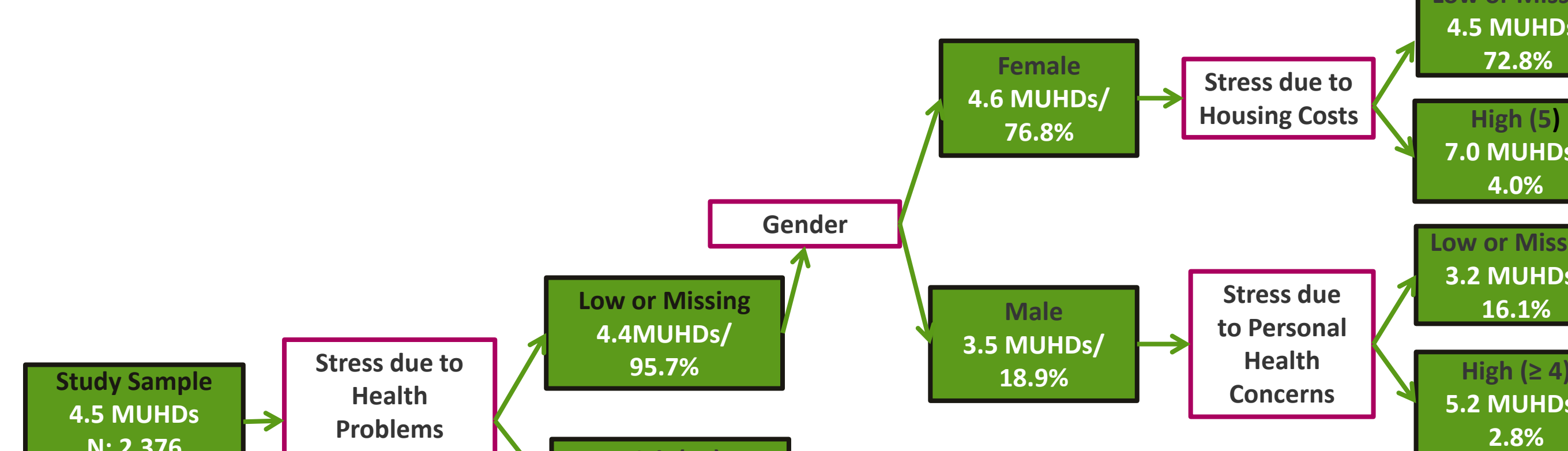
Of those examined, the most useful predictors of total UHDs in this population were diagnosis of depression, BMI ≥37, nonexempt employment status, age <46, and, depending on the presence of other risk factors, waist circumference ≥51.5 inches or ≥38.5 inches.



\*The potential factors for determining splits were medical conditions, biometric measures, age, sex, and exemption status. Only the first 3 levels of splits are shown.

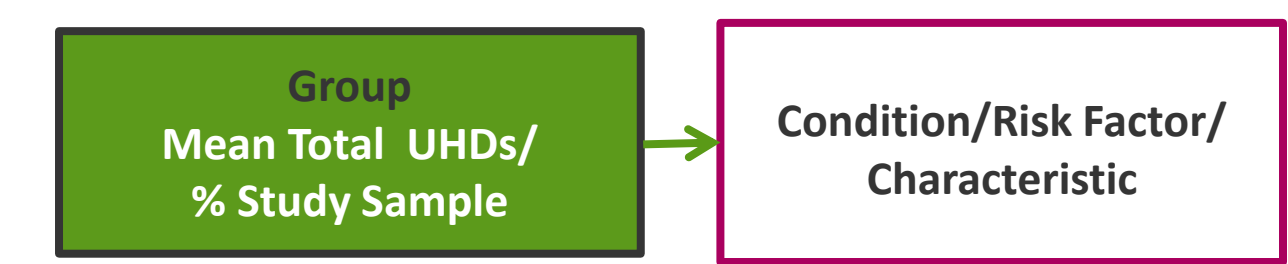
Figure 6. Decision Tree: Prediction of Total MUHDs\*

Of those examined, the most useful predictors of MUHDs in the subpopulation with an especially high number of MUHDs were gender and stress due to family healthy problems, housing costs, or personal health concerns.



\*The potential factors for determining splits were 10 sources of stress, sex, and age. Only the first 3 levels of splits are shown.

Key for Figures 5 and 6



## Conclusions and Future Work

- This study revealed clear patterns of association between HRQOL, particularly MUHD, and age, sex, and exemption status in a working population.
- Results will inform strategies to achieve this employer’s goal of improving the health status of its workforce. For example, priority interventions might target the mental health of young nonexempt employees.
- The random one-third of the respondents excluded from this analysis can serve as a validation set for the decision trees or subsequently derived models.

## Limitations

- The cross-sectional design reports associations and precludes conclusions regarding causality.
- This study relied on previously collected data sources, each with limitations, employment records (missing data), claims (missing data, coding errors), and surveys (non-response and recall bias).
- The associations identified in this study may have been influenced by confounders not available in the data sources.

## References

1. Goetzel RZ et al. *Health Aff* (Millwood). 2012;31(11):2474-84.
2. Goetzel RZ et al. *J Occup Environ Med*. 2013;55(3):272-9.
3. Kowlessar NM et al. *J Occup Environ Med*. 2011;53(5):468-77.
4. Shimazu A et al. *Ind Health*. 2012;50(4):316-21.