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Case article	The quota quandary: some preselected random thoughts on quotas.....and Donald Rumsfeld.
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Dr Sandy Ochojna is an independent survey research advisor. Between 1986 and 2008 he was the Manchester-based director of several well-known international market research companies; for the ten years prior to that he was Passenger Manager at Strathclyde Passenger Transport Executive in Glasgow. From time to time he feels compelled to set down his thoughts on topical survey issues.

It's a sad fact of life that while the larger a sample is the more robust become its statistics it is also the case that the costs of increasing a sample are not matched by an equivalent increase in its statistical reliability; you must quadruple the sample to halve the confidence interval. Such brutal economics means that many if not most surveys aim for the minimum accepted threshold, normally around 1000 interviews; and what this actually implies is that when designing a survey, and devising its fieldwork strategy, the key issue becomes not the size but rather the composition of the achieved sample. 'We will impose quota controls to ensure .....' probably appears in most research pitches. It's a statement, and a practice, which we rely on almost without thinking; but maybe we should think on it just a little more. The trouble is that this consideration can draw us into topics such as segmentation, 'hard-to-reach' groups, design effect, extreme weighting, meaningful representativeness, and Auguste Compte..... and even Donald Rumsfeld.

Quotas; why have them?

A quota is a set number of interviews which have to be achieved with a specific type of respondent. If we know that a certain service has twice as many men than women using it, then we set quotas to ensure the sample comprises men to women in the ratio of 2:1.

Generally quotas are imposed either to ensure a **representative** sample (see above) or to achieve meaningful **specific sub-cell sizes**. To a great degree both objectives come up against the same problems, namely

- are there comprehensive and current databases upon which to set quotas with confidence?
- are the attributes in such databases really appropriate for the needs of the survey?

Quota controls; the representative sample

The most representative sample is achieved using pre-selected fixed random sampling; with its call backs and Kish grids to select the eligible respondents it is time-consuming and expensive, and at the end of day still only manages to include those people willing to be interviewed. Offering interviewers a set of target quotas gives them more flexibility and removes the need for call-backs, hence it reduces both time and cost dramatically.

But what constitutes a representative sample, and how it should be 'quota'd', is not always clear-cut. What might be representative in terms of straight demographics may well be totally unrepresentative in some other dimension; this is a classic problem in travel research for example. In an in-home travel survey with quotas set on age and gender, and even working status, no matter how hard you try the sample will tend to be biased in favour of those with low mobility simply because they have a higher chance of being interviewed because they are more likely to be at home. So, while the sample is indeed representative in some ways, it is clearly not so in the dimension of most relevance to the survey. That's why robust behavioural or experience surveys (including customer satisfaction ones) attempt to set quotas based on frequency of use of the service under review (commuters v. non-commuters), days of the week of use (weekday shoppers v. weekend shoppers), and time of day (afternoon cinema goers v. evening ones); that is, quotas are based on exposure to the experience, not (just) respondent demographics.

Anyway...the standard quotas for general population surveys tend to be based around the demographics of age, gender, ethnicity, home location, and can veer off into attributes such as self-assessed disability/mobility, car ownership, digital exclusion (level of interface with the internet etc.), employment status, etc. Quotas are set using these indicators because information on their incidence in the population is widely available, and is probably accepted as being reliable. A major source tends to be the

Census.....which becomes of increasingly questionable value as the years pass and as areas experience significant changes due to regeneration, economic growth/decline, population shifts and the like. But while this problem can be overcome (see my approach at the end of this case note) it does not address the issue of how relevant are such quota characteristics.

And here is perhaps the fundamental question; in setting quotas on say age and gender, are we setting them as significant discriminators of the survey universe because we **should** classify the population in this way, or simply because we **can**? Most surveys are carried out to investigate attitudes, aspirations, behaviours, needs, experiences and so are we really convinced that classifying respondents by virtue of some physical characteristics is going to produce a truly 'representative' result? I accept that there is no easy answer, but all I can say is that we should be just a little bit more cautious and circumspect when putting the words 'quota' and 'ensuring representativeness' in the same sentence.

Furthermore, the advent of the online panel survey is bringing this problem more and more to the fore. We now see online panels claiming to be representative because of quotas applied to basic demographics. Yet all this does is skew the sample from being one of internet users who are happy to join a panel to one of a sample of internet users with the demographic make–up, say, of the general population..... but that's not the general population because not everyone by a long chalk is both an internet user and a survey completer. 'Silk purse' and 'sow's ear' come to mind!

In all, we can use quotas to ensure a representative or good sample only if the survey database itself contains the survey universe; quotas can ensure representativeness, but they cannot impose it on an incomplete or (partially) irrelevant sample frame.

