# Sociodemographic, Mental, and Physical Health Determinants of Multisite Pain are Associated with Elevated C-Reactive Inflammatory Protein.



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## Introduction

- biopsychosocial model of The biological, that states pain psychological and social factors contribute to the maintenance and worsening of chronic pain<sup>1-2</sup>.
- Yet, the extent to which these together integrate factors remains mostly unknown.

# **Objective**

biopsychosocial burden Define а index of pain from health determinants (sociodemographic, mental health and physical health) associated with the number of pain sites.

# Methods

**Population:** We derived a multivariate model of the burden associated with multisite pain in the United Kingdom Biobank Population data  $(40 \text{ years old and older}, 54\% \text{ women})^1$ .

Analysis: Nonlinear Iterative Partial Least Square (NIPALS) was used to derive a multivariate model of the self-reported number of pain sites and 98 variables organized in three distinct dimensions: sociodemographic, mental health, and physical health. All features of the model were normalized (z-score) in order to be comparable.

**Outcomes**: Exploratory analysis was done on three secondary outcomes.

**Biological:** C-Reactive Protein (CRP), a general index of peripheral inflammation was examined. Log-transformation was applied to CRP to achieve a normal distribution.

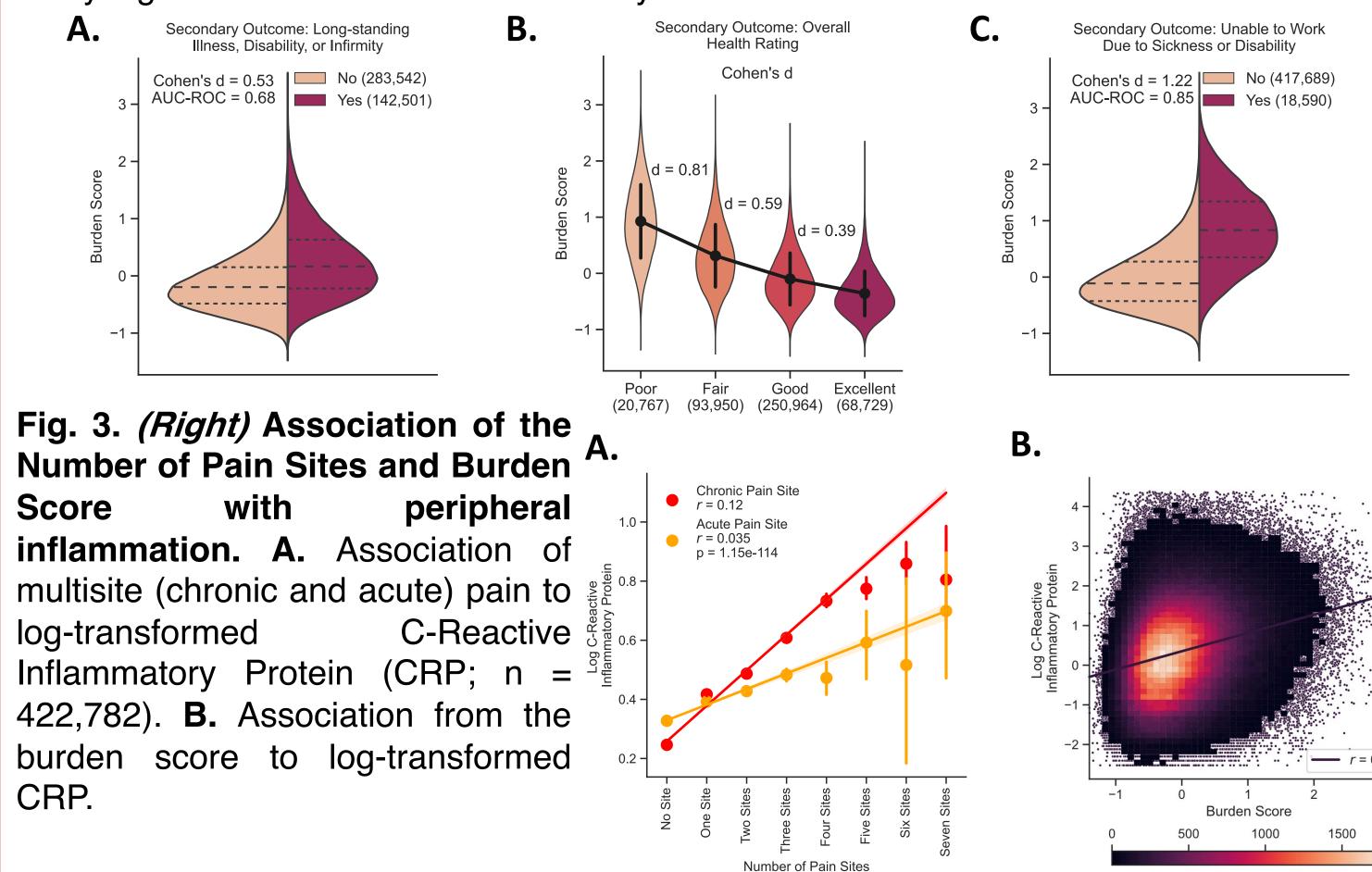
Statistical tests. Pearson correlation coefficients (r) and variance explained (R<sup>2</sup>) were used for association tests. Cohen's effect size (d) and area under the curve of the receiver operating characteristic curve (AUC-ROC) were used to compare groups. Note that given the large sample, p-values of effects higher than 0.1 were not reported due to their strong statistical significance (p < 1 x10<sup>-300</sup>).

