

**THE AUSTRALIAN ACADEMIC PROFESSION IN 2007**

**SURVEY METHODOLOGY AND RESPONSE ANALYSIS**

**Hamish Coates<sup>\*</sup>, Leo Goedegebuure<sup>#</sup>, Jeannet van der Lee<sup>#</sup> & Lynn Meek<sup>#</sup>**

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**\* Australian Council for Education Research, Melbourne**

**# Centre for Higher Education Management and Policy, University of New England, Armidale**

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## **Sample design**

Sampling plays a critical role in ensuring the validity of survey processes and outcomes. The sampling process outlined below conforms to the international and cross-institutional sampling strategy that has been designed for the CAP project. This implies that inferences of population characteristics derived from the survey can be accompanied with accurate and defensible estimates of precision.

### *Population definition*

The generalisability of results and hence the scope of the study is set through definition of the population. Desired, excluded and target populations are defined. The desired population is that about which generalisations are made. The excluded population represents individuals who are not included in the study. The target population is the difference between desired and excluded populations, and is the list from which the sample has been drawn.

#### Desired population

According to the international sampling specifications, the CAP population is “composed of professionals in higher education institutes that offer a baccalaureate degree or higher (Type A of the OECD classification) and professional researchers in public research institutes”. The term ‘professionals’ here is interpreted as ‘academic staff’.

As in most countries, in Australia the term ‘academic staff’ covers a wide range of different roles. An incomplete list includes: Residential Tutor, Assistant Lecturer, Lecturer, Senior Lecturer, Associate Professor, Professor, Clinical Supervisor, Research Assistant, Research Fellow, Senior Research Fellow, Honorary Fellow, Sessional Lecturer, Sessional Tutor, Marker, Examiner, Supervisor, Reader, Principal Research Fellow, Professorial Fellow, Postdoctoral Fellow, Head, Chair, Dean, Director, Deputy Vice-Chancellor, Provost, Pro Vice-Chancellor, Vice-Chancellor and Chancellor. Most, but not all, of these roles are included in the desired population for this survey.

#### Excluded population

Public research institutes were not included in the Australian CAP study. Professional staff working at such institutions were therefore not included in the study, and the results can not be generalised to them. The same is true for those higher education institutions not defined as “Table A” providers in the Australian context, such as private and overseas providers.

While all Australian universities were invited to take part in the Australian CAP survey, participation was voluntary and certain institutions elected not to be involved. In theory, such institutional non-response has the potential to introduce bias into the sample. In practice, however, the number of

institutions that elected to take part in the Australian CAP survey has been sufficiently high to ensure the validity and relevance of the survey results.

The Australian CAP survey excludes specific academic roles. Broadly, these include adjunct, casual/sessional and honorary roles. Examples from the above list of roles include Honorary Fellow, Sessional Lecturer, Sessional Tutor, Marker and Examiner. Note that individuals should only be excluded if one of these roles is their substantive role. Thus, a full time Lecturer who also holds a Honorary Fellowship in another department is not excluded from the population.

Central senior university executive staff are also excluded from the Australian CAP survey target population. These include staff working in positions like Assistant Pro Vice-Chancellor, Pro Vice-Chancellor, Deputy Vice-Chancellor, Vice-Chancellor and Chancellor.

#### Target population and sampling frame

In total, 22 institutions agreed to participate in the Australian CAP survey which is more than half of Australia's 37 public universities. This large number of participating institutions provides an initial indication that the study includes a representative selection of Australian institutions.

A number of further factors affirm the representativeness of the selection of institutions. Review of the list indicates that the participating institutions reflect a wide range of sizes, histories and missions. They therefore can be considered representative of the 16 institutions that chose not to take part in the study.

With these details in mind, the target population for the Australian CAP survey includes all academic staff within participating institutions who are working in faculties rather than central administration, and who do not have adjunct, casual or honorary appointments as their substantive position.

#### *Sample design*

The Australian CAP survey employed a probabilistic sampling strategy designed to select a sufficient number of academic staff into the study to generate powerful and representative statistical estimates at the national level. The basic approach has taken the form of a systematic random sample across participating institutions.

#### Stratification

Stratification often plays an important role in large-scale samples as it improves the efficiency of the sample, helps to ensure the representativeness of the sample, eliminates potential confounds, and

blocks the population along lines suggested by research and practice. Strata might be defined at the institution and individual level.

Institutions provide the explicit stratum as separate, independent samples have been drawn for each institution in the Australian CAP survey. A systematic selection method was planned to ensure proportional representation of academics across these strata.

