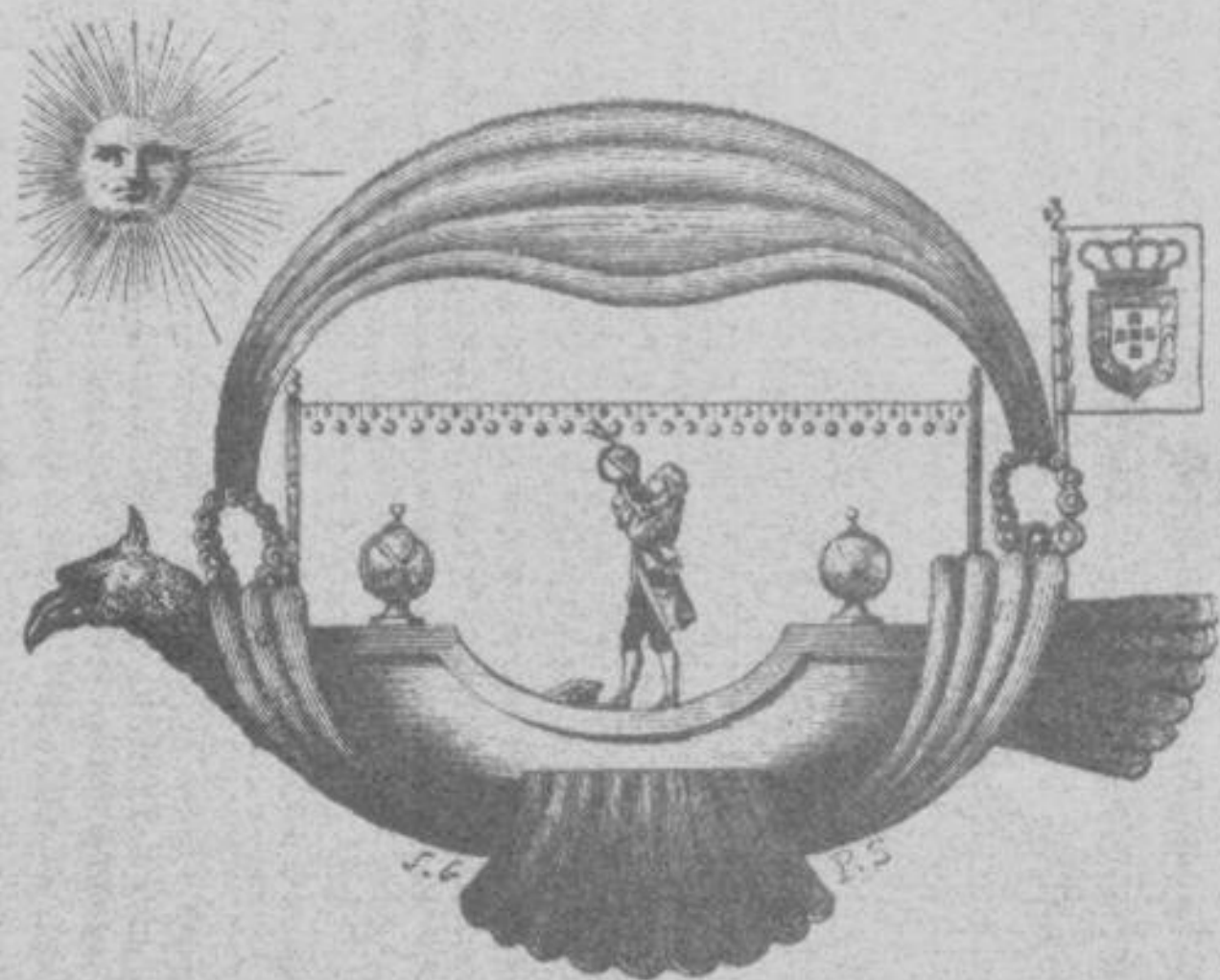


LES CAHIERS **DU TOURISME**



UNIVERSITÉ DE DROIT, D'ÉCONOMIE ET DES SCIENCES

CENTRE
DES HAUTES ÉTUDES TOURISTIQUES

AIX-EN-PROVENCE

Université de Droit, d'Economie et des Sciences
CENTRE DES HAUTES ETUDES TOURISTIQUES

Série C N° 118

**SOME SPECIAL CONSIDERATIONS IN WEIGHTING SURVEY
DATA**

JAY BEAMAN
DIRECTOR
SOCIO-ECONOMIC BRANCH
CANADIAN PARKS SERVICE
ENVIRONMENT CANADA

&

DAVE REDEKOP
DIRECTOR
CANADIAN TOURISM RESEARCH
INSTITUTE
CONFERENCE BOARD OF CANADA

JUIN 1990

CENTRE DES HAUTES ETUDES TOURISTIQUES
Fondation Vasarely
1, avenue Marcel Pagnol
13090 Aix - en - Provence
Téléphone : 42-20-09-73
Télécopie : 42. 20. 50. 98.
ISSN N° 0768-0279.

