AQMeN

Applied Quantitative Methods Network

Economic and Social Research Council: Knowledge and skills needs: Call for evidence

A response from the Applied Quantitative Methods Network

31 October 2017

Priority knowledge/skill

There is longstanding and widespread concern about a UK-wide deficit in quantitative skills amongst social scientists. Problems arising from a skills capital deficit were first identified as early as the late 1960s. During this time, there was rapid, extensive and paradigmatic development in computing and research methods, particularly within the US where work to develop software packages and advanced modelling techniques grew rapidly. However, the rapid pace of change was not matched by adequate training for social scientists, especially in the UK. The decline in quantitative research skills was highlighted by the ESRC in Horizons and Opportunities (1987), which identified a wide discrepancy between supply of quantitative social scientists and demand from potential employers. Evidence from a range of reviews and scoping studies conducted subsequently indicated that the decline had continued (see for example Skinner 1999; Rendall 2003; Williams et al 2004; HEFCE 2005; Mills et al 2006) and was particularly severe in the devolved parts of UK (Lynch et al 2007; McVie et al 2008). In 2005, HEFCE identified social science as one of the most vulnerable subjects in higher education as a result of the crisis in quantitative methods capacity.

Over the last 10 years, there has been significant investment in the development and expansion of quantitative methods capacity across the social sciences. The Economic and Social Research Council (ESRC) has invested heavily in a range of initiatives with a more or less explicit focus on expanding knowledge of and skills in advanced quantitative methods (AQM). This has included initiatives focused on postgraduate training (e.g. Doctoral Training Centres/Partnerships with specific steers on AQM and the introduction of Centres for Doctoral Training with an emphasis of strategic topics requiring AQM skills), career development opportunities (e.g. Internships working in partnership with data rich non-academic collaborators), major investment in the UK data infrastructure (e.g. the longitudinal, biosocial, big and administrative data, election, employment and international comparative surveys) and provision of specific funding mechanisms to exploit these data (e.g. the Secondary Data Analysis Initiative). The ESRC has also undertaken strategic reviews of AQM teaching provision and provided significant funding for methods training through investment in the National Centre for Research Methods and the Applied Quantitative Methods Network, amongst others. In addition, other funding bodies such as the Nuffield Foundation and the British Academy have been instrumental in developing AQM skills at the undergraduate level, through their involvement in developing the Q-Step Centres and various other programmes of work to address the deficit in AQM skills.

It is inconceivable that the sheer extent and breadth of the investment in this area has not addressed the problem to some extent, but such significant challenges will take time and ongoing attention to alleviate. To date, it has been difficult to identify evidence about the extent to which the investments in this area have already created the degree of step change that was anticipated by funders. However, as Sharon Witherspoon MBE recently stated "it is still clear that despite all the work we are doing, we need even more number and data driven social science" (AQMeN Annual Lecture, June 2017). In this submission members of the Applied Quantitative Methods Network (AQMeN) provide comment and opinion on the current state of social science based on our experience of developing, delivering and evaluating quantitative methods training for the last eight years. We also present evidence from a recent survey of training participants which provides valuable information on the perceived value and impact of AQM training provision for UK social scientists, and we advocate the continued need for investment in methodological innovation, training and development in AQM moving forward.

Evidence of need for increased capability and/or capacity

In 2009, AQMeN was funded by the ESRC to address the quantitative methods capacity building needs of social scientists in Scotland through a programme of training, knowledge exchange and consultancy. With further funding in 2013, AQMeN expanded to include a programme of research but retained training in quantitative methods at the heart of its activities. Over the last eight years, AQMeN has delivered over 100 hands-on training courses covering a wide range of different statistical methods, software packages, data visualisation techniques and forms of data. We have also taken care to evaluate on an ongoing basis the training needs of our participants and to be as responsive as possible to changing priorities or emerging skills gaps. It is important to note that over that period, we have seen no decline in demand for quantitative methods training courses and, indeed, can evidence an increase in requests for training at the more advanced end of the spectrum. For example, in 2009 the most commonly requested training was in basic statistics; by 2012, this had shifted to multi-level modelling, although a high proportion of our members still requested basic training; and in 2017, the most common requested training was in Bayesian methods, closely followed by structural equation modelling, with relatively few requesting basic training. From our perspective, both the level of need and the level of demand for advanced quantitative methods have increased and are on a continuing upward trajectory within social science.

