# CHRIS SKINNER

Christopher John Skinner

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Chris Skinner was probably, globally, the very best statistician of his generation working on sample surveys, and someone who made an enormous contribution to social statistics in a number of research areas. In addition, as an academic leader he had an enormous impact on research methodology across the social sciences and in official statistics, and on training future generations of social scientists in methodology.

CHRIS SKINNER

Chris Skinner was born in Penge, South London, on 12 March 1953, the elder son of Richard and Daphne Skinner. His father worked for Lloyds of London, and his mother worked at the family-run furniture store, Edginton's, in Penge. He showed an early aptitude for mathematics at St Dunstan's College, Catford, which had an innovative mathematics curriculum, led by Geoffrey Matthews who went on to be the first professor of mathematics education at a British university. The curriculum involved subjects such as sets, logic, matrices, statistics and computing—a far cry from the standard pure and applied mathematics taught in the great majority of schools—and was taught using innovative learning materials. These excited Chris and, while he had other areas of expertise, he was only ever going to study mathematics at university.

He was advised by St Dunstan's that the best place to follow a similar mathematics curriculum would be Trinity College, Cambridge, and so he applied and was awarded a scholarship. Chris enjoyed the mathematics programme at Cambridge, graduating with a First in Mathematics in 1975. At this stage he had to decide how to take his mathematics further. He could, without doubt, have continued further through graduate study in pure mathematics but decided that he preferred to use his mathematics in the real world. Not being keen on the assumptions often needed to make progress in applied mathematics nor on computing, he chose statistics where he had been attracted by some of the mathematics in it and by Ferguson's book on mathematical statistics, which took a decision theoretic approach.

The statistics component of the syllabus at Cambridge was taught with an element of philosophy, which also appealed to Chris, and so he decided to study statistics further and went on to complete an MSc in Statistics at the London School of Economics in 1976. The LSE course mixed theory with practice and Chris was, by some distance, the best student of his cohort, being particularly inspired by teachers such as Jim Durbin, David Bartholomew and Alan Stuart. He was particularly interested in time series analysis and econometrics and completed a project in band spectrum regression. His quality was demonstrated by one theory examination, when he was delayed en route to the examination hall, arrived fifteen minutes late, quickly answered the paper and left fifteen minutes early, probably with a near perfect mark. It was no surprise to anyone when he was awarded a distinction.

His vision was that he next wanted to do something useful and took a job as an Assistant Statistician at the Central Statistical Office. However, he found himself in a group whose role was the coordination of social statistics. This did not include doing any statistics and he spent much of his time minuting committees, something that was not going to inspire him for long. However, he did get to understand organisations and the way that civil servants thought. He also came to believe that it was incredibly useful for academic statisticians to have done something outside of academia first.

So, he returned to academia, spending the next year as a Research Assistant in the Statistical Advisory Service at LSE. This role was one advising a wide range of people on statistical design and analysis. He worked on a variety of problems and was also able to do some field work. He also got to understand how useful statistics could be; and was further inspired by the high-class University of London seminar series, which persuaded him that an academic career was something that he would find deeply inspiring.

Chris began a PhD at LSE, but, as he had recently become a father, he wanted a job and in 1978 saw that the Department of Social Statistics at the University of Southampton was advertising a lectureship. He was advised that the Department was a good place. Chris applied, and Southampton offered him a temporary lectureship with a half teaching load while he completed a PhD in Social Statistics. This model was the idea of Tim Holt, who had recently returned from four years as a methodologist in Statistics Canada to lead the Department, which at the time was small, with only five academics. While in Canada, Tim had carried out groundbreaking research with Ivan Fellegi on an innovative automatic approach to editing and imputation for survey data (Fellegi & Holt 1976); he was extremely keen to build a strong survey group in partnership with Fred Smith, who was Professor of Statistics in the Mathematics Faculty, and had strong interests in the application of time series ideas to the analysis of repeated surveys. Fred was also ex-LSE and, while there, had been very impressed that any international star of statistics visiting the UK would visit LSE. He and Tim Holt were keen that the same should happen in survey sampling and, together with Chris, set about making this happen.