TABLE OF CONTENTS

	PAGE
PURPOSE	2
BACKGROUND	2
General	2
Practical View : "Example"	3
Different Markets/Universes Must be Considered	3
DEFINING THE MARKETS	5
SELECTING SPECIAL MARKETS	7
General Issues	7
Examples	8
WEIGHTING MAKES A DIFFERENCE	10
A National Park Example	10
Table 1 Comparison of results using different weighting univeses	11
Applying Weights	12
Relating Research to Survey Objectives	13
A Poster Example	13
A Townsite Example	15
THE ACCURACY QUESTION : RELATED TO SAMPLE SIZE	17
CONCLUSIONS	17
General	17
Synopsis	19
Technology and the Future	19
Weighting is Not the Only Issue	20

PURPOSE

The purpose of this paper is to show that in many circumstances it is useful to weight survey data to focus attention on populations and sub-populations other than the original universe sampled.

BACKGROUND

General

When the ideas in this paper were originally formulated in 1982/83 they were formulated for an 1983 oral presentation to professionals in recreation and leisure area. The "key" example used then, as here, related to Table 1. The table was used as a way of putting into focus a continuing problem. However, the goal of that 1983 presentation was to convince people who routinely carry out surveys of the need to carry out their analysis of each survey with respect to different universes. How to weight data to start with unbiased estimates for the universe sampled and how to estimate for alternative universes were covered.

After several rewrites of the present document, it has become clear that this presentation can have a clear and consistent focus by only dealing with the issue of the need for making estimates from a survey for one or more universes other than a universe sampled. The matter of getting valid estimates for a particular universe sampled is adequately covered in technical respects in an abundance of survey design literature (e. g. Murthy, 1967 ; Hansen et al, 1953, Backstrom and Cesar, 1981). Making estimates for a number of markets some of which may be sub-groups of the universe sampled is not covered in such literature.

In this paper, the benefits of the approach presented are demonstrated without introducing any technical details or mathematics of survey design. In fact, problems in using some of the technical methods for getting efficient estimates are discussed.

Practical View : "Example"

It may not be really clear to some readers what the preceding paragraph was trying to get at from a practical point of view. Consider, therefore, that all or some vehicles exiting from a region (park or any of a variety of tourist regions) may be stopped during certain time intervals and, based on certain criteria, questions are asked of an individual or individuals in each vehicle stopped. Having carried out a survey, as just described, it may appear obvious that questions such as : "What is the origin distribution of visitors ?" can be given an unambiguous answer. Unfortunately, parties and individuals exiting from a park, tourist region or other area can be :

- a) exiting for one of many times in a day,
- b) for once in their life or,
- c) exiting on some bases between the two just described.

Origin and party size may be highly related to number of exits made. What is more, those parties exiting may have drastically varied lengths of stay for a visit for which they finally exit. Those exiting for the only time in their life may have a relatively long length of stay compared to "local weekend visitors" who exit on the Sunday of every sunny summer weekend.

Different Markets/Universes Must Be Considered

At this point, some readers may be saying to themselves that all that is being described here is that there are a large number of types of visitors or markets for parks, tourist regions or other kinds of areas being considered. That is a very good way of looking at one aspect of what is being described. However, where this background is leading and the major issue with which this paper is dealing is weighting to see that characteristics of markets/populations and sub-markets/sub-populations can be properly understood in analyses.

Previous discussion has highlighted the matter that different markets have characteristics that distinguish them from other markets. Statistically, there are several issues. A first issue is that when a survey universe is composed of different segments, markets, or whatever one wishes to call them, and

these markets have "radically" different characteristics, in some respects, knowing averages such as average length of stay, average party size, average distance travelled, etc. is too often of little real value. However, if we can break the universe down into markets, market segments, etc., a major cause of confused and erroneous analysis can be "controlled".

The kind of survey design alluded to in the example above might focus on party (or person) trip as a universe sampling unit. When one estimates the number of party (person) trips per year or season from a given origin, one has a party (person) trip generation rate. If one had information to allow estimates to be made for the universe of parties (persons) that exited at least once from a particular study area during a given year or season, then a table giving origin distribution could be used to calculate per party (capita) penetration into the origin areas. Clearly if one can get estimates for the universe of parties (persons) that made at least one trip then multiplying an average number of trips per party (person) travelling for season, year, or whatever unit one is using gives trips generated.