Fig. 1. High-dimensional representation of multisite pain characterizing the burden index. A. Pain status evaluated in the UK Biobank population. B. Variance explained (R<sup>2</sup>) in the number of pain sites from the model across three main dimensions and their unions. C. Explained variance across each of ten categories. **D.** Association from the model with the number of acute and chronic pain sites. E. Model coefficients (and confidence intervals from 1,000 bootstraps resampling) associated with the number of self-reported pain sites.

(3) Neck/Shoulder - 101,733 (4) Stomach/Abdominal - 38,986-(8) Widespread - 8,047

N = 445,132

Fig. 2. Evaluation of secondary outcomes from the pain-associated burden score. A. Individuals with a long-standing illness, disability or infirmity presented higher burden, with a medium discriminability. **B.** Individuals with self-rated poor overall health ratings presented a significantly higher burden. Overall health rating was strongly associated with the burden score (r = -0.52,  $R^2 = 0.27$ ). Individuals with a long-standing illness, disability or infirmity presented a higher burden, with a medium discriminability. C. Individuals scoring very high in this burden were more likely to be unable to work due to sickness or disability.

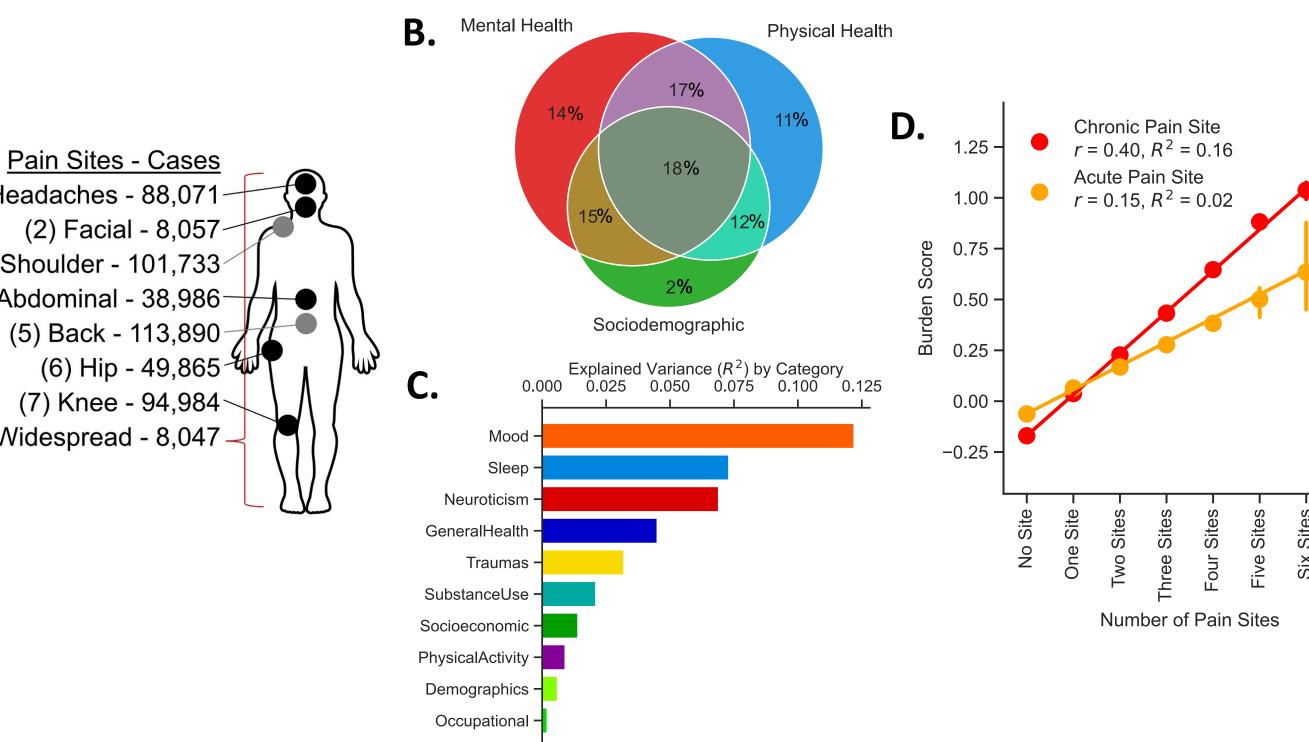


Score log-transformed CRP.

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## Results





### Traumas Last 2 Years Mental Health Trauma to Self **Financial Difficulties** Traumas Frauma on Close Relative Neuroticism **Death Close Relative** Separation or Divorce Mood Death Spouse Miserableness Mood Swings • Fed-up Total Neuroticism Suffer from Nerves Irritability Fense / Highly Strung • Worry / Anxious Sensitivity / Hurt \_oneliness / Isolation Norry for Embarassement Nervous requency Tiredness / Lethargy 2) en GP for Mental Health Risk Taking Frequency Disinterested **Frequency Depressed** Seen Psychiatrist for Mental Health Sociodemographic Practical Career Diploma Number of Employments Socioeconomic Number Vehicules Certificate Secondary Education Occupational Other Professional Qualifications Demographic Look After Home and Family 3) Number of Qualifications None of Proposed Employment Student Unpaid Volunteer Work Ordinary Level Advanced Level College or University Jnemployed Income Paid or Self-Employed Manual