Chris thrived in an atmosphere characterised by open doors and academic discussions with colleagues, and benefited from visits from some of the best academics in the world with interests in the area. He had conversations with the likes of Alastair Scott, Gad Nathan, Jon Rao, Wayne Fuller and Danny Pfeffermann, as well as PhD students such as David Steel. Chris formed lifelong research partnerships and personal friendships with many of the international statisticians who spent time there. These connections eventually led to joint research publications that have had a substantial impact in the field of survey sampling.

But at the same time there was a PhD to undertake. Tim and Fred had been funded by the then Social Science Research Council (SSRC) to undertake research on the analysis of data collected using complex survey designs, and they invited Chris to take part in it; and work associated with this programme formed the basis for his PhD. In the first half of his thesis, Chris worked within a model-based framework for survey design and analysis, which was very much the Southampton approach at that time. Essentially a model conceptualises the relationship between the known population values of design variables and the unknown population values of the survey variables

of interest, and a sample is drawn based on these design variables. Although the sampling scheme is then ignorable for inference about the model parameters, the sample selection can lead to bias if one doesn't control for differences between the population and sample distributions of the design variables and so there is a need for adjusted estimation—these were coined Pearson adjustments by Fred Smith who, in a 1980 paper with Tim Holt and Paul Winter, developed adjustments for regression analysis (Holt, Smith & Winter 1980). Chris took this further by developing the required theory for multivariate analysis of complex survey data, assuming that both the model and the design variables follow multivariate normal distributions. A paper based on the results in Chris's thesis and showing how this works for principal components analysis appeared in 1986 (Skinner, Holmes & Smith 1986).

In the second half of his thesis, Chris looked at the use of models in variance estimation in two-stage sampling. Taking the standard design effect as a starting point, Chris went further than simply comparing the actual repeated sampling variance under the survey design to simple random sampling by arguing that it is more appropriate to compare the variance under the actual analysis model, which properly controls for clustering, to the variance under a baseline model with independent and identically distributed errors. He called this the misspecification effect (Skinner 1986) and it was later implemented in the Stata software programme. Chris completed his PhD in four years, which, given that he was also teaching, was a remarkable achievement.

In a further piece of work from his PhD, Chris showed that some of the standard approaches to control for the effects of complex sample designs on analysis, for example by adding a random effect for the cluster into a regression equation to allow for two-stage sampling, did not work very well (Skinner 1989) and could lead to significantly underestimated standard errors.

Chris suffered from cancer in the mid-1980s, but continued to work very hard despite the obvious difficulties posed by chemotherapy. Indeed, other than sporting a particularly natty cap, he continued more or less as normal. At this stage he invested a lot of time in the seminal book on the analysis of complex survey data that flowed from the SSRC-funded project with Tim Holt and Fred Smith. Their vision, completely achieved, was of an edited book (Skinner, Holt & Smith 1989) with standard notation which could be used as a graduate text and which brought together state of the art results in what was a relatively new area of statistics at that time. The book quickly became (and remains) a standard. Chris was understandably somewhat miffed when the book was withdrawn from publication after the 2003 publication of his second edited book on the analysis of survey data (this time with Ray Chambers), which was more focused on developments in the field post-1989 and was not intended to serve as a replacement but as a Festschrift for Fred Smith who retired from Southampton in 1999 (Chambers & Skinner 2003).

Chris also wanted his career to develop in the way that it had started, by focusing on statistical issues motivated by real-world problems. One example was a problem in market research where the aim was to design a sample of farms. There are typically many reasons for undertaking a survey, and a survey statistician embarking on the design of a survey will often be faced with a number of potential stratifying variables related to these different reasons, suggesting some kind of multivariate stratification. And while, at the time, a variety of methods existed to draw such samples it was common to use standard estimation procedures which didn't take into account the multivariate nature of the strata.

Chris, together with his colleagues Dave Holmes and Tim Holt, proposed an incredibly innovative alternative method by which independent samples were drawn on each of the stratifying variables and then the data from the various subsamples combined in the estimation process using what they called 'multiple frame' techniques. They were able to show that this strategy, with important implications for business surveys, was far more efficient than standard approaches (Skinner, Holmes & Holt 1994). This is also a fine example of how, in statistics, what might start as a seemingly straightforward consulting problem can also lead to new theory (also demonstrated in Skinner 1991 and Skinner & Rao 1996).