The preceding paragraph illustrates that there are many ways of describing computational procedures that may be used to get person information, party information, party or person visit by season etc. These different units of analysis can be obtained if the right questions have been asked in a survey ; or in some cases, if data are available from trip or seasonal permits, etc. From one point of view, this paper addresses the issue of planning to do analyses where the issue is getting the valid person, party, trip per season, "units", etc. for a data weighting. Certainly, having weights that facilitate analysis must be viewed as integrally related to the general problem of collecting data. The technical person designing survey data collection needs to know what analysis is to achieve. A "weighting" framework that relates to what is to be achieved and therefore is based on a survey that has the required questions is certainly important to a good and cost-effective data collection exercise but more importantly it is necessary for successful use of data to meet practical requirements.

As a conclusion to background, and while it may sound like it is preaching and not background, experience has taught an important lesson. This is that whenever one sees or hears a phrase about survey data where a definite article is used ("the origin distribution is", "the length of stay is"), this should create

a response disposition. One should be prompted to ask whether the population, the segment, the market, the public, the facility user group, etc. to which the statement applies is homogeneous enough that a definite article is appropriate. If the nature of the use of e.g. a facility by a group is adequately dependent on a factor so that knowing that factor is of some (significant or even probable) relevance to decision making or reporting of achievement in relation to a study then one has a potentially useful segmentation criterion. Anyway by the end of this paper one will have examples of how the point just made can and should be applied and why such considerations are critical to good analysis.

DEFINING THE MARKETS

As stated earlier, one question that is typically asked when a survey is being designed is "What universe is being sampled?". Asking this question is such an accepted principle that central statistical agencies demand an answer (e.g. Statistics Canada's report : Survey Sampling: A non mathematical guide). You must know what the population is that you are sampling to get a sample that is "representative" of it. However this does not mean that all or most analysis should be oriented to giving figures for the population or strata within it that were sampled. The issue is using a sample from a population to get meaningful information with which to plan or manage. Obtaining good information for management and planning decisions is often difficult because information is collected based on needs statements like :

- 1) The origin of visitors is important ;
- 2) The age distribution of visitors is important ;
- 3) The activities visitors participate in are important ;
- 4) Visit satisfaction of the visitors is important ;
- 5) The visitor's demographics such as income and education are important to designing facilities.

And, the list goes on and on. One notices in the list above that one has a typical pattern of phrases that resemble "academic"

hypotheses or assertions. There is not an orientation to specific management or planning objectives. Furthermore, there is not a concept of either visitor or visit type ; or of markets.

If one were approaching data collection from a point of view of management decisions, a list of objectives to be achieved might include :

- 1) Confirmation that certain markets that relate to the park plan exist and determination of characteristics that allow them to be "marketed to" ;
- 2) Determination of market segments : (a) for particular planning or planned options, (b) that are likely to support or oppose agency positions, (c) for which particular planning options are likely to prompt concern (and why), and (d) which are likely to change behaviour in response to marketing information in such a way that subsequent impacts on specific facilities and services should be planned for ;
- 3) Establishing demographic or other characteristics of visit types/market segments to allow them to be identified and marketed to outside the park to increase their participation at the park and to estimate how their participation will impact on specific facilities and services.

In summary, the point being made is that objectives should at least implicitly define information that can be used to plan or manage. This generally means that objectives must relate to visitor types, visit types, activity at a particular facility by a "social aggregate" or there must be other "segmentation" criteria relating to management. Of course , if a survey is targeted at a particular "segment", then characteristics of that special population can be appropriate information for planning and management. Regardless, the fact that segments or sub-populations can be identified or that the "whole" population sampled is the appropriate subject of analysis for a particular study does not mean that a statement such as "the origin distribution of the segment is..." is valid or logical.

Assume that the population of people who use a particular hot spring or who use a given National Park for a given purpose has been sampled randomly and in an unbiased manner e.g. based on party days use per person. Every table run for that population weighted to the universe sampled tells about it

based on the sampling unit. There are still origin distributions by "at least one trip in a season" (one vote per party or one vote per person per season), by party trip, by person day, etc. Particular objectives and management decisions may relate to party days, person entries, person hours of use, person hours of use by time of day, average number of party visits per week, weekend or weekday, month, season, year, life, etc. or in many cases combinations of such measures !

SELECTING SPECIAL MARKETS

General Issues

As stated earlier, since the ideas on weighting that are presented in this paper were first presented in 1983, the importance of recognizing alternate universes and sub-populations to weight to has become more and more clearly recognized as a critical step in carrying out cost-effective survey research. This means it is important to define populations and sub-populations that are of interest before doing a survey (i.e. "pre-segmentation") since this must be part of the survey design. The analytical search for "markets", "segments", "behaviourally distinct sub-populations", etc., from survey data is a separate matter. There are abundant texts on analytical methods to find clusters of people that have something in common that makes it worthwhile to try to sell them a certain product or to sell than a product in a certain way (see references in SAS Institute Inc., 1988). With pre-segmentation, logic is the real concern. If one is interested in certain types of expenditures then to get segments we can get information about, for example, park visitors that use certain types of accommodation, and when and for how long this accommodation is used on the average. Identifying the segments doesn't require factor analysis or cluster analysis. It requires good pre-planning of surveys.