In the summer of 2017, we conducted a survey of those who had participated in one or more of our training courses between 2013 and 2017. A total of 139 respondents (approx. 25%) completed the survey providing feedback on the value of the training offered by AQMeN and evidencing the need for continued investment and intervention to support UK social science skills in quantitative methods. Of those who replied to our survey, 61% stated that they would have liked to attend more training events. When asked to explain what prevented them from doing so, the most common reasons were: lack of time to attend training courses (especially over several days) and pressure of other commitments that prevented them from attending; a lack of places available on training courses or courses being offered only to selected 'groups' of participants (such as PhD students); the lack of courses available in their locality or the cost and inconvenience of travelling to other places to attend training; and the problem of finding courses that were of relevance to them at the time they needed it. These findings indicate that, even though availability has increased and expanded geographically, there continue to be significant barriers to enabling the social science community to attend training in quantitative methods when and where it is relevant, convenient and appropriate for them. Therefore, there are still challenges to closing the gaps in the quantitative methods skills base that need to be addressed. Interestingly, very few respondents to the survey mentioned cost as a barrier to attending training, but this may be because most of the AQMeN training was delivered free of charge.

In addition to the challenge of quantitative methods skills capacity, it is impossible for serious and robust social science research to be undertaken without developments in data analysis software. The developments in software which began in the 1960s and 1970s have not kept pace with expansion, growth and complexity of contemporary digital datasets. At the current time there is no single data analysis software package that squarely meets all of the data analysis requirements in social science. AQMeN has been good at addressing the need for training in all of the leading data analysis software packages (including Stata, R, Mplus and SPSS). In the emerging climate of new forms of social science data, especially administrative data and new sources of big data, it is likely that new software and programming approaches to data analysis will materialise. One example is the emergence of Python as a data analysis tool. There is also the complexity of the ever increasing overlap between quantitative and qualitative data within the context of big data, which raises a

series of important questions about what methodologies are best suited to explore, analyse and interpret these data. Therefore there is an urgent need to monitor and investigate the changing role and development of data analysis software in the changing climate of social science data.

Evidence of strategic importance

The strategic importance of quantitative methods skills has been clearly set out by a number of bodies including the ESRC (MacInnes 2009), Nuffield Foundation (2013), British Academy (2012), Royal Statistical Society (2014) and, most recently, in the UK government's Industrial Strategy (2017). There is strong and compelling evidence that quantitative methods underpin the development of both basic and applied research, provide the basis for effective evidence-based policy and will be necessary to build a strong and resilient social and economic framework for the UK in the years ahead. The combination of UK investment in world-class social science data infrastructure, the availability of more open access data (including administrative and transactional data), and the increase in data processing speed and power means that we will require even more robust and accurate statistical analyses and complex modelling techniques in future. While data analytics and computing science are part of the solution, there is a strategic need for more skilled social scientists with the ability to understand, analyse and criticise the data and provide accurate, reflexive and mindful consideration of what the data mean and how they should be used. Objectivity and neutrality in data analysis are key; however, this must be balanced by a mature and intellectual consideration of the rigour, relevance and meaningfulness of the underlying data.

In our survey of training participants, we asked whether the quantitative methods training received had had an impact on their work. An overwhelming 95% said that it had had at least some impact on their work, with 31% saying it had a strong impact and 18% saying it had a major impact. The vast majority of respondents offered at least two or more examples of ways in which the training had impacted on their work. Most common was an improved general knowledge of quantitative methods and techniques (77%) and an enhanced understanding of how to use specific methods (76%). However, training participants also commonly said that the training provided had increased their ability to apply specific techniques to their work (53%), increased their confidence in using quantitative methods (44%) and improved the quality of their research and/or teaching (35%). A quarter of training participants said that the training had improved their employability and opened up new career opportunities to them. Most of our training participants were PhD students, so not surprisingly the most common outputs arising from the training were PhD theses (57%) and conference papers (23%); however, 21% of participants said that they produced a peer reviewed journal article using the methods they had learned during AQMeN training.

