'WHAT DO WE DO WITH THE INFORMATION: FROM PRACTICAL CONCLUSIONS TO INFLUENCING CHANGE

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CONTENTS

The paper also uses the diagram techniques described in detail in '**Thinking it through: using diagrams for assessment design and information analysis'** on this website (see "Thinking it Through... " by L. Mayoux on the EDIAIS site).

INTRODUCTION

The usefulness of any impact assessment depends not only on its design and ways in which information is collected but:

- **how the information is analysed:** even the most rigorous and well-funded assessment is only as useful as the conclusions and recommendations which it is able to credibly produce.

- **how the information is disseminated and to whom:** only if information is presented clearly and disseminated to the relevant stakeholders is it likely to make any useful contribution to practical improvement in projects, programmes or policy environments.

In integrated assessment both the analysis of information and its dissemination are ***iterative and cumulative processes*** of comparing and crosschecking information from participatory workshops, qualitative investigation as well as quantitative surveys. There should be periodic pauses in the assessment to take stock This will involve dissemination of 'work in progress' to relevant stakeholders in order to draw on their insights and expertise and also to ensure that practical recommendations are widely discussed as an integral part of the assessment process. This will help to ensure their feasibility and increase their likelihood of acceptance by different stakeholder groups.

It is with these processes of analysis and dissemination of information that this paper is concerned. Underlying the guidelines given are assumptions that:

- the main aim of impact assessments which use development funds (as opposed to research funds) is to lead to implementation of improvements in programmes and policy

- that stakeholder accountability and capacity building are essential to translating improved knowledge into improved practice. This includes not only programme staff, policy-makers and funding agencies, but also those who are intended to benefit and particularly the poor and disadvantaged.

It is assumed that these principles have informed the design and implementation of the investigation: choice of indicators, sampling and ways in which information is obtained as discussed elsewhere on this website.
(See EDIAIS pages on Sampling, Selecting Indicators, and How do we find out?).

All assessments include budgets for data analysis and dissemination. But data analysis often does not do full justice to the data collected. Insufficient attention is often paid to ensuring the effectiveness of dissemination. There is a need for:

- greater rigour in use of quantitative, qualitative and participatory data analysis to address justifiable concerns about inherent limitations in all methodologies

- greater clarity and honesty in presentation of findings and how practical inferences are made

- greater attention to the information needs and skills of different audiences and how these can be addressed

- better use of all opportunities for discussion with the different stakeholders at all stages of the assessment process

SECTION 1: ANALYSING INFORMATION: HOW TO DRAW PRACTICAL CONCLUSIONS

1.1 Analysis of information in integrated assessment

There is wide scepticism about the reliability of any or all of the methods used in impact assessment. This is partly because of lack of understanding between different disciplines. It is also partly because of inherent shortcomings in any assessment methodology in isolation. Economists and statisticians often dismiss as ' fuzzy and anecdotal ' findings which cannot be quantified for large numbers of people. Sociologists and anthropologists are equally sceptical about the credibility of quantitative information because of the inevitable limitations of quantitative indicators and statistical analysis in explaining complex processes. Both are sceptical of participatory research because of its reliance on pictorial products, and the inevitable influence of power relations in the participatory process.

Detailed discussion of methods of analysis of quantification, qualitative research and participatory methods can be found elsewhere on this site and/or in the Resources listed at the end of this paper. Whatever methods are used it will be necessary in analysis to bear in mind limitations in the information obtained due to:

- Partial nature of the indicators used
- Any possible biases in the sampling methodology used and/or actual sample of people interviewed
- Potential unreliability in responses to particular questions and/or responses by particular interviewees

There are ways in which these problems can to some extent be overcome through better use of the different methods. Importantly there are complementarities between methods which can be built on in integrated assessment in order to significantly increase the credibility of the investigation.