Too often we try to use logic to correct for bad planning. Asking people what they spend on accommodation and trying to figure out what kind of accommodation they used based how much they spend per night shows poor planning. Getting price per night without knowing how to translate this into total amount of accommodation demanded or to translate it to a reliable

amount paid for accommodation again reflects bad planning. Another aspect of bad planning is being highly concerned with certain selected accommodation markets and carrying out sampling that gets so few individuals from some markets that the information is virtually useless for part of the markets of interest (useless because the data are too inaccurate). If the sub-populations are a very small part of a population for some weights (e.g. few people but they spend a lot or are the main users of certain costly services), recognizing this early on and planning to "over sample" that segment and to have weights that allow one to put that segment into a correct perspective with other sub-populations of interest is critical both for "traditional" weighting and for the application of the kind of weighting with which this paper is concerned.

Still, logic and presegmentation have limits. Should one proceed with formal mathematical segmentation or other segmentation after one has data on a universe then it is always possible that segments will be discovered that are of interest and for which one did not collect adequate information to make reliable estimates. That happens! Usually there is a next time to collect data missed for a given segment.

Examples

From our point of view, it is common practice in recreation, park user and tourism research to weight data and present results using only final exit parties, party days, "individual visitors" based on at least one visit in e.g. a season or visitor days as a unit of analysis for a survey. The key thesis here is that it is desirable to use different units of analysis or universes to enable the analyst to get clear insight into a multifaceted phenomenon. Visitors'/Tourists' views could be given weight either in terms of 1 vote per "visitor" (whatever means without further qualification), 1 vote per visitor day spent in an area, or based on other criteria. Why should a person who spends 5 hours "visiting" Banff, Jasper or another Canadian National Park have his/her views on camping, interpretation programs and some other matters treated as equal to that of someone who spends 3 days or someone who spends 3 weeks each year? Who gets how many votes could be treated as a policy issue, however, a policy on what data to use can assure that planning isn't done with the correct data ! Having a policy, saying that certain data are "correct", doesn't make these data

"correct" or "best". Bureaucratic "blessing" can make data or methods be required regardless of their logical merits ! Hopefully, bureaucratic blessing is based on sound analysis of objectives and is subject to review.

Practically, as to what is policy and what is "value of views", if a survey were undertaken to evaluate the commercial services of a park to visitors, respondents could be asked to rate the adequacy of restaurants on a scale of 1 (very good) to 5 (very poor). If expenditures at restaurants during a visiting party's stay at a park (in a region) are asked for along with a restaurant rating then the researcher has at least two weighting schemes to use to gain different perspectives on how visitors rate restaurants. One is weighting using party trips as the universe unit. In this case, the results could be stated by giving either the mean party response or by giving the number or percent of party trips that rated restaurants as number 1, 2 and so forth. The second weighting scheme could use average per diem expenditures per party trip in restaurants. The results of using an expenditure weighting would be a ranking by such expenditures. Thus one could have \$60,000 worth of trip per diem restaurant related expenditures rating restaurants as number one, \$ 50,000 as number two and so on. These results are not the same as estimated total dollars spent. Long stay parties can have high expenditures but a low average per diem rate.

A comparison of the ranks cited above based on the two universes can show if high per diem spending parties that are users of restaurants rank, the restaurants quite differently than lower per diem spenders. The value of using the dollar type weighting is that a weighting according to the "average per diem amount of money visitors spent is relevant to business being healthy. You may hypothesize that the more money parties spend in restaurants per diem (or total) the better basis they have on which to rate restaurant services. If the "analysis universe" is visitor parties, a party that does not even go to a restaurant or that went to one and had a bad experience is given the same weight as the party that went six times spending several hundred dollars. Here, key questions are : Which, if either rating is relevant for a planner, information officer, marketer or manager in terms of what can be done or will be done ? Which allows the study objectives to be achieved ? Also, are there other factors such as the "controlled use" of restaurants by tour bus park visitors that should be considered ? If tour bus park visitors are taken only to certain

restaurants, seated together, pay a special price, etc. then they are commenting on a different experience that other restaurant users. They are a sub-population that should be treated separately. By use of two measures, at least one learns if high per diem expenditure visitor parties agree with other visitor parties on a per trip voting basis. If they don't agree, there is an issue that probably should be investigated by more indepth analysis. The "high spending parties" may know the good places or have "different" standards ! High spending parties can like one type of place and low spending parties like other types of places !

WEIGHTING MAKES A DIFFERENCE

A National Park Example

The following table is key to this presentation. It confirms the logically obvious ! It compares the percentage response to selected questions of a survey conducted at Jasper National Park during the summer of 1978. Column (1) presents responses using party nights as the universe. One can see that 61.2 % of the party night population was Canadian, or see that 54,6 % of party nights used campgrounds. This contrasts with the party weighted figures in column (2) which show that 41,8 % of party trips were from Canada and 20.5 % of party trip used campgrounds.

