**COMPLEXITY**

**Handling multiple outcomes in complex intervention trials**  
*Lead supervisor: Prof Rod Taylor*  
In the majority of randomised trials, multiple outcomes are of interest. Traditionally, the analysis and interpretation of trials focuses on a pre-defined ‘primary outcome’ and, in parallel, consideration of the impact on other ‘secondary outcomes’. This studentship is offered to explore the methodological issue of how to better handle multiple outcomes collected in the context of complex intervention trials. Can the design and analysis of trials of interventions with multiple outcomes be improved? What are the relative merits of alternative strategies such as composite outcomes, multiple response models, and multivariate approaches to analysis? The methods for this studentship are likely to include: systematic review and meta-epidemiology including individual data meta-analysis and simulation and will be under the umbrella of the MRC-NIHR Trials Methodology Research Partnership [http://methodologyhubs.mrc.ac.uk/about/phd-studentships](http://methodologyhubs.mrc.ac.uk/about/phd-studentships).

**Agent based models in population health**  
*Lead supervisor: Dr Eric Silverman*  
Many population health issues are driven by interacting behavioural, environmental and social factors. Agent-Based Models (ABMs) allow us to examine how multiple, complex patterns of interactions between individuals, their health behaviours and their surrounding environment, combine to determine population patterns in health outcomes. We are interested in supervising PhD students to either (i) develop ABMs to assess the health outcomes of welfare reforms (such as the Universal Basic Income), or to investigate the provision of social care; or (ii) develop procedures and software tools for the application of machine learning and deep neural networks to the analysis of ABMs.

**Improving the quality of life, activity, connectedness and mental health of older adults living in a community setting**  
*Lead supervisor: Prof Sharon Simpson*  
Social isolation and loneliness among older people are linked with many health problems and poorer mental health. There is some evidence from systematic reviews that interventions offering social activity and/or support within a group format can be effective and social network approaches to understanding and tackling loneliness and social isolation show promise. Systems approaches may also offer potential for understanding the multiple influences on our behaviour, as well as addressing change at a broader level. This PhD will explore the evidence on the relationship between loneliness/social isolation and health and consider how interventions involving social networks and social support might address these issues. The PhD is likely to involve qualitative or mixed methods and could include a systematic and/or theoretical review as well as collecting primary data through, for example, systems mapping and stakeholder workshops.
INEQUALITIES

Where do people age most successfully and why?
Lead supervisor: Dr Elise Whitley
As populations age there is increasing interest in making this a positive experience where people avoid or manage diseases, are socially integrated, and function well physically and mentally. However people’s ageing experience varies according to their socioeconomic status and country. This PhD will explore existing knowledge in developed countries around what socioeconomic factors drive these differences. This will inform quantitative analyses of international datasets to assess variation in aging between socioeconomic groups and countries. Differences will be further explored in terms of individual circumstances, e.g. health behaviours, and national characteristics, e.g. pension policies, to discover what socioeconomic factors drive them.

Understanding and resolving divergences in childhood obesity and overweight data and social patterning
Lead supervisor: Dr Linsay Gray
Data from Scotland indicate that childhood obesity prevalence levels are at an all-time high. Effective formulation and evaluation of action require reliable and consistent data sources and an understanding of what drives obesity and overweight. A key factor impacting on risk of obesity/overweight is socioeconomic status. Data from the annual Scottish Health Survey indicate narrowing of the socioeconomic inequality gap in childhood overweight/obesity, however, data collected over time on Scottish school Primary 1 pupils indicate the opposite. This PhD programme will explore the explanations for and find solutions to this divergence through record linkage to administrative sources.

The changing transition to adulthood and implications for inequalities in health behaviour trajectories
Lead supervisor: Dr Mike Green
The transition to adulthood has changed over the past few decades, with young adults staying longer in education and delaying labour market entry and family formation, but there are still considerable inequalities in transitional experiences. This transition is an important life-stage for establishment of health behaviour trajectories that last long into adulthood, and inequalities in transitions may lead to long-term inequalities in health behaviours. The candidate will engage with advanced quantitative methods using data from historical UK cohorts to examine impacts of transitional change on health behaviour trajectories and estimate where interventions or policies could have beneficial impacts.