This requires ongoing analysis at periodic stages throughout the assessment to examine:

- the usefulness of the hypotheses being investigated and whether these should be refined in the light of the data being collected,
- the reliability and relevance of indicators being used and how any limitations should be addressed
- representativeness or gaps in range of people being interviewed
- how any inherent or emerging limitations of the investigation process should be addressed.

Even in very small and short assessments with little time for change the potential limitations must be constantly be borne in mind and fully addressed in the conclusions and recommendations. At the analysis stage it is crucial to acknowledge any limitations and identify the implications for limitations in the conclusions and recommendations. This involves attention not only to probable criticisms or questions posed by debates within particular methodological traditions, but also issues raised by proponents of other methodologies.[1]

In larger and more comprehensive assessments there is scope for a systematic and well-thought through integration of methods to ensure an ongoing and critical process of reflection, refinement and improvement in reliability of the investigation.

1.2 Lies, damn lies and statistics? Increasing the credibility of quantitative analysis

For most impact assessments statistical analysis will be relatively simple, using a few basic measures and methods of representation. The small sample sizes involved in most impact assessments make the use of complex statistical methods inappropriate. Sample sizes are rarely over 300 because of limitations in resources and the inevitable trade-offs in terms of time between comprehensiveness of questionnaires and numbers of people who can be interviewed. For this reason this paper is concerned with ways of making this level of assessment and analysis more rigorous and credible.

The relevance of more sophisticated statistical modelling techniques may increase with the current moves towards strategic impact assessment. Involving donor consortia may also make statistical modelling more relevant. Also if impact indicators are fully integrated into programme monitoring and evaluation to provide data pools of thousands of beneficiaries then more sophisticated techniques can be used. Detailed discussion of statistical analysis for large samples is given in economics and social science statistics manuals and computer packages for statistical analysis like SPSS (See Resources). Nevertheless sophistication in statistical modelling will still only produce results as good as the data fed into the system. This will still require participatory processes for identifying the most relevant questions to be

[1] For a detailed account of contrasts between different methodological approaches see Hulme 2000.

asked, the most appropriate indicators and effective integration of quantitative with other methods in order to yield credible practical conclusions.

Quantification is an essential part of all impact assessment. It is often possible to say far more than is done in many quantitative analyses. This requires not so much familiarity with sophisticated techniques, but a more thoughtful use of even simple measures and tools:

- Using the raw disaggregated data, it is often possible to get a much more useful understanding of statistical ***relationships between different variables which may be important for policy***. For example gender analysis is often confined to simple disaggregation of formally registered participants by sex. It is possible to use the same data to examine a broad range of policy-related questions even using data which is routinely collected in programme implementation (See Box for micro-finance). Where data on incomes and other quantitative information is also available for large numbers of people then sophisticated techniques for multivariate analysis can be used. But even simple diagrams like histograms and scatterdiagrams can be useful.

- In order to make practical recommendations it is often not so much the average findings which are significant, but the ***exceptional cases*** which require detailed analysis. For example it may be the experience of a small handful of successful entrepreneurs which is are significant in indicating ways in which programmes can be improved. Conversely it may be the experience of a small handful of dropouts or business failures which point to ways in which programmes can be improved and possibly also made more relevant to the needs of current non-participants. Analysis of exceptional cases and their common characteristics can be done partly through examination of the relevant survey data on each case to examine any common characteristics.

Examples of policy-related gender analysis of statistical information

Most micro-finance programmes keep statistics collected at the time of loan application on sex, household composition, occupation and earnings, savings and loan history, collateral/guarantors. Lists also exist of the names of trainees etc. This information can be used to give more than just an estimate of women's participation as borrowers:

- ***to differentiate between women*** to find out whether women from particular backgrounds e.g. economic class, education, marital status and household type, ethnic group, geographical location is related to size of loan, numbers of loans, repayment problems and drop out. This is important to highlighting which particular target groups are likely to be easy to work with and those where there are more likely to be problems.