TABLE 1

COMPARISON OF RESULTS USING DIFFERENT WEIGHTING UNIVERSES

% RESPONSE				
SURVEY VARIABLE	(1) party night weighted	(2) party trip weighted	(3) unweighed raw figures	(4)* % difference

Country of Residence-Canada	61,2	41,8	39,3	46,4
Type of Accommodation Used				
- Motel	34,4	13,5	13,0	154,8
- Campground	54,6	20,5	16,9	166,3
Vehicle Used to Get to Park				
- Auto/Van	79,5	48,9	44,5	62,5
Used eating Services on 3 Days	78,5	87,3	85,0	10,0
Used Sleeping Services for				
- 1 Day	12,1	20,1	18,9	39,8
- 6 Days	2,4	0,7	0,9	242,9
Used Shopping Services for 1 day	29,5	33,0	29,9	10,6
Visited Maligne Lake	44,1	30,7	32,9	43,6
Info. Sources Used-Maps	48,2	38,3	34,8	25,8
Visited Maligne Canyon	55,4	43,1	44,2	28,5
Used Auto to Visit Maligne	48,2	36,3	37,0	32,8

* The last column shows the percentage difference between the party-night weighted figure and the party weighted figure.

Column (4) gives the percentage difference between the responses in column (1) and (2). These columns differ drastically. Most differences are significant well beyond the .01 level ! In column (3) the unweighted survey responses are shown. A comparison of column (3) with figures in columns (1) and (2) gives the clear impression that the unweighted figures must be corrected by weighting to get raw figures to be unbiased estimates for the universe sampled. The sample design did require weighting to get estimates for party trips (the universe sampled). As expected, weighting makes an important difference.

Applying Weights

Given that estimates for different universes differ, one must consider to which universes to weight and figure out a way to derive the weights needed. Survey data alone are not sufficient for some weighting procedures to be applied. The familiar case is getting data from strata and needing to know the size of the strata to get estimates for the population. For example, assume we know that there is a population size of 10,000 which consists of 1,000 bus visitor days and 9,000 other vehicle visitor days. If we interviewed 100 bus visitors and 300 other visitors to get data from each on a visitor day, then the 1,000 bus visitor days and 9,000 other vehicle visitor days cannot be estimated from the survey data. Bus and other vehicle visitor days could, however, be derived in various ways, such as by using data from a counting station at the exit/entrance to a park in conjunction with visitor length of stay and repeat entry data. Figures could also be estimated by using traffic counters and conducting periodic observations to partition use between buses, other visitor vehicles and non-visitor vehicles. The persons-per-bus and other visitor vehicle data must also be estimated and corrected by survey data on length of stay and repeat entry. In other words, a universe figure can be either estimated or be an actual census. The important point is that there must be counts for strata, to estimate a universe or data on the sample in relation to the universe if estimates are to be made for e.g. all visitor days.

Each weighting of a survey may require data that do not come from the survey itself. It is necessary, therefore, to decide on weighting strategies as a normal part of survey design. Many weighting problems arise because universe or strata size

estimates are not available or they are inaccurate, biased, simply incomplete or not really the right counts (conceptually incorrect e.g. pass through and other visitors got counted together, 24 hours or 2-way traffic was counted when only part of this was appropriate, etc.).

Relating Research to Survey Objectives

A Poster Example

The management objectives established for a study should indicate which survey results are the immediate justification for carrying out the survey. The objectives should allow one to determine logically both the weights and data needed ! This returns us to the point that in park and recreation research, often only one weight is computed when weighting is even undertaken.

Consider the objective of evaluating the effectiveness of the use of posters to promote a government program. This has resulted in a plan to survey about 1000 businesses of the 3000 that received posters. In one survey plan it was accepted that what was needed was an estimate of "contacts" resulting from the posters. The "contact" figures, "customer entry counts", were to be used in making decisions. A review of the methodology showed that some technical matters such as the sampling of businesses, the calculation of estimates of "contacts" and the identification of variance of those estimates were well handled for the data collection approach proposed. On closer examination, however, it became obvious that the data could not be validly used to make judgements on the effectiveness of the posters. Really there was one critical question that the survey was required to answer : "Was it worthwhile to send posters to businesses or at least to certain classes of businesses ?". One survey design issue that should have been considered was whether the number of customers who enter the premises of a business is a good indication of how effective the poster was. That is almost like saying everybody came to see the poster and e.g. banking was incidental ! There are many ways to count customers but, in this case, key information to obtain was, at least, whether a customer saw a poster. The research plan missed important information and was destined to

produce poor (basically irrelevant) results for taking the decision needed.