In addition to direct contributions to their work, training participants mentioned a range of wider benefits they had received from attending AQMeN training in quantitative methods, including making connections with other researchers doing similar types of work (49%), developing a research proposal based on new methods or data they had learned about (18%) and going on to collaborate with other researchers on a specific project (14%).

Current interventions

Over the last eight years, we have tried a variety of different modes and methods of training delivery within the AQMeN team to develop, enhance or expand methodological capacity. Here we provide

opinion on those that we found to be most successful, which fall under three broad headings: early career mentoring; research-informed training; and output-focused collaboration.

Early career mentoring – There have been many initiatives focused on early career scholars (at undergraduate, postgraduate or postdoctoral level) which aim to expand their knowledge and expertise in advanced quantitative methods. Good examples include the Q-Step Centres which have expanded the provision of degree options with an explicit focus on quantitative method; the redrafting of the ESRC's postgraduate training guidelines in 2015 which provided explicit guidance on the inclusion of quantitative training for all PG students; the Doctoral Training Centres/Partnerships which opened up training (including quantitative methods) to a wider range of students and have encouraged better collaboration between institutions; and the development of bespoke funding opportunities, such as the Secondary Data Analysis Initiative, which enabled early career researchers to lead on research bids involving a significant degree of quantitative analysis. In our experience, however, many individuals involved in quantitative social science can be isolated and often become lone scholars who do not have the opportunity or capacity to share their skills with others. This is partly because they lack opportunity and partly because are not taught how to do so. In our experience, a degree of mentoring and an 'apprenticeship' style approach is a more productive method of training quantitative social scientists. For example, the AQMeN research centre involved a small cadre of PhD students (mainly funded through institutional support) in its research activities. Although working on independent projects, the AQMeN team brought the PhD students into the research meetings, worked collaboratively on specific projects and provided supportive mentoring which enabled the students to learn approaches and techniques as part of a working partnership, and to deliver training in these areas. In addition, AQMeN ran a series of doctoral events bringing together AQM students to discuss aspects of methodology, software and data visualisation which enabled them to develop wider interdisciplinary networks. In our view, these PhD students emerged from their experience more confident, skilled and employment-ready than other comparable PhD students.

Research-informed training – In its initial phase, AQMeN training focused specifically on the teaching of particular methods and techniques. Examples were largely drawn from either existing teaching materials or readily available datasets that could be accessed by the students. As we entered our second phase as a research centre, our aim was to increasingly deliver training that drew on the data, skills, methods and techniques that we were developing and applying to our research activities. It is our opinion, based on evaluation of our training courses, that by adopting a more research-informed training approach the course participants learned more and were equipped with a better understanding of the application, limitations and interpretation of the data and methods we were using. Good examples of this are the AQMeN training courses on 'data analysis using count data' which drew on our research on the crime drop in Scotland (Humphreys et al 2014, forthcoming); 'latent class analysis' which demonstrated our work on changing patterns of victimisation in Scotland (Norris et al 2014, McVie et al forthcoming); and 'introduction to HESA data' which showcased our research on social inequalities in graduates' labour market outcomes in the UK: the role of regional job opportunities (Iannelli and Duta forthcoming). In our view, social scientists learn best when training involves not just the development of methodological expertise but provides substantive and contextual learning that focuses on their research application.

Output-focused collaboration – In addition to training in specific methods and techniques, AQMeN took on the challenge of attempting to increase the usage of specific UK datasets in recognition of the fact that the UK has many rich and varied datasets that are not being used to their full potential. We ran a series of short courses on data such as the Scottish Social Attitude Survey (SSAS), the

Scottish Crime and Justice Survey, Understanding Society and HESA data. One of our most notable successes was the training we developed on the SSAS, in which we focused on only on teaching the course participants how to analyse the data and deal with its complexities, such as survey weights and design effects. We also set ourselves the challenge of encouraging the course participants to work collaboratively in small teams to produce a published output from the survey. Over a period of 12 months, the participants attended training, received mentoring and advice from a panel of peer reviewers and worked in partnership to produce a series of journal articles that were published in a special edition of the journal Scottish Affairs in January 2014 (see http://www.research.aqmen.ac.uk/scottish-independence-referendum-2014/measuring-public-attitudes-towards-scotlands-constitutional-future/). In our view, this form of output-focused collaborative training could be a more fruitful model for future capacity building than standard stand-alone training.