- ***to compare women with men*** along these lines of differentiation to get a much clearer picture of dimensions of gender difference. For example are poor men likely to require more assistance to increase incomes than better off women.

- ***to find out the differential participation or impacts of different programme strategies*** e.g. whether women participating in training programmes have better repayment performance and/or ability to use larger loans.

At the same time, even very simple quantitative measures taught in secondary schools are often used and explained badly. Summary guidelines for using simple techniques are given in Appendix 1. Where they are misused this can lead to serious misrepresentation of information and very unreliable conclusions[2]:

- ***Percentages have little meaning unless accompanied by a statement of the sample size.*** Percentages are not appropriate when the sample size is small (e.g. less than 30) because they give a false sense of accuracy.

- ***Average measures have little meaning without an indication of the level of spread.*** The particular ways in which average measures and levels of spread are calculated must also be carefully examined. Measures of average may be misleading if they lead the reader to assume that the average is a "typical" value. See Appendix 1.

- Exact values for data like income levels often ***conceal estimation and inaccuracies during the collection of the information.*** More appropriate here is the use of grouped data, despite the greater complexity of estimating averages and level of spread.

- Data on changes over time ***says very little about the significance of the magnitude of such changes*** without reference to contextual information e.g. comparative income levels, subsistence needs, beneficiary aspirations. These problems are not necessarily completely addressed by using control samples.

- Statistical relationships indicated by scatter diagrams, or even many of the more sophisticated statistical techniques, ***say very little about causation*** or the direction of any causation. They cannot therefore be taken as proof of impact of a particular programme or policy. Even use of control samples may not correct for 'selection bias' i.e. the parameters used for selection (e.g. gender, age, income level) may not allow for the fact that programme participants may be those with better contacts, more entrepreneurial motivation and so on and hence with 'success potential'.

[2] For more discussion of this see for example Nichols 1990; Mukherjee and Wuyts 1998.

Considerable care must be taken that sophisticated statistical techniques do not amplify rather than resolve these problems. This is a particular danger where the more sophisticated techniques are used by those who are not sufficiently experienced to identify their limitations and pitfalls. This means the analysis risks either being accepted uncritically or rejected as unnecessary obfuscation by those many development practitioners and academics from other disciplines who are unfamiliar with them.

1.3 From 'fuzzy anecdote' to credible inference: Increasing the rigour of qualitative analysis

Qualitative analysis is an essential complement to quantitative methods and must be integrated at all stages of an assessment. Qualitative analysis is inevitably to some degree subjective. Even in quantitative analysis subjective views influence which types of statistical relationships are investigated, which are considered significant and so on. In qualitative analysis however the interpretation of data requires greater insight and work on the part of the analyst and is therefore potentially even more open to any possible prejudice and preconceptions. Nevertheless it is possible to reduce bias in analysis through self-awareness and open acknowledgement of any strong views which might affect the analysis and constant examination of the implications for the conclusions[3].

It is often useful for some types of qualitative data to use diagrams to indicate interlinkages between types of indicator or different processes. Such diagrams include trees and flow diagrams, cognitive mapping, Venn diagrams and network diagrams. Many of these are also used in participatory methods. In qualitative analysis they provide a useful aid to think though ideas and hypotheses, inserting the sources of information and 'proof' and the gaps in knowledge.

In recent years a number of qualitative databases have been developed for computer analysis. Particularly in large impact assessments these may be very useful. One such database is QSRNUD.IST which operates through developing an index system in the form of a tree, similar to the Indicator Trees discussed elsewhere on this site . Data can then be searched along a number of simultaneous criteria. This indicates whether or not there are a large number of cases where particular combinations of criteria arise, as in quantitative analysis. It also identifies individual exceptional cases, which may need close examination to be presented as Case Studies. This method is also useful because often information about individuals may be given in interviews with other people, and this enables such information to be crosschecked. This programme is compatible with other database programs like Excel, Access and SPSS which can handle small amounts of qualitative as well as quantitative data. In assessments with very small samples it is possible to do this type of analysis using cards or a simple system of indexing

[3] For more discussion of academic debates about rigour in qualitative analysis see the various papers in Denzin and Lincoln 1994

files in a normal word processing programme or database with a search function.