In such a study, there must initially be a clear statement on what is to be achieved. There must be an analysis plan showing what decisions are to be taken and how data are to be used to influence these. Based on saying in some meaningful way what "being effective" means, one must form the basis for determining information needed to make decisions. What was needed for decision-making was whether posters in some locations were influencing behavior as desired and to what degree (was enough consequence achieved given the cost). Any approach that didn't get data on customer reactions to the posters had no direct relevance to the product being evaluated ! However, it sounds good to say that each poster resulted in e.g. 10,000 customer contacts even if not one of the 10,000 customers going to a business saw e.g. the poster that was sent out which was "posted" in the staff coffee room.

Where weighting and sub-populations enter into this example may still not be clear. This is because what decisions are at issue and factors influencing them haven't been made clear. Why send posters to businesses at \$5.00 each (with printing, postage, etc.) ? Well, the posters were to get a message to people. From the businesses, one can find where or if the poster was displayed. Then one must ask if the businesses' clients saw the poster and reacted appropriately. Given that sending out posters was being evaluated, weighting by businesses' client counts is relevant to getting a picture of the number of unique people entries to businesses resulting in the entrant potentially being exposed. Weighting may also relate to the likelihood of seeing the poster resulting in a client reaction of interest. Mailback cards "linked" to each poster could have given data to relate to the "customer/client potentially exposed universe" to those that took an action (sending/handing in a card). Some messages reach urban people better than rural, rich better than poor, etc. Really, evaluation should have been planned to involve on site review of responses to the posters or even follow-up mail-out questionnaires. Regardless, in the end one should be answering "which impacts on whom and where are worth \$5,00 ?

A Townsite Example

Now, consider the problem of preparing a plan for Jasper, Banff or another townsite in a national park. A natural request is for data on "visitors" and their reactions to or their expectations from a visit to park/town. A typical survey to obtain such information would proceed by specifying the universe for the study as "all visitors" and "residents". A strategy to sample from this universe might involve interviews with people in the town based on some sampling plan. Some surveys have involved "picking" people at random on the street in a town. An exit survey and the "man on the street" survey, if not weighted to correct for probability of selection, are of different universes ! With an exit survey and a residents survey how do you put them together or what do you compare ? With one of the strategies cited above accepted, much can happen. A questionnaire is designed and pretested. A sampling plan is established. Labour for interviews, supervision, coding, etc. is arranged. And, other tasks up to having a report printed can occur.

But why was one or the other universe being used chosen ? What are the decisions to be taken and how will a visitor's characteristics or other data to be collected be used to impact on decisions ? If we ask visitors and residents about adequacy of various services or about the appearance of the town, we still must ask how e.g.1 vote per interview should influence what we do. As already stated in another context, why should the "vote" of visitors who spend say 10 minutes in a town buying gas be as influential for all services as that of a person who spends several days or weeks in the area of a town ? How is the information to be used in decisions and thus how are analysis results to be presented to decision-makers ?

The discussion above is meant to focus attention on the possibility that the universe for analysis would be person days or another specific measure. Person days applies to both residents and visitors. Visitors is not a clearly defined concept ! It is a term like electricity which is not precise but watts, watt-hours, volts are precise ! Use of person days would give the views of the people who spend many days in a town the dominant role in the statistical picture that would be formed. Demographic and many other visitor characteristics obtained with a person day weight, can be thought of as corresponding with the experience of someone "living" there.

But is giving residents, locals or heavy users a heavy weight, or big share of votes on what happens, right ? Statistically a variety of weighting can be done correctly ! None of these is inherently right or wrong !

If 80 % of visitors spend less than an hour in a town, a person who spends time there still tends to meet people in proportion to how long he stays which "causes" a "length of stay bias" (Lucas, 1963). Weighting based on length of stay gives what can be called "a person on the street perspective". "One person one vote per season" gives a "democratic" perspective from one view of democracy. Expenditure weighted votes gives a "he who pays the piper calls the tune" view. So, in reality we gain something by acknowledging that we should consider how people view something based on 1 vote per visitor per season as well as based on votes that reflect length of stay and/or expenditure. Into this whole business comes the matter of whether visitors are campers, bus visitors, repeat day visitors, etc.

Many studies present results for campers in tables broken out by length of stay, by type of user, by origin and other categories, so one has dozens of tables. Campers is a term like visitor ! Are the results for camper party nights, camper party trips. And, as well are the tables usually produced "needed" for decisions ? The truth comes out when one asks how the multitude of tables from a typical park use or townsite use survey are actually used in decisions regarding a plan or development. What have we done differently because 30 % of visit days are credited to persons 25-45 years of age, or are for people who come from the USA, or are for people who think that restaurants are poor, etc.

Weighting is one way to manipulate data to get a "better handle" on who needs what, who wants what or who likes what. The restaurant example cited earlier clarified this point. Various cross tabulations, or other analyses could be used to get results similar to those obtained using weighting . The point remains that more analysis needs to be done with data than is typically done so that information produced contributes directly and correctly to decision-making. Creative use of weighting gives the chance of putting fewer numbers in a decision document. Defining weights also should lead to concept clarification (e.g. from visitors and campers to something meaningful !).