The link between theory and practice became closer during the 1990s. In the early part of the decade the UK's national statistics agency, the Central Statistical Office (CSO), was headed by an Australian, Bill McLennan. McLennan believed that the quality of business surveys needed to be improved—there had been a number of estimation problems during the late 1980s—and he decided that a link with a strong university group would be a good way forward. Following some consultancy work, there was a big expansion of the CSO's methodology unit, which included letting a contract for methodological support. Chris led the successful Southampton tender for providing this support, and it was his guidance that subsequently ensured its enormous success over the next two decades, with many of the senior academics in Social Statistics at Southampton over this this period getting involved, as well as their students and their visitors.

The Southampton team, with Chris firmly in the lead, helped transform survey methodology in UK official statistics. An important example was the estimation of the distribution of employees' hourly pay. The introduction of a national minimum wage in 1999, expressed in terms of hourly pay, meant that it was really important to have good estimates in the tail of the distribution. The Labour Force Survey was used at that time, and the estimates were obtained by asking questions about hours and pay separately—this procedure was subject to measurement error bias for many reasons. Therefore, a new direct hourly pay question was asked—but was not available for the whole of the sample—again because of potential measurement error. The challenge

was to reduce measurement error by using the new data without impacting negatively on selection bias due to the partially observed nature of the variable. Again this work led to an important paper in survey methodology and, of course, the national minimum wage has become a very important policy tool for governments aiming to reduce poverty (Skinner, Stuttard, Beissel-Durrant & Jenkins 2002).

But it was more than the link with the CSO per se that led to the growth of Southampton's reputation in social statistics or—as one article in an American journal coined it—the best effort of its kind in the world. Rather, the atmosphere built by Chris, Tim Holt, Fred Smith and later Ray Chambers, who came to Southampton in 1995 from the Australian National University, was vibrant, exciting and most of all collegiate. Doctoral students came from all around the world, often from national statistics offices, attracted by the opportunity to work on challenging statistical problems, but those grounded in applications that would impact on citizens' lives. And when they arrived, they did not find, say, formal fortnightly meetings but rather a culture of open doors, conversations over coffee and seminars featuring the leading scholars in social statistics from across the world.

Among many others, Pedro Silva (who would later become President of the International Statistical Institute) worked on the use of auxiliary information in survey estimation and analysis. Fernando Moura worked (with Tim Holt) on small area estimation; Gabriele Beissel-Durrant on the joint challenges of missing data and measurement error; Keith Humphreys on measurement error; and Jouni Kuha on categorical data analysis and misclassification. All went on to further their careers in academia or official statistics.

In addition, during the mid-1990s, Chris led a major Southampton-wide Economic and Social Research Council (ESRC) grant on the Analysis of Large and Complex Datasets. This broadened the Southampton contribution and, as it was part of a national programme, improved the networks of social statisticians across the UK; and resulted, for example, in a collaboration with Harvey Goldstein's team, which was working on multilevel modelling at the Institute of Education (IoE).[1]

Chris's early work on multivariate analysis for survey data obtained via two-stage sampling had implications for this emerging field of multilevel models, and the collaboration with IoE led to proposals for a novel way of weighting the estimation of a two-level multilevel model when survey data are derived from a multistage design using unequal selection probabilities. The proposal—using the reciprocal of the selection probabilities at each stage of sampling—was innovative and led to a landmark paper with Danny Pfeffermann and colleagues in 1998 (Pfeffermann, Skinner, Holmes,

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[1] For Harvey Goldstein, see John Gray, Ian Diamond & Fiona Steele, 'Harvey Goldstein, 1939–2020', *Biographical Memoirs of Fellows of the British Academy*, XIX (2020), 357–76.

Goldstein & Rasbash 1998). It also formed the starting point for a series of papers over the next decade.