While no explicit individual-level strata were specified, implicit stratification helps to ensure that bias in the sample is minimised. A number of implicit strata within each institution were recognised such as sex, appointment fraction, term of appointment, academic classification/level, work sector and academic function.

Implicit stratification was managed by sorting the sampling frame and using a systematic selection process. Thus, no systematic bias has been introduced into the sampling process as a result of the selection method or default orderings in the target population list.

#### Level of analysis

Large-scale social surveys occur within various contexts, and the ‘level of analysis’ is the level at which it is desired that generalisations are made. The ‘level of analysis’ should not be confused with the ‘unit of analysis’, the latter being the object of the analysis which in the CAP study is academic staff.

There are multiple levels of analysis in the CAP survey. The first level of analysis is the international level and the second is the national level. The national level requires an effective sample size of 800.

#### Multistage selection

Institutions volunteered to participate in the Australian CAP survey in response to an invitation sent to all Australian ‘Table A’ universities. In broad terms, Table A institutions are defined as public providers by the Australian Government.

Table 1 lists participating institutions by state and territory, and institutional group. Australia has eight states and territories: Western Australia (WA), Northern Territory (NT), South Australia (SA), Victoria (VIC), New South Wales (NSW), Tasmania (TAS), the Australian Capital Territory (ACT) and Queensland (QLD). Australian higher education has three formal institutional groupings: Australian Technology Network of Universities (ATN), Group of Eight (Go8) and Innovative Research Universities (IRU). Not all Australian institutions are covered by these three groups. As a

result, a number of additional informal groupings are frequently used. For current purposes, institutions not included in the ATN, Go8 or IRU in Table 1 have been classified as either regional (REG) or New Generation Universities (NGU). The number of institutions in each group and state is shown in brackets beside the label.

The distribution of institutions in Table 1 provides assurance as to the national representativeness of the participating institutions. The institutions cover the range of states and groups. The notable exceptions are that there is no institution participating from the state of Tasmania, and that only two of the six IRU universities are involved.

Table 1: Institutions participating in the Australian CAP survey

State	ATN (5)	Go8 (8)	IRU (6)	REG	NGU
WA (4)	Curtin University of Technology	University of Western Australia			
NT (1)					Charles Darwin University
SA (3)	University of South Australia		Flinders University		
VIC (8)	RMIT University	University of Melbourne		University of Ballarat	Victoria University  Deakin University
NSW (10)		University of Sydney	Macquarie University	Charles Sturt University  Southern Cross University  University of New England  University of Wollongong	University of Western Sydney
TAS (1)					
ACT (2)					University of Canberra
QLD (8)	Queensland University of Technology	University of Queensland		University of Southern Queensland  University of the Sunshine Coast	

Participating institutions supplied a population list from which the staff sample was drawn. A systematic sampling procedure was used to obtain a probabilistic sample of staff within each institution. The systematic approach was used because it was sufficiently parsimonious to be applied consistently across institutions, and because it ensures proportional representation of academics across the implicit strata.

### Sample size

A national effective sample size of 800 has been set for the study through the international specifications. This effective sample size has been determined by considering the substantive focus of the survey and the kinds of statistical analyses likely to be performed.

To achieve an effective sample size of 800, it is necessary for the actual sample size to be larger than 800 to account for non-response and the clustered nature of the target population. It is necessary to use complex sampling methods because of the structural characteristics of universities and the higher education system.

It is important to account for the natural clustering which occurs within institutions as a result of disciplinary groupings and organisational structures. Such clustering arises because survey responses can be more homogeneous within institutions than across the Australian academic community as a whole.

The international sampling specifications propose that a design effect of 2.0 be factored into sample size calculations. This is considered a conservative estimate, and is based on survey work conducted in the United States. The observed clustering effect behind this figure is affirmed by a recent Australian survey of academic leaders (Scott, Coates & Anderson, forthcoming).

A design effect of 2.0 means that twice the sample size is required to achieve the effective sample size, so a national sample size of  $800 \times 2 = 1,600$  academics is proposed to satisfy the international sampling specifications.

The sample size also needs to be adjusted to reflect anticipated response rates. Experience in prior studies (Scott, Coates & Anderson, forthcoming) suggests that response rates to surveys tend to hover between 30 and 50 per cent. A conservative response rate of 30 per cent has been assumed for the Australian CAP survey. This means that the complex sample size needs to be multiplied by  $100 / 30$ . A design sample of  $1,600 \times (100 / 30) = 5,333$  therefore has been identified to meet the international requirements for this survey. To be conservative, the design sample size has been rounded upwards to 5,500.

To satisfy the requirements of the international survey, the national design sample size of 5,500 was allocated proportionally across the participating institutions, according to the number of academics within each institution.