THE ACCURACY QUESTION : RELATED TO SAMPLE SIZE

The approach of using various weightings of data in analysis has consequences. One is that accuracy criteria adopted based on a certain universe do not apply to numbers produced using other weightings ! When one is going to present a decision-maker with a 1 vote per visitor trip, 1 vote per visitor day, 1 vote per party trip or 1 vote per party day, then having at least 1 % or 5 % accuracy on all estimates is not really important ! The decision process isn't generally objective enough to require better than ± 10 % (or worse) ! If a decision maker considers different criteria subjectively, why measure them to ± 1 %. It should be clear, therefore, that many technical matters of "sampling efficiency", accuracy of estimates, etc., are misguided uses of resources given that sampling is generally only optimal for the universe sampled. Some examples may clarify the point. An efficient sampling for party trip data is not efficient for person trip unless all parties are the same size ! Dollar tables or rating scores aren't efficient or accurate to a survey design percent error criterion that was derived for yes-no answers to questions ! Accuracy in any of these can be forced to be ± 1 % and one could have a survey design so that estimates for a variety of universes were all at least ± 1 % at the 95 % level. But, that isn't the way most surveys are designed so in using multiple weights, one must be aware that any estimates for a survey will be much less accurate than one might expect from the "design accuracy" for the survey. Selecting the universe that is to have the most accurate estimates and defining rough accuracy for other universes and sub-populations should become a more common part of survey designer.

CONCLUSIONS

General

One approach to dealing with surveys in general and accuracy and "efficiency" in particular is to ask and answer : Is an inappropriately large amount of research resources going to technical matters of variance estimation, questionnaire administration, etc. compared to work directly contributing to decisions ? In the poster survey example one has a case where

data collection could result in a "technically" good product but a product that is wrong for making decisions. Actually, Beaman (1977, 1978) has been critical of much research that is technique oriented. His point was that one can often see by how data are being collected that a certain technique is to be used in analysis whether or not its use is an effective way to meet management objectives ! In other cases, problems are responded to by the use of time-consuming and expensive surveys when observation of behaviour supplemented with survey data would address the management issues effectively. Is parking adequately available most of the time ? Define adequately and look. There is no need to "survey" visitors !

Again, the contention here is that the best insurance that data will be generally useful to meet the broad objectives that one has for them, is that the objectives (and how they will be met with data) be identified with e.g. sub-populations for which estimates must be made. Survey design must flow from an analysis plan. Firstly, there must be the potential for a valid analysis, then the concern becomes getting enough information for different weights and/or sub-populations that when one has data for a universe so that one can get "adequately reliable" estimates at least for all those sub-populations and weights that pre-planning indicated it was important to be able to get estimates for. The design may well include much non-survey observation, counting, automated recording or other activity to link survey data to parking, crowding, etc. ; or data on having been at, seen or done or refused an "experience", etc.

This presentation has mentioned a number of topics without giving a set of how to do it rules. One may ask why the paper is not more definitive. Well, as expressed above, surveys are often less definitive than their authors would like to think. Who gets how many votes on a townsite appearance review or wilderness policy review ? Which of several visitor/user groups that want different services do we bias our results toward by the weight(s) we give their views ? There aren't simple answers and so none are offered here. Weighting as described here is suggested as a powerful tool to facilitate decisions. In this regard, a critical matter is that proper use of weights can allow a compact yet relatively precise and understandable picture of survey implications to be presented to decision makers. A pile of tables or even one table with several columns to show how "big per diem spender parties" or "longer stay parties" vote compared to "low per diem spender parties" or "shorter stay parties" will probably have less impact

than 2 numbers expressing the results of a "vote" from two perspectives. As long as properly understood and presented, the latter is better for decisions. The elaborate table may be needed by the analyst to be sure that the summary figures are not misleading or to give a hint on issues to examine.

Synopsis

Hopefully, many readers have a new insight into the importance of weighting to good research design. Design includes more than a sampling plan and related weighting to a universe. Firstly, surveys do not replace observing behaviour. Good design involves recording (counts by photos, observation, VHS, etc.) whether lines are long, beaches are crowded, water is dirty, weather is hot, etc., as are relevant to using data for decisions. Are the visitors' (some visitor groups) views of long waits, crowding, parking at your door or having a beach to themselves, something you really want to give a weight in a decision? Still, you may want an estimate of this group's size to judge the number of complaints you'll get if you make changes.

Efficient survey research certainly involves more than selecting a sample size of 100 or 1000 from some table in a book then doing the survey. If decisions to be taken and the universes to which they relate have not been defined, the research design is inadequate. If weighting schemes to make estimates for these universes are not defined, the research plan is incomplete. Finally, if the logic to be used in recommending decisions has not been worked out, the research is not adequately planned and may fail because tables or other analyses that result will not contribute to the kinds of decisions that are really needed. The critical importance of the considerations just cited is what this paper should really have highlighted to the reader!

