



WOLFRAM CONSULTING SERVICES

Modelling Emotional Labour in Healthcare Workforce Planning

Industry: Healthcare & Research

Applications: Statistical Analysis, Principal Component Analysis, Data Visualisation



ABOUT

Wolfram collaborated with researchers at London South Bank University to model the impact of emotional labour on the healthcare workforce. Traditional workforce models in healthcare rely heavily on activity-based metrics and broad supply-demand calculations but overlook the psychological and emotional demands placed on staff. Using data collected from 512 haematology professionals, Wolfram's technical consulting team used analytical techniques to identify how different emotional labour patterns vary across professional roles, pay grades and years of service. The resulting insights provide a foundation for more sophisticated workforce planning that accounts for the hidden costs of emotional demands in patient-facing roles.

THE CHALLENGE

Modelling workforce capacity is an important challenge in healthcare systems worldwide. Hospital administrators and policymakers need accurate models to predict staffing needs, prevent burnout and maintain quality of care. However, existing approaches focus primarily on easily quantifiable metrics like patient volumes, procedure counts and shift coverage ratios. These models tend to oversimplify a complex environment in which professional, personal and psychological factors interplay to determine the effectiveness and satisfaction of the workforce.

One important psychological factor that is often missed is the concept of emotional labour: the effort required to manage, suppress or simulate emotions as part of job performance. In healthcare, professionals must frequently suppress negative emotions (frustration, disgust, fear) while projecting

positive ones (empathy, calmness, confidence). This emotional work is well documented in other professional sectors like hospitality, law enforcement and assisted living but remains largely unexplored in healthcare workforce planning.

The research team at London South Bank University recognised this gap and administered the widely used Discrete Emotions Emotional Labour Scale (DEELS) to staff across multiple roles within haematology healthcare organisations. The challenge was not simply collecting this data but extracting meaningful, actionable patterns from it: Which specific emotions contribute most to emotional labour? How do these patterns differ between junior nurses and senior consultants? Between administrative staff and clinical practitioners? And critically, how can these insights be integrated into workforce planning decisions?

THE APPROACH

Wolfram's technical consulting team brought expertise in multivariate statistical analysis and data visualisation to address these questions. The researchers at London South

Bank University administered the DEELS instrument, which captured responses across 14 distinct emotions organised into three subscales: genuinely expressed, faked

“As researchers and modellers working with real-world, complex situations, we value our collaboration with Wolfram. It gives us the extra computational and technical capacity to deliver projects with accuracy and on time.”

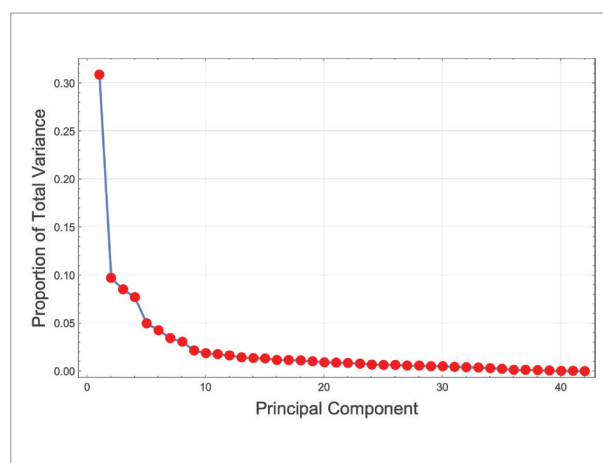
—Professor Alison Leary, MBE PhD RN FRCN
Chair of Healthcare & Workforce Modelling
London South Bank University

and suppressed. With 512 respondents across diverse roles, the resulting dataset was high dimensional and complex, requiring sophisticated analytical techniques to reveal underlying insights.

Wolfram's team employed Principal Component Analysis using Wolfram Language, a dimensionality reduction technique that identifies which emotions tend to co-occur and which contribute most to the overall emotional labour burden. This approach revealed that emotional labour is not a monolithic experience but rather consists of distinct patterns captured by six principal components that explain approximately 66% of the variance in the data. Wolfram's team then stratified these findings by three critical workforce variables: professional role, pay grade and years of service. Nonparametric statistical tests were conducted to detect significant differences between cohorts along the principal components.

The analysis revealed that the most significant component of emotional labour (explaining 31% of variance) is suppressing negative emotions, followed by displaying fake positive emotions while simultaneously

suppressing authentic positive feelings. Importantly, this burden is not distributed uniformly across the workforce. Early-career professionals displayed distinct emotional labour patterns compared to mid-career and highly experienced colleagues. Similarly, professionals in lower pay bands showed different emotional patterns compared to those in higher pay bands with managerial responsibilities. These distinctions have important implications for targeted interventions, training programs and workload distribution.



Main results from the principal component analysis, showing the proportion of variance explained by each identified component.

“Naturally, collecting healthcare data is an arduous task. This investigation involved joining across many disparate datasets to measure the 'consequence' of an imbalance of capacity and demand within a healthcare workforce. The DEELS framework provided many interesting lines of inquiry, but we also explored other metrics, e.g. hours of unpaid work/overtime.”

—Joseph Brennan
Wolfram's lead technical consultant

ACHIEVEMENTS

- **Validated application of emotional labour measurement in healthcare**

By identifying six principal components that capture the dimensional structure of emotional labour, Wolfram's team provided empirical validation that emotional labour can be systematically measured and analysed in healthcare settings. This establishes a methodological foundation for integrating emotional labour into workforce modelling and operational planning.

- **Granular insights by role, seniority and experience**

Rather than treating healthcare workers as a homogeneous group, the analysis modelled statistically significant differences in how emotional labour is experienced across professional roles, pay grades and tenure. This level of granularity transforms workforce planning from a simple headcount exercise into a nuanced understanding of psychological workload distribution.

- **Framework for evidence-based workforce interventions**

By modelling which emotional labour patterns are most burdensome and which staff segments experience the greatest demands, the analysis provides healthcare organisations with clear targets for intervention. Workforce capacity models can now incorporate emotional labour as a legitimate factor in staffing calculations, with different weights for different roles, pay grades and experience levels, moving beyond the oversimplified assumption that all positions within a role category are equivalent.

LET'S TAKE YOUR PROJECT TO THE NEXT LEVEL

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