Throughout his career the challenge of analysing complex survey data was a constant thread in Chris's research. He looked at the problem in a number of ways: for example where there is correlated nonresponse within clusters, he and Julia D'Arrigo proposed a weighted estimator based on conditional logistic regression which overcame the problem that the standard methods of using inverse probability weighting fell apart with small sample sizes and nonignorable non-response (Skinner & D'Arrigo 2011); and in another he reassessed the standard Clogg-Eliason approach to fitting log-linear models in survey data with complex designs (Skinner & Vallet 2010). His work in this area was perhaps summarised well in two later papers. In a major review paper for a special edition of the *International Statistical Review* in honour of his long-time friend and collaborator Jon Rao in 2018, he takes the reader through a history of the analysis of categorical data from surveys with complex designs, pointing out very gently that if you fail to take into account the design your inference will suffer (Skinner 2019); and in the introduction to a special edition of *Statistical Science* that he edited with Jon Wakefield he brings together the arguments for and against the model-based and design-based approaches to sample survey inference, as well as describing model-assisted approaches to survey design and analysis and in particular to variance estimation (Skinner & Wakefield 2017).

This is perhaps as good a place as any to ask where Chris would have stood on the spectrum of survey sampling statisticians taking a model- or design-based approach— a major debate in the 1980s. Chris started his career in the model-based school of Tim Holt and Fred Smith; and even after Fred's damascene conversion to design-based models in the early 1990s, Ray Chambers brought his steely view of model-based designs (particularly for business surveys where decent auxiliary data exist) to Southampton. Many of Chris's contributions were to offer the reader some sobering advice on the dangers of not taking into account the design in the analysis or indeed of using some of the standard adjustment methods. Over time, though, he could certainly see the advantages of taking a design-based approach when estimating variances. One could argue that Chris, in a truly brilliant way, brought clarity to the sometimes overheated debate of model-based versus design-based by enabling the advantages of both sides to be prosecuted while providing caution of the dangers of radical adherence to either side. Some final views on this debate and the ways in which the two paradigms have become progressively more integrated are found in an interview Chris gave for the *International Statistical Review* in 2019 (Haziza & Smith 2019).

Survey design and analysis is perhaps the major area where Chris was a global superstar; but it was not the only area where he was seen as a world leader. He also made important contributions to methodology for release of anonymised census

information and to assessment of disclosure risk, where problem-based challenges led him to make fundamental contributions.

Censuses had been undertaken across many countries since the late 1700s. Results were produced as counts and the census office would typically produce a book of cross tabulations of major variables. These cross tabulations would normally have some adjustment method to maintain the privacy of the respondent. This would be particularly important for people with a rare set of characteristics, for example a Spanish-speaking doctor on a remote Scottish island. However, by the 1980s there was an increasing call for individual-level census data to be made available for analysis—what became known as a public use sample. A group of leading social scientists led by Cathie Marsh formed a working group to agitate for the Office of Population Censuses and Surveys (OPCS) to produce an anonymised sample of census records.

The OPCS was being, most serious commentators would suggest, unduly conservative in their response, answering no to all arguments and often citing the potential for disclosure without really arguing why. Denise Lievesley, a member of the working group, approached Chris to see whether he would think about a statistical model for disclosure control. And of course he did, producing world-leading work (Skinner, Marsh, Openshaw & Wymer 1994) on the theory of disclosure as well as enabling the social science community to make a very strong case. But even after this strong case was made, the innate conservatism of OPCS meant that the sample was produced with so many controls that it missed the necessary granularity for the kind of inferences that would have really impacted on society. And so, with Angela Dale and Cathie Marsh, Chris argued strongly for safe settings where detailed analysis could take place (Marsh, Dale & Skinner 1994). This body of work was successful in allowing analysts to access census data, although the policy of safe settings must have impacted on inclusivity of access.

The work with Cathie Marsh and the working group opened Chris's eyes to a very interesting statistical problem and one that would only become more important and mainstream as improvements in computing power, the political push for open data, and the increasing availability of administrative data (often linked) made questions of privacy critical for data controllers.

For the rest of his life, Chris was at the forefront of work on disclosure control, producing a series of influential papers. He was one of the founding editors of the *Journal of Privacy and Confidentiality*, and advised the Office for National Statistics (ONS) on disclosure control in both the 2001 and 2011 censuses. Chris's contribution was marked not only by brilliant theory but also by outstanding practicality. His later work with Natalie Shlomo is a model of this (Skinner & Shlomo 2008).

