Managing the Effect of a Disaster on Official Statistics

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Abstract.

The recent series of earthquakes in Canterbury, New Zealand has been a major test of Statistics New Zealand's ability to produce timely and good quality official statistics. The earthquake affected respondents and Statistics NZ staff in Christchurch as well as the challenge of monitoring and adapting to a rapidly changing social and economic environment in Canterbury. Maintaining the output of statistics was a challenge that provides insights into what is important in producing statistical outputs to a suitable quality standard. Some of these insights will be of interest to those producing and using survey outputs that may be affected by natural and human disasters.

Keywords: Natural disasters, statistical quality, official statistics

1. Introduction.

In September 2010, February 2011 and June 2011, Christchurch New Zealand was hit by three significant earthquakes (magnitude 7.1, 6.3 and 6.3, respectively), and approximately 13,000 aftershocks. While smaller in magnitude than the September 2010 quake, the February aftershock was particularly devastating because it was centred very close to Christchurch city and occurred just after midday on a Tuesday. Following the initial realisation that it was a major earthquake it then took time for the full extent of the loss to be understood: a total of 185 lives were lost, the central city was heavily damaged and 7,000 homes in Christchurch suburbs require demolition. Fortunately, no Statistics New Zealand (Statistics NZ) staff were injured.

The Statistics NZ Christchurch office is its second largest office, and at the time of the quakes comprised about 220 staff from a total of 1100 staff. The Christchurch office is where most business collections, population statistics, and half the census team are located. In addition, there are the usual support functions. A consequence of these collections is that the Christchurch office 'releases' over 100 outputs per annum, and provide many of the key inputs into the System of National Accounts.

This paper first discusses how, following the earthquakes we managed our staff, then our outputs. Then the paper looks at how Statistics NZ created quality outputs for our Retail Trade Survey and Household Labour Force Survey, under extremely trying circumstances. Finally, we examine the timeline surrounding the decision to halt the 2011 Census.

2. Management of our Staff.

Immediately following each quake the well-being of our staff was management's prime concern – starting with contacting the individual staff members asking about their circumstances and passing on any information, reassurances etc. At times this interaction was challenged by the staff's management being located in Wellington, or some Christchurch managers themselves being significantly affected; along with the added problems of telecommunication, water and power outages. Staff themselves were affected in a

variety of way ranging from homeless to minimal damage, and with many staff living in homes that require substantial repairs or lacked amenities and even those with minimal damage may be providing accommodation to friends, family etc. for extended periods of time.

Up until the February 2011 quake, Statistics NZ had largely kept its production function going uninterrupted. The February quake forced us to move to limited temporary office space with staff utilising 'hot desks', with some staff not being able to return to work for 2 months. To bring more staff back to work, through some determination, the organisation's computing division were able to establish a remote computing environment, enabling the staff to work from home. This meant that when the June 2011 quake left us with even fewer building options everyone was set up with remote facilities, and it was more of a psychological setback of having another quake and losing another building. The June quake didn't really interrupt the work.

As many staff where at home in less than ideal circumstances, the key was communication – within the team, exchange of ideas and to provide information / support. To facilitate increased team work innovative solutions were thought of. To assist staff well-being, psychological counselling was provided. It is worth noting that there are on-going stresses on staff e.g. as repairs get underway and that Statistics NZ will look to provide support to staff for years to come.

Given the difficulties of travelling and staying in Christchurch during this period, the management of the Christchurch based staff and office fell largely to the Christchurch based management team.

3. Management of Statistical Outputs.

Following the February 2011 earthquake it was evident that the quality and economic and social patterns of Statistics NZ's outputs would be affected – the challenge lay in identifying which ones and to what degree. As context, the Christchurch and Canterbury region accounts for about 10% of New Zealand's population and economic activity. As an organisation we all agreed that we needed to try and keep up the release of information as if there was a time the country needed good information it was at a time of crisis. The key enabling decision was taken by Statistics NZ's Government Statistician that the release of any output, including important ones such as QGDP, could be delayed if there were unresolved issues relating to their data quality due to the earthquakes.

To assist decision making, the organisation determined a prioritised list of outputs, in the following order:

a. Cardinal outputs - QGDP, BoP, CPI, Population Estimates, and Household Labour Force Survey.
b. Collections that feed into the above; for example Overseas Trade.
c. Finally, the remaining collections.

In addition, as we were well underway with our modernisation programme Statistics 2020 – Te Kâpehu Whetû (Stats 2020) we needed to consider these projects as part of the prioritisation.

