

Response to Economic and Social Research Council call for evidence on knowledge and skills

Section 2: Call for Evidence

2.1 Priority Knowledge/Skill: Which high-level knowledge/skill, that is both strategically important and one that requires intervention to improve the UK's social science capability and/or capacity, do you want to tell us about?

(enter one knowledge/skill only)

Quantitative skills

Please provide a summary of the knowledge/skill

(maximum of 1000 words)

The RSS is concerned with the health of two main areas of quantitative skills in social science:

- **Quantitative social science:** the application of statistical methods in social science research.
- **Social Statistics:** the development of statistical methods that are motivated by social science problems and that support quantitative social science.

Quantitative social science exposes social scientists to statistical concepts, and applies these to real world problems. Statistical science is an essential element of scientific discovery and progress and so, all research disciplines have a quantitative element. We are pleased that recognition of the applicability of statistical science has grown across the social sciences, beyond disciplines such as economics and psychology. Economics and psychology have more of a quantitative tradition that also needs attending to.

Social statistics offers a deeper set of skills that are based on deep mathematical understanding, alongside social scientific experience and expertise. It is distinct from quantitative social science but complements it in important ways, because social statisticians are concerned with devising, developing and improving methods.

Social statisticians have played a major part in the development of methods that are now considered mainstream, and which are widely used across the social sciences and beyond,

such as multilevel modelling, structural equation modelling and survey sampling.

2.2 Evidence of need for increased capability and/or capacity: Please provide evidence to support the need for intervention to improve the UK's social science capability and/or capacity.

Should include reference/hyper-links to supporting information e.g. reports, reviews, publications, feedback, data etc. Supporting information constitutes an important component of the call for evidence, knowledge and skills needs that are not appropriately evidenced are likely to be discounted.

Evidence of Need

(maximum of 1000 words)

Strong growth in the data economy is unfortunately accompanied by major skills shortages. In addition to this, basic skills for working with data are also insufficient in the UK. These issues have a direct effect on the UK social science community's capability and capacity for social science research, including quantitative social science and Social Statistics.

In the OECD's international assessment of adult skills (PIAAC), 24% of adults in England and Northern Ireland scored at Level 1 or below in numeracy, compared to an average of 19% across all assessed countries [1]. Among recent and current school students, the proportion who do not take part in any dedicated mathematical study after the age of 16 is also higher in than other countries. As noted in a review of evidence on quantitative skills for the British Academy, "Hodgen et al (2010 ...) show that England, Wales and Northern Ireland are alone among 24 advanced industrial nations in having fewer than 20% of upper secondary students participating in mathematics study [this refers to continued study in basic mathematics as well as advanced studies]. And, in spite of Scotland's preservation of a broader upper secondary curriculum than is found in the rest of the UK, it is one of only three other countries with fewer than half of upper secondary students continuing with mathematics study." [2]

The recent [Report of Professor Sir Adrian Smith's review of post-16 mathematics](#) further notes that "With the exception of mathematics degrees, more than 40 per cent of English 19 year olds studying STEM subjects [science, technology, engineering, or mathematical subjects] in UK universities do not have a mathematics qualification beyond GCSE. This increases to over 80 per cent for students on non-STEM degree courses, many of which have a significant quantitative element. A lack of confidence and anxiety about mathematics/statistics are problems for many university students." [3]

Professor John MacInnes' Review of social science for ESRC described this problem with regard to social science disciplines in 2009:

"Beyond economics and psychology, social science undergraduate quantitative methods teaching ranges from the absence of any provision at all through to specialist options, mostly taught in Year 2. [...] Methodology and evaluating empirical evidence appears as an 'optional extra' that can be safely ignored. Therefore, few who progress to postgraduate research consider using quantitative methods." [4]

Although there are substantial initiatives that are developing quantitative social science skills, such as Q-Step and the Advanced Quantitative Methods Network (AQMeN), they are not comprehensive in scope and there is much more that can be done. Initiatives have been focused on undergraduate, doctoral and post-doctoral training, leaving a bigger gap at the higher end of disciplines. For career researchers, access to methodological skills development and research also depends on funding provided to and from dedicated centres such as the National Centre for Research Methods, which has proven valuable in building a network.

We would like to see a strengthened ESRC providing more adequate support for quantitative social science among masters students, doctoral researchers, post-doctoral researchers and university lecturers. This will have many different applications to research: for innovation with data and secondary analysis, and for the integrity of research. Trained statistical instructors are needed across disciplines, and the more that senior researchers within disciplines can advise on sound statistical research, the easier it will be to strengthen quantitative social science. For these higher professional levels, it is especially important that Social Statistics is supported, as this is a source of methodological development and expertise for the social sciences as a whole.