In 2012 he argued that the role of statistical science in this area was to assess disclosure risk. Put simply, there will always be risk and it will always be theoretically

possible to break privacy controls. Statistical science can help to quantify that risk. It is then for the data controller to assess those risks (Skinner 2012). And for many controllers any risk can be too much—which is why there is a need for sensible ethics and approvals committees. The trade-off between usability and privacy is a critical one. In recent years a number of statistical agencies have produced software to enable users to generate their own tables, but sometimes the privacy controls render the data largely useless. In a very accessible paper Chris addressed this by looking at the table generator of the Australian Bureau of Statistics (Rinott, O'Keefe, Shlomo & Skinner 2018). with the article being a wonderful description of the choices between confidentiality protection and the usability of the data set. Chris was also a primary instigator for the 2016 programme on Data Anonymization and Linkage at the Isaac Newton Institute for Mathematical Sciences at the University of Cambridge.

Chris did not have any experience in the practical delivery of national censuses, but this body of work on disclosure control plus his eminence made him the ideal person for the ONS to ask to lead a major review of the 2021 census. As austerity hit with the advent of the 2010 coalition government, there was an awareness that the increasing availability of administrative data and computing power potentially presented an opportunity to save money by getting rid of the 2021 census and instead use administrative data sources, perhaps augmented with large-scale rolling surveys, to create the required census outputs. Together with local authority expert John Hollis and demographer Mike Murphy, Chris undertook a major review where they were asked to distinguish the relative merits of an online census conducted largely in the traditional manner and an administrative data census augmented by a 4 per cent rolling survey.

The review concluded that, in the absence of a population register such as that available in many, particularly Nordic, countries, the online option was relatively low risk, and Chris's team believed this would be the natural evolution of census taking in the UK. They also recommended implicitly that a programme of work should be undertaken to consider the post-2021 future. This led to parallel work on administrative data being conducted alongside the 2021 census, which will lead to decisions in 2023 on the future of the census. The review also made some radical suggestions on making census data available for analysis in safe settings, linking into Chris's previous work on this topic.

A final strand of Chris's research that it is important to note is that on measurement error. An ESRC grant with Tim Holt on measurement error in the analysis of panel data led to a programme of work that lasted throughout Chris's career. An early piece of work was that on event history analysis—a topic becoming increasingly important in the late 1980s (Holt, McDonald & Skinner 1991). Subsequently he went on to author a number of top-class articles which got to the heart of some important

problems, particularly those where the effect of measurement error could be severe: for example, in the case of estimating low pay described earlier, the impact of measurement error can be to drive the estimates upwards. Fundamentally, adjustment for measurement error is in the same class of challenges as adjustment for non-response. Progress really depends on having some decent auxiliary data to work with; and Chris, together with co-workers such as Gabriele Beissel-Durrant and Keith Humphreys offered some practical solutions when a subsample with accurate ancillary data was available (an example of this work includes Pfeffermann, Skinner & Humphreys 2002).

In Chris's later work, as part of an ESRC Professorial Fellowship, he expanded the use of auxiliary information to include paradata—data at the unit level related to the collection process which might say something about the quality of the survey data. Data such as these have received attention in nonresponse correction, but it was Chris who really started to think about how they might be used in correcting measurement error. In work with Damião da Silva he looked at the measurement of pay. Here the paradata was whether the respondent referred to pay records in giving their response. They proposed two approaches which also control for the complex survey design and demonstrate that they can reduce bias and improve accuracy (Da Silva, Skinner & Kim 2016).

Chris returned to the Department of Statistics at LSE in 2011. As soon as he arrived, he was keen to discuss new ideas and form collaborations with his new colleagues, reinvigorating the department's social statistics group in the process. A particularly fertile area of collaboration combined Chris's interests in adjustment for nonresponse and measurement error and the analysis of complex survey data, with the LSE group's long-standing interests in latent variable modelling. For example, his professorial fellowship research on the use of indicators of data quality collected at the level of the individual in surveys led to work on the effects of probing 'Don't know' answers on measurement quality and nonresponse in surveys (Kuha, Butt, Katsikatsou & Skinner 2018). This work, carried out as part of an ESRC National Centre for Research Methods project led by Jouni Kuha, found that for attitudinal questions the reduction in nonresponse from probing came at the cost of data quality. In another project, with Irini Moustaki, he considered goodness-of-fit testing for latent variable models estimated for complex surveys. Most recently, he was part of a team (with Jouni, Irini and Fiona Steele and colleagues from the Department of Social Policy) working on an ESRC project concerned with the analysis of longitudinal dyadic data from pairs of members of family networks. Chris led a strand of this project on data quality and measurement issues. In one of his last papers, he constructed separate estimators of common dyadic characteristics using data from both a parent and a child perspective, taking account of complex design features, and

showed how comparisons of these estimators can shed light on data quality issues including differential missingness and reporting error (Skinner & Steele 2020).

