

PhD Studentship: Aggregating multi-domain wellbeing across individuals

BACKGROUND

This PhD studentship is offered as part of the SIPHER (Systems science in Public Health and Health Economics Research) consortium. Preventing ill health related to the “social determinants of health” requires well-coordinated policies across many sectors. SIPHER is a major investment by the UK Prevention Research Partnership, which brings together scientists across six universities, three government partners at local, regional and national level, and ten practice partner organisations. SIPHER will deliver novel evidence of the costs and benefits of the complex, interlinked and long-term consequences of policy decisions. For further details of SIPHER, see <https://sipher.ac.uk/>

The PhD will be part of Work Stream 6 of the SIPHER consortium. This Work Stream concerns social valuations of cross-sectoral outcomes and equity implications, to provide insight into how people value different policy outcomes (e.g. increased income versus improved health) and different distributions of outcomes (increased total income versus increased income inequality).

INTRODUCTION

Public health interventions can have implications beyond health, and public policies outside of health can have implications for health. Ultimately, policies need to be evaluated across multiple domains (or dimensions) of wellbeing, including for example, health, employment, housing, and social capital. Thus, two key assumptions in evaluations is that social welfare is an aggregation of individual wellbeing, and that wellbeing is multidimensional. (In engineering, this has been known as the many-objective optimisation problem.)

In welfare economics, there are two approaches to aggregate multidimensional individual wellbeing (both of which engineers will recognise as *a priori* approaches). One is called the individualistic approach, where the overall wellbeing of each individual is first calculated (by aggregating across the dimensions for the individual), and then these are aggregated across individuals to obtain social wellbeing. The other is called the domain-specific approach, where wellbeing is aggregated across individuals first within each domain, and then these are aggregated across domains to obtain social wellbeing.

If all aggregation stages are simply additive, the two approaches result in the same total social wellbeing. However, there may be ‘aversion to inequality’: people may value more equal distributions of wellbeing even if that meant a lower total. Where this holds, each unit of wellbeing to an individual will have a diminishing marginal effect on social welfare, and aggregation across individuals will not be additive. The individualist approach calls for aversion to inequality in overall wellbeing across individuals. The domain-specific approach calls for aversion to inequality by domain. The aversion to inequality in different domains of wellbeing may vary across each other and with the aversion to inequality in overall wellbeing.

Now, imagine that society has 300 individuals “in need” across two domains of wellbeing. Society can improve the wellbeing of 100 individuals in domain 1 and another 100 in domain 2. There are two extreme allocation possibilities (and everything else in between):

- Improve the wellbeing of 100 people in domain 1, improve the wellbeing of another 100 people in domain 2, and leave 100 people as they are; or

- Improve the wellbeing of 100 people in domains 1 and 2, and leave 200 people as they are.

The relevant decision makers may regard the first outcome as fairer, because the benefits are spread out more widely. Let us refer to this as cross-domain inequality aversion. On the other hand, the second outcome may be perceived as more efficient, if the impact of improved wellbeing in both domains is larger than the sum of the impacts of each of the domains on their own. Let us refer to this as cross-domain synergies. Cross-domain inequality aversion and cross-domain synergies may (or may not) cancel out each other.

The individualistic approach and the domain-specific approach will, in theory, have different implications across these two allocation possibilities. However, whether the differences between the two approaches would have a real impact on actual decisions is unknown. This would depend on other relevant parameters. Case studies based on actual policy examples and analysed using the multi-criteria decision-making (MCDM) framework is a possible method to explore this.

RESEARCH QUESTIONS

The proposed PhD will explore the following questions:

1. Do relevant decision makers have different inequality aversion for overall wellbeing and the domain of wellbeing, and for what reason(s)?
2. Do relevant decision makers value the two allocation possibilities above differently, and, if so, for what reason(s)?
3. Are the differences between the individualistic approach and the domain-specific approach large enough to affect actual policy decisions?

METHODS

- Review of the theoretical and the empirical literatures on multi-domain social welfare, inequality aversion, and multi-objective optimisation.
- Analysis of existing data from the SIPHER project on domain-specific inequality aversion [Q1]
- Stated preference study on across-domain inequality aversion [Q2]
- Case studies: adapt the SIPHER multi-criteria decision-making (MCDM) framework for cross-sectoral public health policy action to account for the individualistic and the domain-specific approaches and conduct a series of what-if analyses to map out the conditions under which the two approaches will result in inconsistent ranking of policies [Q3]

KEY READING

Abásolo I, Tsuchiya A (2013) Is more health always better for society? Exploring public preferences that violate monotonicity. *Theory and decision*, 74(4), 539-563.

Decancq K, Lugo MA (2012), Inequality of wellbeing: A multidimensional approach, *Economica*. 79(316): 721-746.



Systems science
In Public Health and
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Fischer GR, Kipouros T, Savill AM (2014). Multi-objective optimisation of horizontal axis wind turbine structure and energy production using aerofoil and blade properties as design variables. *Renewable Energy*. 62:506–515.

Meier P, Purshouse R, et al, (2019) The SIPHER Consortium: Introducing the new UK hub for systems science in public health and health economic research. *Wellcome Open Research*, 4:174.

Purshouse RC, Deb K, et al, (2014). A review of hybrid evolutionary multiple criteria decision making methods. *IEEE Congress on Evolutionary Computation*, 2014: 1147-1154

SUPERVISORS

- Professor Aki Tsuchiya, Professor of Health Economics, School of Health and Related Research, https://www.sheffield.ac.uk/scharr/sections/heds/staff/tsuchiya_a
- Professor Robin Purshouse, Professor of Decision Science, Department of Automatic Control and Systems Engineering <https://www.sheffield.ac.uk/acse/people/rp>

ESSENTIAL REQUIREMENTS

- Holds, or is on track to be awarded, a postgraduate degree in a quantitative subject such as economics, quantitative psychology, quantitative sociology, or engineering
- A willingness to engage in an interdisciplinary research environment
- A willingness to learn new skills including basic qualitative research methods

WHO CAN APPLY

This PhD Studentship is open to all applicants. For UK and EU students the tuition fees are covered by the studentship. Applications from outside the UK/EU will be required to evidence how they will make up the shortfall between the home and overseas fees during the application process.

HOW TO APPLY

Please complete a University Postgraduate Research Application form available here: www.shef.ac.uk/postgraduate/research/apply

Please clearly state the title of the studentship (Aggregating multi-domain wellbeing across individuals), the prospective main supervisor (Prof. Aki Tsuchiya) and select SchARR as the department.

You will also need to include:

- A statement (up to 750 words) explaining why you wish to apply for this studentship and what specific skills and experience you have that make you a suitable candidate.
- A copy of your CV.