### *Drawing the sample*

#### Sampling management

Preparation of the sample involved collaboration between participating institutions and the Australian Council for Educational Research (ACER), the agency that coordinated the design and development of the Australian CAP sample. Rather than supply institutions with the full specifications, a sampling manual was produced to assist institutions identify relevant academic staff. The manual provided an introduction to the CAP survey and sampling process, an overview of the sampling strategy, and key steps for selecting defined academic staff.

Institutions were asked to provide a full list of academic staff at their institution from which ACER could draw a sample. For this, they were provided with a data specification defined in terms of the national statistics collection. Specific elements included staff email, institution code, sex, work contract, current duties term, current duties classification type and level, work sector, academic function.

ACER worked with institutions to ensure the consistency and integrity of data provided. All but one of the 22 sampled institutions provided a list of academic staff. Of the remaining 21 institutions, one provided email addresses only, and one did not provide information on work contract. Once all data was received, a number of recodings were conducted, and out-of-range, duplicate records and individuals in the excluded population were removed. The first column of Table 2 shows that the cleaned population list comprised 20,563 academic staff members from 21 institutions.

#### Sample production and verification

The population list was sorted using the variables obtained for the purposes of stratification (sex, work contract, current duties classification, academic function, and current duties term). A systematic random sample was then selected for each of the 21 remaining institutions. A total sample size of 5,496 was obtained. The number of staff selected within each institution is provided in the final column of Table 2.

As a final check, the sample statistics were compared with the population parameters. This showed that the sample was representative of the population at the participating institutions in terms of sex, work contract, current duties term, current duties classification, and academic function. Table 2

presents comparisons between the distribution of staff in the target population and in the planned sample.

### *Secured sample analysis*

#### Sample size and consistency

The online survey was distributed to the 5,496 individuals sampled from the target population list. The initial distribution was made between 18 and 26 September 2007, with follow up distributions sent to non-respondents on 3 October, 29 October and 3 December 2007. The fieldwork was closed mid December.

Of the 5,496 individuals in the sample, a total of 187 were unable to be reached electronically, either due to their account being closed, or the individual no longer being employed at the institution. Each undelivered email was checked for validity and at times an alternative email address was retrieved and used to contact the individual. It was necessary to resend emails to staff at one institution that had initially provided emails in an incorrect format.

A total of 153 individuals indicated that they were away from their email during the survey period, not to return until after the closing date of the survey. While a useful figure for working purposes, there is some unreliability in this figure given that not all individuals use vacation messages and that individuals may still respond even though out of the office.

A total of 1,382 individuals logged on to the survey. Only a single version of the instrument was used and the number of responses varied due to item-level non-response. While 1,222 individuals responded to the first section, for instance, only 982 individuals provided comments in the second section of the questionnaire.

After final validation of responses, 1,252 responses were classified as valid in that the individual answered one or more questions. After subtracting undeliverables and out-of-office numbers from the initial sample, this number of responses implies a response rate of 24.2 per cent. This rate is 5.8 percentage points below the planned rate of 30 per cent, but certainly in the range of what would be required for an acceptable response.

More importantly, the complex sample size of 1,252 implies an effective sample size of 626, given the assumed design effect of 2.0, which is 174 below the planned effective sample size of 800. This has implications for the consistency of the sample. Specifically, it means that confidence bands around point estimates would be plus or minus 3.9 rather than 3.5 standard errors. This is not a large variation in certainty.



### Sample distribution and bias

It is important to compare the secured sample against the target population to test the representativeness and hence generalisability of the sample. Close correspondence between the designed and secured distributions of staff on key variables helps provide confidence in statistical estimates.

Table 2 presents figures that allow comparison of the distribution of staff across the target population, planned sample and secured samples. Note that certain percentages do not sum to 100 due to missing data.

In summary, the figures show that:

- the secured sample is distributed proportionately across the 21 institutions despite slight under and over-representation at a few institutions;
- females tended to respond more than males compared with population distributions, although the number of responses for both sexes is high;
- the secured sample is distributed representatively by work contract;
- compared with population distributions, more staff with limited-terms have responded while fewer staff with confirmed tenure have responded;
- the sample is representative in terms of level of duty; and
- the secured sample is well distributed in terms of academic function.

Overall, while the distribution of respondents in terms of marker variables in the secured sample varies slightly to that in the population, the variations are slight. As anticipated in the sample design, the secured sample of responses appears to be representative of the target population of academics from the 21 institutions. Given the distribution of these institutions across the Australian higher education sector, it is appropriate to use the survey data to make generalisations at the national level.