Having established a prioritisation matrix, we set about determining the impact of the earthquakes upon each release – both in terms of our ability to process the collection (staff & system availability) and measurement of the effects.

Staff and system availability was an immediate concern, but with some innovative solutions the organisation was able to navigate through this challenge successfully. Some examples included:

a. Moving key staff from Christchurch to our Wellington or Auckland office's temporarily.
b. Identifying staff in Wellington or Auckland who could run the systems as needed.
c. Set-up temporary work-spaces in the homes of unaffected Christchurch staff.
d. Focus on the high-level aggregates.

The prioritisation matrix meant that we were all clear about the relative priorities of one's work as opposed to the work of the others. The key managers meet on a daily basis to ensure the correct effort was going into our key outputs.

Immediately following each major earthquake it was decided to halt data collection from the Christchurch city area and surrounding region, until staff and support could return. The halting of data collection left some serious gaps in the data, especially as the country wanted to know what was happening and the long-term effect. Over a number of months, data collection was resumed area by area (this in its self is a challenge).

Given the situation in our Christchurch office, gaps in data (through non-collection) and the desire for information, Statistics NZ's methodology area (Statistical Methods) took the lead in ensuring consistency of approach and methodologies through the outputs. As a result the following actions were undertaken:

a. Significant focus on collaboration between Statistical Methods and the major business and social subject matter area experts - recognising that good communication and planning are vital to the continued delivery of high quality statistics.
b. All high priority output areas completed an analysis of the impact of the earthquake on their outputs, broken down by each stage of the Generic Statistical Business Process Model (GSBPM). This was then used to determine the order of remedial methodological work, commonality of issues, interdependencies and gaps.
c. Regular reporting of issues and mitigations to the Statistics NZ Senior Management team.

The final outcome was that with a few minor exceptions, the organisation released all it releases on time, and continued to meet Statistics NZ's quality standards.

4. Statistical Quality – What is Important?

This section examines statistical quality for two collections, the Retail Trade Survey (RTS) and the Household Labour Force Survey (HLFS). In both cases we demonstrate how fit-for-purpose output can be released even under extreme hardship.

With the support of the Government Statistician's statement relating to the need to preserve suitable output quality, Statistics NZ staff could then focus on adapting and enhancing the existing quality measures in light of immediate and possible future effects of the earthquake on responses. Multilateral communication meant that each area was kept informed on what quality checks and measures were being done and their results. We also knew that there would be considerable interest in the economic measures for Canterbury for the March 2011 and subsequent quarters so we considered methods to improve the quality and detail of outputs. While much of the work was accelerating existing programmes it was not necessarily a simple exercise even with the prior planning.

<u>Retail Trade Survey.</u>

The RTS is run from our Christchurch office and is a key indicator of household economic activity. The first task was to ensure we got responses from RTS units in Christchurch. Many retail addresses did not exist and phone numbers did not connect. We were aware that many retailers had relocated to temporary premises or had retained on-line presence so we could not assume an initially uncontactable unit no longer existed. The process to track down businesses had to be flexible as businesses could be inactive for varying times after the earthquake and it was not unknown for them to have several temporary premises over time. Even businesses that no longer existed after the earthquake had March 2011 economic activity to the date of the February 2011 (22 February) we had to measure.

Christchurch was divided into 3 zones as there were expected differences in methods of getting responses, the quality of the responses, and the value of responses before and after the earthquake.

- *East* - severely damaged but accessible. May have relocated, or still trading at address. Economic activity generally initially decreased.
- *Central Business District CBD* - severely damaged and inaccessible. Not trading at address. Financial accounts may not be available. Economic activity generally initially decreased.
- *West* - relatively undamaged. Economic activity possibly initially increased.

A significant part of the methodological work involved scenario modelling of various possible data outcomes. Given the many unknowns as to how business activity would evolve after the earthquake changes to methods and processes would only be made if evidence could be found to justify them. For example, we looked at imputing values for a typical March quarter, assuming no retail activity from February 22, then imputing the proportion of missing activity. We also investigated imputations using different subpopulations (e.g. the zones above), a trade-off in smaller samples but possibly more homogeneous respondents. In most cases the differences between outputs from the various possibilities led to results that had no significant differences.

Another issue was retail stock change due to stock being written off as earthquake damage is treated differently to stock change due to sales and purchases within National Accounts. To measure this difference we quickly developed a small survey for Christchurch retailers. We found for those businesses in the CBD had the problem that until they got access they had little idea what stock was salvageable so some estimation method needed to be developed.