The health of care experienced children in Scotland
Lead supervisor: Dr Denise Brown
Care experienced children (CEC) are at risk of poorer educational outcomes and reduced life chances but little is known in Scotland about the health of CEC. The aim of this project is to examine how the health of CEC compares to children in the general population. Anonymised individual level data on all school-age children in Scotland (n = 600,000) have been linked to health and socio-economic data. Strong numerical skills will be required in the management and analysis of this large dataset. Findings may help to reduce inequalities in health in Scotland and will help deliver better outcomes for CEC.
RELATIONSHIPS

The role of the partner/fathers in supporting vulnerable mothers’ parenting: developing an intervention for partners/fathers
Supervisors: Dr Katie Buston, Dr Marion Henderson
The THRIVE Trial (Healthy Relationship Initiatives for the Very Early-years) investigated the effectiveness of two parenting support programmes for women with additional health and social care needs in pregnancy. It highlighted the deep and enduring vulnerabilities that some mothers face. This project will undertake secondary analysis of THRIVE data to explore these vulnerabilities, as well as the role of the partner/father in the family. Additional, in-depth interviews with THRIVE mothers and with staff in organisations such as Barnardos and Fathers Network Scotland, will support the development of an intervention targeted at the partners/fathers of vulnerable mothers.

Peer-led health interventions in schools: Using social network analysis to understand when and for whom they work.
Supervisors: Dr Emily Long, Dr Mark McCann
Peer-led interventions capitalise on the influence of social networks to improve health behaviours. The extent to which the success of these interventions relies on characteristics of the peer leaders, or contextual factors such as type of school or family background, is currently unknown. Thus, this project will use two existing datasets (e.g., adolescent smoking, sexual health) to examine when, for whom, to what extent, and under what circumstances these interventions are effective. The successful applicant will receive training in quantitative research skills and in social network analysis.

How does PrEP change personal and interpersonal scripts in relation to condom use?
Lead supervisor: Prof Kirstin Mitchell
HIV PrEP prevents HIV negative individuals from contracting the HIV virus but condom use is still required to protect against other STIs such as gonorrhoea. In reducing fear and anxiety about HIV, PrEP has potential to influence both inclination and confidence to use condoms. This PhD will explore how ‘scripts’ that individuals use to talk about and use condoms are co-created between sexual partners both online (e.g. in dating apps) and face-to-face. Methods are likely to involve an online survey and longitudinal qualitative analysis with MSM prior to starting PrEP and several months later.

Digitally-mediated community-seeking in the context of mental health and isolation among older people
Supervisors: Dr Kathryn Skivington, Dr Elise Whitley, Dr Ruth Lewis
Social isolation and loneliness are associated with increased morbidity and mortality risk. Intervention is required to prevent those at risk from becoming socially isolated, and to promote healthy and successful ageing via stronger social networks. Online is one promising space to develop and maintain a network, but the opportunity for older people is unclear. This study will use an exploratory mixed-methods approach to explore and understand the potential of digital connection and online communities for reducing social isolation and loneliness, and/or to buffer the mental health impact of life disruption and social isolation, among older people.
Development of a pervasive multi-sensor device to measure the ‘active ingredients’ of the relationship between nature and child health in Early Learning and Childcare settings.
Supervisors: Dr Paul McCrorie; Dr Anne Martin; Dr Kevin Worrall (UofG James Watt School of Engineering)

The natural environment affects our physical and psychological health. A number of hypothesised pathways exist, including physical activity, air quality, psychological restoration, and improved immune functioning. Few, if any, existing experimental and observational studies focus on more than one of these pathways, meaning that we don’t really know if/how/what ‘active ingredients’ combine to exert their effects or understand which are more or less important. Public health scientists and engineers have mutually beneficial expertise, yet seldom work together. This PhD offers a unique opportunity to develop a system combining multiple sensors for the investigation of how nature influences our health.

Who goes where: how does daily movement around the city create or compound social segregation?
Supervisors: Dr Stefano Picascia, Prof Rich Mitchell

A growing body argues that individual experiences of, and roles in, social segregation are not only a result of their home neighbourhood but also daily mobility. This PhD will consider novel data sources (such as GSM mobile data and GPS traces) and computational techniques (such as machine learning and agent-based modelling) as an opportunity to widen segregation research and include people’s diurnal trajectories (i.e. where they go during the day, and who they encounter). These might prove useful to uncover the causal pathways and hypothesise on the actual processes that may link inequality, segregation, and the emerging health outcomes.