Quota targets; the meaningful sub-cell size

By meaningful sub-cell we mean achieving a minimum of say 80-100 interviews with a particular type of respondent; this can be say, those from an ethnic minority background (EMG), or residents in a particular area, or users of a particular service - indeed any target sub-group of the survey population whose incidence is low enough to mean that in a random sample their sub-cell of interviews would be too small to sustain meaningful statistical analysis. So we boost their number, we skew the sample, and we say all will be well at the end because the data will be

rebalanced to be representative overall. This is well and good up to a point, assuming that no 'extreme' balancing or reweighting is required

But great care must be taken in deciding what attributes should be in the quota frame. They must be attributes which can be asked quickly and clearly at the start of an interview; they must be attributes which will not give rise to immediate embarrassment or offence. It is for these reasons that the standard demographics are usually the quota setters, and while we must accept that such variables as age, gender, home location, are also precisely what is needed by those using the results to frame policy and deliver actions or services, we really should ask ourselves for example just how good a discriminator is say, age or ethnicity, of behaviour or attitudes or service use?

Auguste Compte; the first word

Auguste Compte (1798-1857) is seen by many to be the father of sociology. It was he who pointed out the dangers of investigators influencing that which they are investigating (an issue that plagued quantum physics throughout the 20th Century). He concluded that:

"If it is true that every theory must be based on observed facts, it is equally true that facts cannot be observed without the guidance of some theories. Without such guidance, our facts would be desultory, fruitless; we could not retain them: for the most part we could not even perceive them."

I interpret this to mean that any research demands an initial hypothesis. In much market research such hypotheses are wittingly or unwittingly, explicitly or implicitly, incorporated into survey design by the way in which quotas are defined and set. Consequently the setting of these quotas can in itself lead the research to find in favour of the hypothesis.

For example, in household surveys samples can be boosted in particular wards or divisions where authorities are targeting effort. Because these sub-cells have comparatively larger sample sizes than their natural incidence would dictate, they can be misinterpreted to become more likely than other (non-boosted) groups to produce results which appear statistically significant different. So, we set up a proposition and then prove it to be so. You know the line; 'the authority has been targeting area A for the last two years and the sample in that area has been doubled to test for any changes and allow for more detailed analysis within that area. The results show that awareness of improvements in

area A is higher than it is in areas B, C, or D.' Now, if the sample size for area A were the same as that for the others, could the same conclusion have been drawn – maybe, but maybe not. (eg If areas A and B had samples of 200, then A's proportion of 16% of respondents noticing improvement would not be significantly different from that of B's 10%; but if A's sample were 400, then the two proportions are significantly different.) Hence it is always wise to check what conventions your analysis package is applying in such circumstances.

This is not to say that such area boosting should not be undertaken; rather the analysis and reporting of the results needs to be done with the utmost caution. With any skewed or targeted quota sample there is a strong case for producing two reports – one based on a sample with no boosters in it, to get the representative overview, and a second concentrating on the samples of interest, the boosted ones, using the first report for context. But then, who has the time or inclination to write, and read, two reports on the same subject?

Donald Rumsfeld; the last word

Applying quotas is often taken too lightly. It can result in self-fulfilling hypotheses and a misunderstanding of what is going on. But, as Compte pointed out, we cannot just 'do' a survey; we need some direction and purpose to it. Quotas can enforce such direction, but we need to appreciate fully how they might also influence the results. In all, the choosing of the quota parameters is an often overlooked yet vital element of the survey design process. A wrong choice can lead to a wrong conclusion. As Donald Rumsfeld so famously put it;

"As we know, there are known knowns. These are things we know we know. We also know there are known unknowns. That is to say we know there are some things we do not know. But there are also unknown unknowns, the things we don't know we don't know."

Poorly constructed quotas can mean the 'unknown unknowns' remain so. Ideally all this can be avoided by having a very big pre-selected fixed random sample and a broad range of respondent descriptors; realistically, the costs involved mean this is rarely an option. In deference to Donald, the benefits of quotas can be maximised by applying what I shall term the IRAQuota regime. That is, when determining what quotas to set, check that they...

i are **impartial** and will not dominate, or direct, the analysis unduly

r require only **reasonable** questions to identify the eligible respondent

a can report the results using **actionable** descriptors and variables.

At the end of the day you will probably still set quotas based on age and gender etc., but when it comes to reporting let Donald have the last word:

"Learn to say 'I don't know'. If used when appropriate, it will be often."

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A wee note on in-field quota surveys

When I was doing in-home surveys towards the end of the '90's the 1991 Census was getting a bit dated, hence we developed the concept of 'in-field quota setting'. I tried it a couple of times, before the 2001 data came on stream, and it seemed to work. It was based on a simple two–stage process, but it might be heretical to theorists. The two stages are;

-randomly select target households from PAF, and then have the interviewer identify the eligible respondent at that address by applying the 2nd birthday rule (this is just like the 1st birthday rule, but by asking for the person whose birthday is not next but rather the one after that, it is less likely to encourage the person answering the door to claim to be the eligible respondent).

-the interviewer then asks some basic demographics of that target; eg age, gender, working status. If that person is available and willing to be interviewed, then excellent: if not, the interviewer goes into standard quota sampling mode, and seeks a replacement meeting these demographics in households nearby.

All in all, the beauty of in-field quota setting is that it does not need an external data source; in effect the quotas are set by the survey population itself in the place and at the time of fieldwork – and it does it without the need for so many expensive call-backs.