

# Rejoinder to Chris Wild and Iddo Gal's Comments by Neville Davies

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Two of the big ideas in statistics are associated with the trustworthy use of populations and samples. These groups of data and their inter-relationships are often difficult for learners in school to grasp. Chris Wild refers to data handling software that utilise innovative technological advances for simultaneously displaying data from several variables, which, in turn allows users to get information from population and sample data. The 2005 New Zealand Data Viewer and the software tools of Rosling and Ridgway-Nicholson enable displays of population data to be made in very colourful and appealing ways, whereas the web-based database interrogation tool referred to in the paper and the new and freely available PC-based *iNZight* data analysis system work with samples of data.

I believe that we should, subject to confidentiality issues, return to the public all the data collected about them: this applies to the data collected for and about school-aged learners in the *AtSchool* projects and data collected by National Statistics Offices (NSOs) for and on behalf of governments and the public. So Wild's comments lead to the question: should samples of the data or the whole population of data collected be returned – or both?

From the points of view of *teaching* data handling and statistics to school aged learners it rather depends on what we want them to learn. On the one hand it may be useful for them to be able to explore the relationships between complex multivariate populations – the Ridgway-Nicholson software is excellent for doing this. From another point of view, looking at populations and samples taken from them, such as is possible from using the software described in Wild et al. [17], it may be a plausible teaching objective to connect the two convincingly. However, when we are only interested in teaching inference about samples, it may be confusing to school aged learners to mix these up with population data.

For schools, the challenge for NSOs in returning data to education is not to overload schoolteachers and learners; rather they should ensure the data are motivating and appealing for teaching and learning. One project that did this was the *stats4schools* project financed by the UK Office for National Statistics in 2004. This comprised 15 lesson plans and was originally stored at [www.stats4schools.gov.uk](http://www.stats4schools.gov.uk). It was very popular with teachers, but cutbacks meant it was shut down late in 2010. Fortunately it can now be found at the RSSCSE web site [www.rsscse.org.uk/stats4school/](http://www.rsscse.org.uk/stats4school/).

Iddo Gal's critique of the success, or otherwise, of *CensusAtSchool* is excellent and 'hits the nail on the head'. An activity that is enjoyable and nice to take part in does not necessarily lead to better statistical literacy: I agree with this. Gal also stresses the need to engage with a range of data production scenarios other than the survey-type one used by *CensusAtSchool*. Indeed, I recognise that in the paper by promoting pupils getting involved with data produced by designed experimental regimes.

Gal also addresses the sample-population dilemma which, as I have argued, is not an easy one to resolve in restricted school time and curriculum specifications common in many countries. In any case employing easy-to-use software is essential.

I agree with Gal that achieving statistical literacy is a multi-step process that will involve, over an extended period, appreciating the very broad range of contexts in which statistics is useful. It may be that achieving statistical literacy has to be regarded for some as a life-long learning activity. I, for one, am still learning after a very long time getting my hands dirty with real data!

One of the purposes of my paper was to suggest that the *AtSchool* projects are useful ways to contribute to enriching students' learning and teachers' teaching experiences, which may, in turn, help to improve their

statistical literacy. It is true that, as far as I am aware, there have been no formal evaluations of the impact on statistical literacy. However, one could argue that there is some indirect evidence for *CensusAtSchool* helping to improve *at least* the learning of statistics. This is provided by the fact that the project applies some evidence-based principles already established by other authors to be effective for learning the subject [8,9]. In fact in Table 5 I address the issue by proposing improved ways of implementing the project in the future, especially with regard to the proposed new collaborative teaching and learning environment. Some limited evidence about *CensusAtSchool* helping to develop statistical thinking is provided in [4].

Finally as hinted by Gal, a research project to evaluate the *CensusAtSchool* project in all the countries that have used it is long overdue and would be very useful. If, for example, a number of NSOs were willing to share the cost of an international approach to do this, the cost to each NSO would be relatively small. Gal also suggests NSOs get involved – for example, the research project could, in addition, look at optimal ways to get NSOs to engage with statistical education in schools (and perhaps universities and the workplace) to help make everyone more statistically literate. The RSSCSE would be more than willing to help run such a project.