Thus far this memoir has focused on Chris's research, but his contribution to statistics and, indeed, the broad panoply of social science was much greater, for he made an enormous contribution to training future generations of social researchers. This was not just through outstanding teaching at Southampton, and later the LSE to which he returned in 2011 (although there was plenty of that), but rather through his vision in developing and leading a number of major initiatives and centres which continue to flourish.

In the late 1980s the ESRC had observed that PhD completion rates were, most would say, scandalously low. As part of a suite of policies to address this, the ESRC insisted that all social science PhD students should spend 20 per cent of their first year undertaking a multidisciplinary course in the methodologies of social science. At Southampton, Chris worked alongside the sociologist Graham Allan to put together a programme that worked excellently. Notwithstanding the challenges of engaging game theory economists with ethnography, or of political theorists with multiple regression, this course was a success, led to a widely used handbook (Allan & Skinner 1991) and contributed to Southampton gaining enviable success rates.

In the early 1990s the sociologist Martin Bulmer joined Southampton, and he and Chris quickly moved to work with the National Centre for Social Research on a proposal to improve the quality of social survey methodology. The idea was to form a programme that involved teaching and a practicum. The ESRC was keen on a programme of short courses but did not fund the latter, and so the Centre for Applied Social Surveys was born. Roger Thomas initially directed it, with Chris taking over subsequently. The Centre constituted short courses in many aspects of survey design and analysis, held right across the UK. It was very popular and convinced Chris, who led the Centre in the late 1990s, of the merits of short courses.

Around this time came the opportunity to partner with the CSO (which together with the OPCS later became the current ONS). As noted above, this partnership led to the transformation of business and social surveys in the ONS. As the partnership developed, it became clear that sustainability would not come from the Southampton team designing every survey, but from the transfer of knowledge to the ONS staff. And so what was, at that time, an incredibly innovative programme, the MSc in Official Statistics, was born. The idea was that students, very largely staff from ONS, would take short courses as part of their continuing professional development. These courses were standalone but could be built into a portfolio which led to an MSc. Again, it was extremely successful and, together with the Centre for Applied Social Surveys, led to Southampton becoming a major hub for short courses in the late 1990s and early 2000s, all with Chris firmly at its head.

The phrase 'building a department' is often used of academics, but in Chris's case this was literally true. At the turn of the twenty-first century the UK government had become persuaded of the need to invest in academic infrastructure and, together with the Wellcome Trust, had a large programme to invest largely in the natural sciences. Chris was able to persuade the government that a building for a Statistical Sciences Research Institute would be a good investment and so a wonderful building evolved. Chris ended up spending much time with architects as well as persuading a Deputy Vice Chancellor of the important merits of a balcony.

In the first couple of years of the current century the ESRC became aware of two issues: first, there were, at best, tiny numbers of social statistics PhD students (and the very great majority were at Southampton); and second, that there had been, outside one or two islands of excellence such as Southampton, Lancaster and the Institute of Education, little development of social science methodology. As European social science agencies also recognised the first of these problems, a proposal was put to the European Union for a programme to improve quantitative methods in social science across Europe. It was a successful programme—largely because Chris led it in his usual effective way.

To address the second issue, ESRC first put together a research methods programme, but soon realised that the problem was simply too big for one programme to solve. The solution was the National Centre for Research Methods, a major centre run on a hub and node model; and one that would cover the full range of the social sciences. The body of work described above meant that a Southampton bid led by Chris was always going to be competitive, and so it proved. It was successful beyond the level any reasonable person could have expected. Most importantly, as well as undertaking top-class methodological research across the nodes, it engaged the social scientific community in an exciting way. Together with the sociologist Graham Crow, Chris was responsible, for example, for developing the biennial social science Research Methods Festival which had been instigated by Angela Dale under the original methods programme. Few might have expected that, on the same weekend as the Glastonbury Festival, over a thousand social scientists would spend three days discussing methodology—but they did and had a great time doing so!