or Physical Job Live with Partner Job Standing or Walking Live with Grandchilds Number in Household Able to Confide Live with Related Relatives Live with Children Live with Grandparents Live with Siblings Live with Unrelated Relatives Live with Parents Little Friends Family Visits Moderate Friends Familty Visits Asian Ethnicity Black Ethnicity Other Ethnicity Mixed Ethnicity White Ethnicity Physical Health Moderate Alcohol Intake Change Alcohol Intake Last 10 Years Substance Use Previous Drinker Past Tobacco Smoking Sleep Daily Smoker Physical Activity Previous Smoker Hours Exposure Tabacco at Home General Health Ever Smoked Smokers inside Household Never Drank Occasional Smoker Sleeplessness / Insomnia Difficulty Waking-Up -Narcolepsy Napping Frequency Late Chronotype **Sleep Duration** MET Moderate Activity Low IPAQ Activity Group High IPAQ Activity Group vsical Activity Recommendation MET Walking Attend Sports Club or Gym MET Vigorous Activity requency Physical Activity per Week Body Mass Index · Weight • Gained Weight Fractured Last 5 Years Lost Weight Pulse Rate Diastolic Blood Pressure Systolic Blood Pressure Grip Strength 0.15 0.05 0.00 0.10

-0.05

Coefficients

- multisite dimensional representation, pain impacted.
- Secondary
- associated proposed presented inflammation.

For more information regarding this burden index, including its validation in an independent dataset and its association with functional morphological and see **Poster** brain signatures, **#1038676**)

### References Rice, Smith, & Blythe (2016). Pain and the global burden of disease. Pain. Gatchel, Peng, Peters, Fuchs, & Turk (2007). The biopsychosocial approach to chronic pain: scientific advances and future directions. Psychological bulletin. Bycroft et al., (2018). The UK Biobank resource with deep phenotyping and genomic data. Nature. Acknowledgements





### Discussion

The burden associated with pain was characterized by highа health could it explain up to near 20% of the overall number of pain sites variance with chronic sites being more outcomes showed that individuals with longstanding illness, poorer self-reported overall health and unable to work scored higher in this burden. While multisite pain was with elevated peripheral inflammation, the burden index higher association with peripheral

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