Running RTS from Christchurch made the internal processes complicated, though bringing forward the planned facility for staff to work from home made this less of a problem than it could have been. However having Statistics NZ survey staff in Christchurch had the advantage that respondents dealt with staff with first-hand knowledge of their problems. Also staff having first-hand information on the various effects of the earthquakes on businesses in their areas was helpful for defining the various scenario models.

<u>The Impact of the Christchurch Earthquake on the Household Labour Force Survey.</u>

Another, area of interest was the impact the February 2011 earthquake had on the labour market, as primarily measured by the person based Household Labour Force Survey (HLFS) but also supported through other measures such as the business based Quarterly Employment Survey (QES) and tax record based Linked Employer Employee Database (LEED) data.

The issues relating to the HLFS, were not generally related to Statistics NZ's facilities (as the HLFS is processed in Wellington), but rather data collection issues. Such issues stemmed from: people temporarily leaving Christchurch (and popping up elsewhere in the country), people who had jobs but weren't working, people who didn't know if they still had jobs, people whose homes were difficult to access and who may or may not be more difficult to gain cooperation from.

In analysing the effect of the February earthquake on the HLFS the key issue was that the HLFS is designed to produce national estimates, with no regional population benchmarks. Also, due to reasons of both practicality and conceptually it was decided early on to not continue with the collection of data in both the Christchurch and Canterbury regions, resulting in sample loss to the extent that the usual non-response adjustment mechanisms were potentially inappropriate. As with the RTS, HLFS data had already been collected from January 1 to Feb 22 so there was half a quarter of "normal" data for Canterbury.

In working through the options we found that the final approach did not appear to have any significant bias at the national level, nor at the sub-national level for those areas outside Canterbury. However, there was almost certainly some bias in the Canterbury estimates for the quarter. Firstly, because we did not adequately capture the effects of the earthquake with our collected data - for example, we don't know if the population in non-private dwellings has swelled considerably or not since the HLFS is not designed to capture that. Secondly, as the HLFS is a panel survey with an 8 quarter rotation policy, when removing some of the sample previously used in already published results this would result in some bias when compared with originally published estimates. In addition, conceptually, the HLFS estimates will be similar to those that would have been produced had there been no earthquake, demonstrated biases aside. We published statements at release time to alert users of these issues. Also, to aid analysts, a variant of a number of the national estimates was made available which excluded Canterbury for a variety of reasons.

Overall, we are happy with the HLFS estimates, subject to caveats provided. Supporting documents have been made available to aid interpretation of the results.

5. Census 2011 – Decision Making.

As the February 2011 quake occurred fifteen days before the 2011 census day it meant that major decisions about the 2011 Census had to be made quickly. These included decisions about immediate census operations (based in Christchurch) and a bigger decision about whether the census could or should continue. The timing of the quake meant that 25% of all census forms had already been delivered to New Zealand households.

Immediately following the quake decisions were taken to initially halt delivery of census forms to Christchurch and surrounding areas, but the day following nationwide delivery of forms and census advertising were put on hold. However, just in case the decision was made to resume the census, operations needed to be kept 'ticking over'.

It was increasingly clear this was a major disaster, confirmed by the Prime Minister's announcement on Wednesday 23 February that New Zealand was in a national state of emergency. The whole country was now focused on the Christchurch disaster and what the media were reporting. Statistics NZ started receiving feedback from members of the public via the census field operation that this was not a time to be conducting a census.

On Thursday 24 February, less than 48 hours after the earthquake, the census management team recommended to the senior management of Statistics NZ that the 2011 Census be cancelled. The census management team had concluded that the census could not be successfully completed, given the probable negative impact of the disaster on census results. The management team had considered a paper that systematically assessed options against the criteria of public acceptance and census reputation risk, operational feasibility, data quality and cost. Importantly the management team had also sought the advice of two key people outside the organisation: a previous census manager and a former New Zealand Government Statistician. These individuals were able to offer the census management team a viewpoint that rose above the technical focus and strong commitment of the census team to find ways to make things work.

The Government Statistician and the Minister of Statistics announced the census cancellation early on Friday 25 February. The announcement was well received, with almost every commentator saying it was the right decision in the circumstances. The next chapter then started – when to run the next census (which incidentally was run on March 5 2013).

6. Conclusion.

The situation that Statistics NZ, its staff and the people of Christchurch faced following the tens of thousands of aftershocks with several hundred being felt city-wide has been challenging (as an understatement). We hope that this paper has given you a sense of how Statistics NZ as an organisation responded and survived. We would never wish such a disaster on anyone / country, but we believe that sharing our experiences will assist other NSOs if such a disaster does occur.