Most of Chris's career (1978 to 2011) was spent at Southampton, and it was there that he became internationally recognised as one of the very best social and survey statisticians in the world. He became a Professor of Statistics at Southampton in 1994, and then head of Social Statistics in 1996. Chris remained at Southampton until 2011, when he was awarded an ESRC Professorial Fellowship. He then moved back to London to be Professor of Statistics at LSE, and after the completion of his Fellowship, served as head of the Department of Statistics at LSE from 2013 to 2016. Under his leadership the department expanded significantly, with the creation of a new data science group and the appointment of the department's first chair in data science.

As has been discussed above, a key feature of Chris's approach to research was that it based itself in applications to real statistical problems. He was an outstanding consultant, very patient in explaining challenging statistical concepts so that they could be understood. He had a large international network of colleagues, many of whom he collaborated with in his research, and was highly sought after by international statistical agencies across the world for advice on methodology. For example, he was appointed to the Statistics Canada Advisory Committee on Statistical Methods in 2000. This Committee served as a model for other national statistics institutes, in that Statistics Canada really listened to the advice and used it to inform their methodology. Chris served on this committee for eleven years. An additional offshoot of committees such as this was the advances in survey methodology that must have resulted from the out-of-meeting discussion between a group involving Chris, Jon Rao, Wayne Fuller, Bob Groves and others. Chris also served on the equivalent committee set up by ONS, one which also involved economists.

Chris was also an extremely kind and unassuming person who actively encouraged people to visit Southampton, and later LSE, often going out of his way to facilitate their visit—to the extent of lending cutlery and bringing beds around. He was also a generous and conscientious mentor and friend to his many PhD students, and was instrumental in launching many of their academic careers. Chris garnered many awards in his life, too many to list here. These included the 2009 West Medal from the Royal Statistical Society. This was awarded for the cumulative weight of his contributions to official statistics. In 2010 he was awarded a CBE for Services to Social Science, and in 2019 the Waksberg Award for contributions to survey methodology. He served on many editorial boards, including as Editor of *Series C* of the *Journal of the Royal Statistical Society* (RSS) 2007–10, served on the RSS Council 2005–9 and was Chair of the Social Statistics section in the late 1990s. All told, he contributed almost twenty years of continuous service to the RSS.

In every respect Chris was an incredibly respected statistician and a joy as a colleague. Any discussion with him would always result in deep insights clearly and quietly expressed after proper consideration and listening patiently. His sense of humour was always there, usually in the background, but always gentle when expressed. He may have seemed reserved sometimes, but anyone who was privileged to hear his introduction to the first Cathie Marsh Memorial Lecture at the RSS in 1998 would have seen someone whose rhetoric was passionate, informed and powerful. Given Chris's international standing, it would not have been surprising that some of this fame should have rubbed off on his ego. But ego would be the last word one would use to describe the way Chris interacted with others, either privately or in public. There are many photos taken at international conferences over the years where Chris was a star attraction and where, for one reason or another, a group photo of the great and

the good at the conference was deemed necessary. In almost all of these photos one would be hard pressed to immediately see Chris in the foreground of the photo, with much scanning of background faces necessary to pick him out. Chris was never one to call attention to himself—he let his research do the talking.

Chris visited his collaborators when possible. Together with his partner Sandra, Chris enjoyed a well-earned sabbatical in the Antipodes in 2017. Most of his time was spent at the University of Wollongong, discussing issues arising from informative sampling with old colleagues and friends there, and with both him and Sandra enduring the heat of an Australian summer. Their visit to New Zealand after that was blessed relief!

Finally, Chris was someone for whom a commitment was something to be taken seriously. Thus, when told in 2019 that he had won the Waksberg Award, and this meant that he was invited to travel to Canada to accept it and to present the award lecture, Chris initially refused since he was not sure that this would be possible given the state of his health at the time. In the end the award organisers were able to persuade him to prepare a lecture to be presented on his behalf. Unfortunately, Chris's deteriorating health made it impossible for him to finish the lecture, so the organisers decided to make the 2021 Waksberg Award an invited paper event, a fitting memorial for a great statistician and a kind and caring person.

Chris died on 21 February 2020 aged 66. He is survived by his wife Sandra, his two sons, Sam and Tom, his granddaughter Zoe, his mother Daphne, and his younger brother Julian.

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