An important consequence of the representativeness of the secured sample is that it is self-weighting. This was anticipated by the use of explicit and implicit stratification, and in the use of a systematic random selection procedures to sample academic staff in the target population. It is confirmed through the figures presented in Table 2. While sampling weights could be applied to adjust for slight disproportionalities in relation to institution, sex and tenure, the corrections would be small and would likely not be balanced by the reduction in analytical parsimony.

Table 2: Population and sample comparisons

		Target population		Planned sample		Secured sample	
		n	%	n	%	n	%
<b>Institution</b>	University of Western Australia	1,201	5.8	321	5.8	60	4.8
	University of Southern Queensland	467	2.3	125	2.3	29	2.3
	Curtin University of Technology	1,239	6.0	331	6.0	68	5.4
	University of Canberra	355	1.7	95	1.7	29	2.3
	Charles Darwin University	271	1.3	72	1.3	21	1.7
	University of Western Sydney	905	4.4	242	4.4	52	4.2
	Charles Sturt University	639	3.1	171	3.1	63	5.0
	Victoria University	544	2.6	145	2.6	35	2.8
	University of Queensland	2,286	11.1	611	11.1	142	11.3
	University of South Australia	1,050	5.1	281	5.1	88	7.0
	Flinders University	722	3.5	193	3.5	56	4.5
	Deakin University	959	4.7	256	4.7	55	4.4
	RMIT University	1,108	5.4	296	5.4	61	4.9
	The University of Melbourne	3,105	15.1	830	15.1	172	13.7
	Southern Cross University	278	1.4	74	1.3	28	2.2
	University of New England	446	2.2	119	2.2	29	2.3
	University of Sydney	2,682	13.0	717	13.0	161	12.9
	Queensland University of Technology	1,146	5.6	307	5.6	52	4.2
	University of the Sunshine Coast	152	0.7	41	0.7	14	1.1
	University of Ballarat	241	1.2	64	1.2	20	1.6
University of Wollongong	767	3.7	205	3.7	17	1.4	
	<b>Total</b>	<b>20,563</b>	<b>100.0</b>	<b>5,496</b>	<b>100.0</b>	<b>1,252</b>	<b>100.0</b>
<b>Sex</b>	Female	8,700	42.3	2,327	42.8	622	50.5
	Male	11,622	56.5	3,105	57.2	610	49.5
	<b>Total</b>	<b>20,563</b>	<b>100.0</b>	<b>5,432</b>	<b>100.0</b>	<b>1,232</b>	<b>100.0</b>
<b>Work contract</b>	Full-time work contract	16,044	82.0	4,291	82.1	1,022	84.1
	Fractional full-time work contract	3,511	18.0	936	17.9	193	15.9
	<b>Total</b>	<b>19,555</b>	<b>100.0</b>	<b>5,227</b>	<b>100.0</b>	<b>1,215</b>	<b>100.0</b>
<b>Current duties term</b>	Limited term 1-60 months	8,122	40.0	3,260	50.0	761	50.0
	Limited term > 5 years	826	4.1	215	3.3	41	2.7
	Probationary tenurable term	1,963	9.7	521	8.0	145	9.5
	Confirmed tenurable term	9,377	46.1	2,518	38.6	574	37.7
	Other	34	0.2	6	0.1	1	0.1
	<b>Total</b>	<b>20,322</b>	<b>100.0</b>	<b>6,520</b>	<b>100.0</b>	<b>1,522</b>	<b>100.0</b>
<b>Current duties classification type and level</b>	Level E	2,287	11.3	614	11.3	122	9.9
	Level D	2,455	12.1	654	12.0	153	12.4
	Level C	4,660	22.9	1,249	23.0	294	23.9
	Level B	6,912	34.0	1,842	33.9	449	36.4
	Level A	4,008	19.7	1,073	19.8	214	17.4
	<b>Total</b>	<b>20,322</b>	<b>100.0</b>	<b>5,432</b>	<b>100.0</b>	<b>1,232</b>	<b>100.0</b>
<b>Academic function</b>	Teaching only function	582	2.9	153	2.8	32	2.6
	Research only function	3,773	18.6	1,005	18.5	219	17.8
	Teaching and research function	15,632	76.9	4,183	77.0	951	77.2
	Other function	335	1.6	91	1.7	30	2.4
	<b>Total</b>	<b>20,322</b>	<b>100.0</b>	<b>5,432</b>	<b>100.0</b>	<b>1,232</b>	<b>100.0</b>

## **References**

Scott, G, Coates, H. & Anderson, M. (forthcoming). Learning Leaders in Times of Change: Academic Leadership Capabilities for Australian Higher Education. Sydney: Carrick Institute.