The need for investment is reflected in the British Academy's *Count Us In* report, which recommended many ways to build on success of initiatives such as Q-Step, including by increasing the number of quantitatively skilled social scientists, and increasing the number of university researchers and university teachers who can use advanced statistical techniques. The report concludes that "this will be required to raise the quality of research and development and innovation." [5]

It is also important to have strategic support for the reproducibility and scrutiny of social science findings, with thoughtful and constructive processes built into this, to build adequate support for change within disciplines. Mechanisms to address statistical integrity are most advanced for medicine and clinical trials: the models developed there should be applied more widely to other fields of research.

We therefore recommend

- a strengthened ESRC that supports breadth, depth and quality of quantitative methods for social science at all levels;
- monitoring and support by ESRC of the recruitment and training pipeline for Social Statistics, as this is a vulnerable skill area;
- support for 'joining-up' between Q-Step and doctoral training, and raising the standard of training in Masters courses;
- continued support for NCRM, AQMeN, and for post-doctoral training in quantitative methods;
- Work towards accredited and high quality staff training and CPD to widen both the staff skills base, and the offer of professional recognition for teaching excellence;
- Support for scrutiny of data and methods at the higher levels of disciplines;
- International development of statistical skills and capacity, with the Global Challenges Research Fund;
- With UK Research and Innovation, the RSS, the Alan Turing Institute, and others, advance the cross-disciplinary work of social scientists in the development of statistics, data science and artificial intelligence.

References

[1] OECD (2013) *Survey of Adult Skills First Results: England and Northern Ireland (UK)* [PDF] <http://www.oecd.org/skills/piaac/Country%20note%20-%20United%20Kingdom.pdf>

[2] Page 59 in Mason, G. Nathan, M. & Rosso, A. (2015) *State of the Nation: A Review of Evidence on the Supply and Demand of Quantitative Skills* [PDF] <https://www.britac.ac.uk/sites/default/files/BA-NIESR%20State%20of%20the%20Nation%20-%20A%20review%20of%20evidence%20on%20the%20supply%20and%20demand%20of%20QS%20%281%29.pdf>

[3] Pages 6 to 7 in Smith, A. (2017) *Report of Professor Sir Adrian Smith's review of post-16 mathematics* [PDF] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/630488/AS_review_report.pdf

[4] MacInnes, J. (2009) *Proposals to support and improve the teaching of quantitative research methods at undergraduate level in the UK* [PDF] <http://www.esrc.ac.uk/files/research/gmi/final-report-strategic-advisor-for-quantitative-methods-proposals-to-support-and-improve-the-teaching-of-quantitative-research-methods-at-undergraduate-level-in-the-uk/>

[5] p. 15 in British Academy (2015) *Count us in: Quantitative skills for a new generation* [PDF].

<https://www.britac.ac.uk/sites/default/files/Count-Us-In-Full-Report.pdf>

2.3 Evidence of Strategic Importance: Please provide evidence for the strategic importance of the knowledge/skill.

Responses should include reference supporting information for example link to ESRC Strategy, Industrial Strategy, or Global Challenges Research Fund, and refer to the main 'end-users'/beneficiaries of the expertise. Please explain why it is strategically important for the knowledge and skills to be enhanced in the UK.

Evidence of Strategic Importance

(maximum of 1000 words)

Building capability, and creating and maximising data infrastructure for research, are two of the four main strategic areas identified in ESRC strategy. For these areas, quantitative social science and social statistics will each be important in their own right (as we have discussed in the answer to the previous question). They are also important for data infrastructure. The capability to undertake secondary analysis affects the use of major investments in surveys, the linkage and uptake of government administrative data, and the capability to develop and work with large and linked sets of survey and administrative data. Advanced quantitative skills are needed to ensure that these resources are taken up as needed and have wider benefit to UK research and innovation.

The application of quantitative social science in industry is an area that both the Research Councils and the government's industrial strategy have arguably under-addressed in their development so far. This is not due to lack of potential. With a membership that spans industry, government and academia, our Social Statistics Section highlights the applicability of quantitative social science and social statistics across the full span of industrial surveys, data analytics, and public opinion research, as well as the applicability of social science to public policy issues. The new UK Research and Innovation body should identify statistics, data science and AI as a national priority as this would make more of the wider sector-based opportunities for research and development, working with all of the Research Councils.

The Global Challenges Research Fund has a dual focus on building capacity for research and innovation, and on addressing the UN Sustainable Development Goals. The RSS support the development of statistical skills and capacity internationally and see this as an important aspect of both addressing Global Challenges and the SDGs. We have contributed to this through voluntary

initiatives with our International Development Section, and through AIMS (the African Institute for Mathematical Sciences). Our [statement](#) with other bodies for World Statistics Day 2015 highlighted the importance of data for sustainable development. (http://www.rss.org.uk/RSS/Influencing_Change/World_Statistics_Day_statement/RSS/Influencing_Change/World_Statistics_Day_statement.aspx)

2.4 Current Interventions: Please provide evidence of any relevant interventions (that you are aware of) by funders, institutions, companies or professional societies.