Technology and the Future.

Returning to the "problem" of survey weighting almost a decade after most of the ideas presented here were first put on paper has resulted in an article that ignores a "technological revolution" (Kovar and Doucet, 1989). Systems to aid in good questionnaire development (Jaro, 1989), rigorous professional statements of what is needed in expert systems (Nicholls and

House, 1987) and a torrent of other computer-related ideas (Satin and Shastry, 1983) have changed the way that experts can be used to see that many problems do not occur in surveys. The Canadian Parks Service started looking at "automated questionnaire databases" in 1986/87. The effective use of such systems is only becoming a reality in 1990. The capability of dealing with the weighting "issue" pursued here has been one of many design, population definition, variable/question definition matters being dealt with in developing an expert system that forces many weighting issues to be properly addressed.

Weighting is Not the Only Issue

The technological revolution cited in the preceding section is not the only revolution worth citing in closing this paper. The way data are being viewed and the way that some data are collected by socio-economic professionals in the Canadian Parks Service has changed radically. This topic is pursued elsewhere (Beaman and Grimm 1989 ; Beaman, Thomson and Cotter 1990 ; Cotter 1989) but several points are appropriate in closing this paper :

- (1) questionnaire and other data can and should be treated in an integrated manner ;
- (2) having a "data model" for questionnaires forces some question definition and "question level" problems to be recognized and dealt with ;
- (3) it also facilitates recognizing sloppy usage of words in describing populations, sub-populations and weights ;
- (4) and it facilitates valid use of questions and responses from a database and efficient data capture, edit and analysis.

In the 90's the Canadian Parks Service is to use automation to lead users from analysis plans ; to information needed ; to alternative collection methods ; to effective data collection and analysis. The 1990's are going to be an exciting era for CAL (Computer Assisted Learning), AI (Artificial Intelligence) and Expert Systems to support survey data collection as part of general Management Information.

BIBLIOGRAPHY

BACKSTROM C.H. - CESAR G.H., 1981.

Survey Research, second edition, John Wiley and Sons, New York pp. 334 - 335.

BEAMAN J., 1977.

"Education for Tourism Research for the 1980's". The Travel Research Association Eighth Annual Conference Proceedings.

BEAMAN J., 1978.

"Leisure Research and Its Formulation of Relevance to Planning Management and Policy Formulation : A Problem of Major Proportions". Recreation Research Review, Vol. 6 (3), pp 18 - 25.

BEAMAN Jay - GRIMM Sylvanna, 1989.

"Park Use Related Data Recording : A New Direction for the Canadian Parks Service". Proceedings of the 1989 Northeastern Recreation Research Symposium, April 3 - 5, 1989, United States Department of Agriculture, Forest Service, Northeastern Forest Experiment Station, General Technical Report NE - 132, pp. 69 - 76.

BEAMAN Jay - THOMSON Ed - COTTER Mary L., 1990.

"Effective Management of Parks and Recreation Information". Paper for the 1990 Northeastern Recreation Research Symposium, May 1990 (proceedings to be published).

COTTER Mary L., 1989.

Park Use Related Data System (PURDS) Data Model : Concept Paper, Socio-Economic Branch, Canadian Parks Service.

HANSEN M. H. - HURWITZ W. N. - MADOW W. G., 1953.

Sample Survey Methods and Theory, Volume 1, John Wiley and Sons, New York, pp. 66.

JARO M. A., 1989

"Hyperquest : A New Method for Interviewing Using Laptop Computers", Symposium 88 : The impact of High Technology on Survey Taking, J. Kovar and E. Doucet.

KOVAR J. - DOUCET E., 1989.

Symposium 88: Impact of High Technology on Survey Taking, Proceedings of Conference, October 24 - 25, 1988, Ottawa : Statistics Canada.

LUCAS Robert C., 1963.

"Bias in Estimating Recreationists Length of Stay from Sample Interviews".
Journal of Forestry, Vol. 61 (2), pp 912 - 913.

MURTHY M. N., 1967.

Sampling Theory and Methods, Statistical Publishing Society, Calcutta,
pp. 425 - 428.

NICHOLLS William L. - HOUSE Carol, 1987.

"Designing Questionnaires for Computer-Assisted Interviewing / A Focus on
Program Correctness", U. S. Bureau of Census. Third Annual Research Conference
Proceedings.

SAS Institute Inc., 1988.

SAS / STAT User's Guide. Release 6.03 Edition. Cary, North Carolina, U.S.A.
pp. 47 - 83.

SATIN A. - SHASTRY W., 1983.

Survey Sampling : A Non-Mathematical Guide, Statistics Canada.