Suggested actions

To enhance and sustain the future of quantitative methods capacity building within UK social science, we are strongly of the opinion that continued dedicated investment is needed. Despite significant funding in a variety of initiatives over the last 10 years, the gap between training provision and skills needs is still too wide to ensure that the future health of social science is secure. However, the stand-alone model of training courses is somewhat outmoded and has limitations as to the successes that can be achieved. To become adequately proficient in quantitative methods it is necessary to have a strong baseline in terms of underpinning skills (which should be supported at undergraduate level and expanded into postgraduate training) and ongoing opportunities for both learning (through bespoke research-focused training) and support (such as mentoring and working in collaboration with more experienced analysts or partnering with external organisations that can provide access to data and better grounding in the application of the data).

Based on our response above, we make three recommendations:

1) The ESRC should consider asking the DTPs and CDTs to provide AQM students with a specific methodological mentor (who may or may not be a supervisor) who would agree to engage with the student and involve them in a wider range of methodological activities. This could involve teaching or research, but should involve working in partnership with others on a wider range of activities than those directly focused on their doctoral research. The aim should be to enable them to learn how to operate within a collaborative environment in which methodological skills are shared, shaped and sharpened which would avoid quantitative students developing as lone scholars but would equip them with the skills and knowledge to further build capacity. In addition, there would be value in creating a virtual quantitative doctoral community across the DTP network with a specific set of activities, events and opportunities for networking over and above those aimed at cohort building.

2) There has been significant investment in training course in a wide range of quantitative methods and there are increasing resources, such as blogs, you tube videos and guidance manuals. However, these resources in isolation of research-relevant context can be limited in their value to social scientists who wish to be able to apply the work to their own research and who seek examples of ways in which this has been done. The ESRC already invests significantly in both quantitative training and quantitative research, but it would be value to review how well these two activities dovetail together and whether further work could be done to ensure that modes of quantitative methods training sufficiently draw on real-world

examples of research and encourage more social scientists (especially those who have historically had a cultural aversion to these types of methods) to consider using them.

3) To date the longer term outcomes and benefits of quantitative methods training courses have not been well researched, which means that there is limited evidence on the success of specific investments. We recommend that the ESRC considers better ways of evaluating the long term benefits of its quantitative training activities and, as part of the conditions of funding such activities, requests that those undertaking training identify a concrete set of outcomes. Where possible, we would recommend that at least some training activities are tied together much more specifically with research interests, and are undertaken with a specific focus on utilising and exploiting the UK data infrastructure and producing tangible outputs.

Timeliness of action(s)

The activities suggested above should be part of the ESRC's strategic action plan in relation to the elevation and promotion of social science within the UKRI research agenda. It will be critical that the provision of skills training for social scientists continues to be at the forefront of developing a vibrant and capable labour force which can support all aspects of public, private and third sector productivity. The existing investments that have been established form a clear platform on which to build these future capacity building activities.

Partnership

There is already strong evidence of the ability of the academic community to work together in partnership around the DTP network and to provide AQM training, so the development of a more specific mentoring structure and a virtual doctoral community of quantitative students would not be difficult to achieve. There are also many examples of good practice in drawing together research and training, but more could be done to capitalise on the wealth of AQM research that is currently ongoing in order to be strategic about how working in partnership would better support the next generation of social scientists – for example, by linking together those with the pedagogical training skills with those researchers funded to conduct high level quantitative analysis, especially if this was used as an opportunity to maximise research outputs for academic audiences or create short non-academic briefings for non-academic audiences. There is significant interest across industry, public policy and charitable organisations in the better use, sharing and exploitation of data and a strong incentive to do so in partnership. And there are clear examples of how academia is leading on the development of such partnerships. For example, the ADRC-Scotland is working in partnership with several public sector organisations (Police Scotland, Scottish Fire and Rescue, the Ambulance Service and NHS 24) to share data on emergency service calls in order to establish both a broad research agenda on the impact of vulnerability on public sector service demand and delivery (that is in line with the strict governance structures surrounding administrative data linkage) and to work towards creating an integrated framework that would ultimately provide a new operational calls structure four blue light organisations. The leveraging of additional investment should be a strong priority but it should also be dependent on developing mutually symbiotic relationships which have a clear economic and/or social value for both parties.