Neighbourhood heterogeneity in health outcomes during urbanisation and stagnation
Supervisors: Dr Rebecca Mancy; Dr Konstantinos Angelopoulos (Adam Smith Business School)

Sustaining healthy, equitable cities is a pressing contemporary issue, yet has been a challenge throughout history. However, quantitative analysis of within-city inequalities has largely focused on recent decades, implying an unmet need to investigate health outcomes over longer periods. This is required to understand historical underpinnings of health inequalities, distinguish trends from shorter-term fluctuations, and identify relationships with socioeconomic conditions. To address this gap, this project will focus on statistical analysis of detailed archive records of human health outcomes (fertility, causes of death, infectious disease) for Glasgow for 1898-1972, contextualised using more recent longitudinal data from BHPS/Understanding Society.
SETTINGS

Adolescent wellbeing within the school context: a systems perspective  
Lead supervisor: Dr Jo Inchley
Adolescents spend a large part of their waking lives in school and schools have an important role in supporting healthy child development. From a systems perspective, multiple factors at different levels within the school system have the potential to influence health outcomes. Using existing data from the Scottish Health Behaviour in School-aged Children (HBSC) pupil survey and school-level questionnaire, this studentship will investigate how school level factors (e.g. school size, pupil:teacher ratio, school ethos, policies and practices) may influence pupil health outcomes. A range of outcomes will be considered including mental health, sleep, and relationships with family and friends.

School teachers’ wellbeing  
Supervisors: Dr Lia Demou, Dr Marion Henderson
The teaching profession has been categorised as “emotionally taxing and potentially frustrating”. Large amounts of research show teacher stress levels are high and, probably, increasing. Teacher stress can impact on individual wellbeing as well as on pupil experience. The objective of this studentship would be to investigate relationships between individual, organisational and social aspects of teachers’ working experience and their wellbeing. The methodology may include analyses of (existing) survey data; and/or qualitative data collection methods with teachers and school administrators. The potential use of novel methodologies to detect more ‘real-time’ dynamic fluctuations in stress/resilience can be explored.
POLICY

Using instrumental variables to evaluate public health interventions
_Supervisors: Dr Peter Craig; Dr Michele Hilton Boon; Dr Vittal Katikireddi; Dr Hilary Thomson_
Interest is growing in the use of natural experiments to evaluate policies and other large scale interventions that are not amenable to randomised controlled trials. In the absence of randomisation researchers must find other ways to guard against selective exposure to the intervention. One is to use an instrumental variable to model exposure. Such approaches have advantages over other commonly used methods, but rely on assumptions that can be difficult to test. This project will review the use of instrumental variables in public health, evaluate their contribution to the evidence base, and identify how (if necessary) practice could be improved.

How effective is the ‘public health approach’ to preventing violence?
_Supervisors: Dr Peter Craig; Dr Ruth Dundas; Dr Frank Popham; Dr Vittal Katikireddi_
The ‘public health approach’ to preventing violence, pioneered by the Violence Reduction Unit set up Strathclyde Police in 2005, has become a model strategy for dealing with knife crime. Research using recorded crime and victimisation survey data suggests that, while changes in the pattern of violent crime are consistent with the focus of the new policing strategy, trends in violent crime in Glasgow since 2005 largely follow trends elsewhere in Scotland. The project will take a natural experimental perspective, using hospitalisation data alongside other sources to identify the effect of the public health approach to preventing violence.

Evidence for ‘health in all policies’
_Supervisors: Dr Hilary Thomson; Dr Michele Hilton Boon; Dr Vittal Katikireddi_
There is a diverse range of outcomes which may be considered within a ‘health in all policies’ approach. This can result in conflict about the overall benefits and harms, and can make decision making difficult. For example, investment in road infrastructure may impact positively or negatively on a range of health determinants, such as economic opportunities, air quality, accidents and community networks. This project will use a range of evidence synthesis and primary research methods to consider whether and how diverse outcomes can be systematically considered by those pursuing a health in all policies approach to policy decisions.

What are policy recommendations in public health research papers based on?
_Supervisors: Dr Peter Craig; Dr Hilary Thomson; Dr Michele Hilton Boon_
Research quality assessment increasingly takes account of actual or potential impact. Researchers face powerful incentives to emphasise the relevance of their work for policy and practice, yet reporting guidelines provide little guidance on how recommendations should be made. This project will investigate how far recommendations for policy and practice made in public health research papers are supported by the data reported, and how recommendations from individual studies compare with recommendations from related systematic reviews. It should appeal to candidates interested in public health policy and evidence synthesis methods.