

Nataliya Rybnikova, Dani Broitman, Murielle Mary-Krause, Maria Melchior and Yakov Ben-Haim, 2024, Uncertainty in the association between socio-demographic characteristics and mental health, *PLoS One*, to appear.

**Abstract** Questionnaires are among the most basic and widespread tools to assess the mental health of a population in epidemiological and public health studies. Their most obvious advantage (firsthand self-report) is also the source of their main problems: the raw data requires interpretation, and are a snapshot of the specific sample's status at a given time. Efforts to deal with both issues created a bi-dimensional space defined by two orthogonal axes, in which most of the quantitative mental health research can be located. Methods aimed to assure that mental health diagnoses are solidly grounded on existing raw data are part of the individual validity axis. Tools allowing the generalization of the results across the entire population compose the collective validity axis. This paper raises a different question. Since one goal of mental health assessments is to obtain results that can be generalized to some extent, an important question is how robust is a questionnaire result when applied to a different population or to the same population at a different time. In this case, there is deep uncertainty, without any a priori probabilistic information. The main claim of this paper is that this task requires the development of a new robustness to deep uncertainty axis, defining a three-dimensional research space. We demonstrate the analysis of deep uncertainty using the concept of robustness in info-gap decision theory. Based on data from questionnaires collected before and during the Covid-19 pandemic, we first locate a mental health assessment in the space defined by the individual validity axis and the collective validity axis. Then we develop a model of info-gap robustness to uncertainty in mental health assessment, showing how the robustness to deep uncertainty axis interacts with the other two axes, highlighting the contributions and the limitations of this approach. The ability to measure robustness to deep uncertainty in the mental health realm is important particularly in troubled and changing times. In this paper, we provide the basic methodological building blocks of the suggested approach using the outbreak of Covid-19 as a recent example.