Strategic priorities: Faculty of Population Health Sciences 2013-18

Cutting-edge Clinical and Community Cohorts

Cohorts can range from rare disease registries of less than a 100 individuals through to populations of hundreds and thousands (with more than 10 million person years of follow-up). Well-characterized cohorts are marked by depth of phenotyping, genotyping and diversity of data types (from imaging to metabolomics). Longitudinal data collection and analyses help inform translational clinical science, improved clinical decision making and optimum service configurations.

Realising the potential for individual patient benefit and population health gain across the spectrum of small biobanks through to ‘big data’ requires a new strategy. At the heart of this lies quantitative inter-disciplinarity, with computer scientists trained alongside epidemiologists; statisticians alongside biologists; clinical trialists alongside basic scientists. We also need to take the public and patients along with us on this journey, as active participants and advocates for cohort clinical science. A new approach to the engagement of policy makers will be key to delivering impact.

Our plans for a cohort-driven strategy will meet these challenges decisively.

1. Translational potential of stem-cell treatments
Embryonic stem cells provide a new therapeutic modality for inherited and acquired diseases, and patient-derived induced pluripotent stem cells a new tool for modeling genetic and non-genetic disease mechanisms. For example, using our deeply phenotyped and genotyped patient cohorts we are able to identify the causative genes in a wide range of rare diseases. Identifying these genes can give valuable information useful for diagnosis and patient management and lead to the development of new forms of treatment. We are developing novel stem cell and gene therapies for a wide range of rare diseases, using technology that will then be useful in developing such treatments for many more common diseases in the future. Early phase clinical trials expertise will be critical to this pathway.

2. Translational Pharmacogenetics
Recent discoveries arising from genomics and related fields of research offer opportunities for developing novel drug therapies and biomarkers predictive of treatment response, to maximise treatment benefits and minimise harm. However, their development necessitates moving the field forward from significant associations in research studies to demonstration of clinically useful effect sizes and cost-effectiveness. FPHS is well placed to achieve this because of the co-location within the Faculty of expertise in genomics and biomarker research as well as in clinical trials, prognosis and applied healthcare research. Harnessing our exceptional access to large population and patient collections, with linkage to routinely collected health record data, we seek to bridge the gap between bio- and health-informatics to develop a programme of translational pharmacogenomic research. This will benefit from greater visibility and better alignment and integration of expertise. We will grow, develop and attract high quality individuals to this field in anticipation of the significant investment projected to resource this field in strategic documents from the major funders. Over the coming period we propose to develop translational pharmacogenomics as a worked example and focus of what can be achieved through ‘reverse translation’.
3. Methodological challenge of integrating the domains

In the last few years there has been an explosion in biosocial data collections from cohort and panel surveys and this trend is set to continue for the foreseeable future with rapid developments in access to ‘big data’. There is an urgent need to build capacity in the skills required to interrogate and exploit to maximum effect these data. Multidisciplinary working is central to this endeavour. There are two overlapping elements to this. Firstly, and in order to improve our understanding of how social conditions translate into health and disease (social-biological transitions), we require advances in theoretical approaches. That is, we need to progress our thinking on how both social structural conditions (eg economic austerity) and individual situation (eg educational level, age, gender) link plausibly with biological pathways, disease mechanisms and outcomes. This will involve developing new paradigms that integrate social theory with phenotypic, genotypic and ‘omic’ data. Secondly, we need to be at the forefront of biostatistical and quantitative methodological development, which is crucial to advance population health. This applies to all of the methodological domains in which we work: observational, experimental and evaluative.

4. Citizen Clinical and Population Science

It is increasingly possible with modern technology to monitor one’s own health status (blood pressure; insulin levels), physical activity (portable sensors; pedometers) and dietary intake (‘smart-phone’ cameras; scanning technology) in real time. This is part of a movement called the ‘quantitative self’ in which the use of new and emerging technologies allow data to be both generated by patients, and transmitted to clinical and other scientists for research purposes. It offers the individual the opportunity not only to measure their own ‘performance’ over time, but also allows comparison with a population of like-situated people.

Citizen science is scientific research conducted, in whole or in part, by members of the public, in support of a larger scientific endeavour. This could involve relatively modest engagement (allowing your PC to be co-opted into a network to increase computing power) or very high levels of involvement (the systematic collection and transfer of anthropometric data on a daily basis).

We will investigate the potential of combining both the quantitative self and citizen science, as part of the further development of patient and public engagement in clinical research. Rather than being the objects of research, patients become investigators; they are not subjects, but true collaborators. The potential of citizen clinical and population science is to reinvigorate the social contract in health research: between public, patients and health researchers. We will find new ways of promulgating public involvement, and of measuring its impact.

5. Teaching

In a society where the health economy is growing, there is a need for interdisciplinary biomedical and social scientists with quantitative skills to fulfil a wide range of health management roles. A BSc in Population Health Sciences is being developed to generate a work-force with quantitative health analytic and management skills, but that understands the causes of good health and the consequences of ill-health in populations.

Beyond this need, there is a recognition that Faculty expertise must feed into the delivery of professional development opportunities after graduation. We are establishing new institutes addressing research problems in health informatics and in clinical trials
methodology; this will create opportunities to develop novel educational offerings and modules which span the breadth of SLMS educational aspirations. With the expansion of the range and use of social media, the landscape of CPD and short-course provision is changing rapidly. The Faculty seeks to be at the forefront of such provision.

6. Enterprise
Institutes within the Faculty have a long tradition of knowledge transfer and impact, with direct input to policy making, clinical guideline development and health service configuration. However, we have even more to offer from an enterprise perspective because of the distinctive range of potential services that could be marketed and delivered to public and private providers. This includes gene and stem cell treatment, diagnostic markers, neonatology and prenatal therapies, along with high quality analytic and statistical expertise in relation to observational and trial data. All offer ready avenues for increased business and consultancy activity. Improving staff understanding and increased exposure to external partners (Industry, Government) are required as the next steps, to create realizable objectives and timeframes.

Faculty research units
- UCL Institute of Child Health
- UCL Institute of Epidemiology and Health Care
- UCL Institute for Women’s Health
- UCL Institute of Cardiovascular Science
- UCL Institute for Global Health
- UCL Institute of Clinical Trials & Methodology