Please be as specific as possible including timing and scale of intervention, career stage and consider all appropriate types/modes of intervention, including for example training courses and positions, changes to funding policies, secondments, discipline hopping grants, interdisciplinary centres, workshops, networking events, Continuing Professional Development (CPD), summer schools, etc.

Relevant Interventions

(maximum of 500 words)

The Q-Step Programme, funded by the Nuffield Foundation, ESRC and HEFCE, represents one of the ESRC's main interventions to increase the supply of social science graduates with quantitative skills. This is designed to promote a step-change quantitative social science training in the UK.

Q-Step has the potential to strengthen links between undergraduate study, master's courses and research degrees (though we note that it is still limited at present to 15 universities). The evaluation of the Programme should offer plenty of material to support the future of quantitative skills teaching and learning at the undergraduate/postgraduate interface.

The Royal Statistical Society is active with regard to education, statistical literacy and skills development, and also runs an accreditation scheme with regard to courses. By awarding accreditation to undergraduate courses, the RSS provides assurance that a programme produces graduates with the technical skills and subject knowledge required of a statistician. We seek to ensure that teaching, learning and assessment within a programme is of high quality and meets the needs of students and employers.

The provision of research methods training at masters and post-graduate level should learn from and build on the achievements of Q-Step, and this could encourage providers at

undergraduate level to further strengthen the quantitative elements of courses.

2.5 Suggested Action(s): For the suggested priority area, describe and evidence what action(s) could be taken forward by ESRC (in partnership with others, where appropriate) to support the efforts identified in question 2.4. This should be supported by evidence as to the efficacy of the suggestions for example how/where/when the suggestion(s) has worked before.

Please be as specific as possible e.g. describe the type or mode of support which would be most appropriate to deliver the identified priority area, the scale of intervention and stage of career. This is an opportunity to consider different models of delivery i.e. options beyond the more commonly-funded 'training' approaches.

Suggested Action(s)

(maximum of 500 words)

Given that the ESRC's investment in research capabilities and in quantitative skills for the future has been a. promising but also b. not its highest level of investment, we would be pleased to see a strengthened ESRC supporting a stronger suite of quantitative skills and methods development for social science in the UK.

The National Centre for Research Methods has been effective in nationally distributing the support that it provides, and we strongly support continuation of this model of support for statistical science. However, we would also like to see more in-depth provision for understanding of statistical methodology.

A strengthened ESRC can play a vital role. It should

- Provide system-wide strategy and support, in recognition that competition from employers and overseas may constrain the percentage of trained graduates going on to postgraduate work. This should include monitoring the health of Social Statistics as a vulnerable skill area.
- Develop the pipeline that Q-Step now provides by ensuring at least some postgraduate Doctoral Training Partnerships have the capacity for advanced work. Gradually raise the floor of quantitative methods training provided at masters level to all students, to encourage emulation of Q-Step.
- Support far reaching development of statistical expertise and methods for research careers, through the National Centre for Research Methods, through the advanced quantitative methods research network (AQMeN) in Scotland, as well as internationally with regard to Global Challenges.

- With the UKRI, RSS, Alan Turing Institute and others advance the cross-disciplinary work of social scientists in the development of statistics, data science and artificial intelligence. There is a need to distinguish doing research with big data from talking about it. Skills in the former are badly needed, and this is an area for collaboration.

We see statistics, data science and AI as a national priority which should be supported by UKRI, to make more of sector-based opportunities for research and development. We have called for stronger representation of this in the UK's industrial strategy (<http://www.rss.org.uk/Images/PDF/influencing-change/2017/RSS-response-to-BEIS-industrial-strategy-green-paper-April-2017.pdf>).

2.6 Timeliness of Action(s): Please outline any additional information that evidences the impact of the ESRC not investing in the suggested priority area at this time? Why is it timely to act now? Does the UK's have capacity to deliver suggested action(s) now?

Timeliness of Action(s)

(maximum of 500 words)

Evidence to the Science and Technology Select Committee's inquiry into Research Integrity has highlighted the importance of statistical principles and practices to the integrity of research, and the wider public interest in understanding key principles of statistics across disciplines [1].

We have seen substantial growth of support across the social sciences for quantitative methods training, growing this from quite a low base. We recommend that preceding and wider interests in this area should be reflected in the ESRC's balance of activities, that the Global Challenges Research Fund should also build statistical capacity internationally (including for the Sustainable Development Goals), and that UKRI should identify statistics, data science and AI as a cross-cutting priority for research and innovation.

References

[1] Q14, Q20, in *Science and Technology Committee Oral evidence: Research Integrity*, HC 350, Tuesday 24 October 2017

<http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/science-and-technology-committee/research-integrity/oral/72112.pdf>

2.7 Partnership: Please evidence the opportunities, relevant to this priority area, to create

partnerships with business, policy and/or the third sector, with potential to leverage additional investment.

Evidence of opportunities to create partnerships

(maximum of 500 words)

No response

2.8: Additional information: Please provide any additional information or comments.

Additional Information

(maximum of 200 words)

No response

Response submitted 31 October 2017