At all stages there should be constant awareness of where any conclusions are based on the actual words of respondents and where they are based on inference by the researcher. As discussed in detail in the paper on qualitative methods on this website the rigour of qualitative investigation depends very much on the degree of detail and objectivity in recording information. It is important to consider how the general or immediate context of the interview might affect the responses given. For example: were people alone and free to talk openly, did they understand the questions or did it take time to adapt them for the local situation? The skill of the researcher is also crucial and the particular modes of interviewing. For example how directive was the questioning, did it follow a prescribed protocol or was it allowed to take its course? In either case what might have been the significant omissions or reasons for the interview taking the particular course it did? It is also important to justify the selection of case studies and respondents. How representative are they, are there any gaps in the sample and how might this affect the information given? Where interviews have been recorded on audio or videotape then it is possible to systematically crosscheck any analysis made at the time and hence errors of memory. It is also easier for others to scrutinise it if bias is suspected.

1.4 **Acknowledging power and process: Increasing credibility of analysis of participatory research**

Participatory methods are an essential part of integrated impact assessment in order to:

- increase the relevance of the questions being asked about development goals and processes
- increase the accuracy and reliability of indicators
- rapidly collect quantitative and qualitative information from people outside the core sample
- explore complex findings and processes arising from quantitative or qualitative research and their likely generalisability

When used with skill by someone familiar with the context they can be used to collect both quantitative and qualitative data. This can be as reliable as, and often more cost-effective than, other methods.

The degree of rigour and credibility depends partly on the participatory process itself. In particular decisions will need to be made carefully about the composition of groups producing pictorial outputs. In some cases it will be necessary to get separate matrices or diagrams for different stakeholder groups. In others one ‘consensual’ matrix or diagram may be sufficient. This depends partly on anticipated differences between stakeholders. Even where different maps are produced, it may also be interesting to see what happens when all stakeholders collaborate together. The differences between the joint

product and those maps which are separately produced is likely to be a good indicator of the ways in which power relations operate between the different groups.

Rigour and credibility will also depend on the ways in which the outputs are analysed. Aggregation of findings may be a problem, depending on the nature of the particular exercises and outcomes. However common features and trends can be analysed and even presented quantitatively. Importantly the diagram outputs cannot be treated uncritically as 'proof of consensus'. Contextual and other information is essential to interpreting and explaining their significance. As with qualitative methods it is important to take into account:

- the relevance of any contextual information in explaining group dynamics and the significance of particular diagrams

- what is actually said by different people and how this relates to the analysis made by the facilitators

1.5 Summary guidelines for assessing the credibility of practical conclusions

Box 1 summarises a number of key questions in assessing the credibility of analysis of information. Whatever methods are used there will need to be a careful explanation of:

- why particular methods were used
- theoretical assumptions underlying the hypotheses and development goals to be tested and assessed and hence also the conclusions drawn
- why particular indicators were chosen and how relevant they are in measuring or demonstrating the goals to be assessed
- how and why particular samples or informants were chosen and how reliable their information is likely to be
- any contextual factors influencing the collection of information
- the limitations of any conclusions and practical recommendations

The analysis must also discuss the degree to which the use of different methods has been used to cross-check information. It must also explain any discrepancies between different sources and the implications for the conclusions and recommendations.

BOX 1: KEY QUESTIONS IN ASSESSING THE CREDIBILITY OF ANALYSIS

QUANTITATIVE ANALYSIS

1) What theoretical assumptions underlie the questions being asked?

2) Why have particular statistical tests been used rather than others? What strengths and limitations will need to be borne in mind in assessing the credibility of any conclusions?

3) How and why were the indicators selected? What impact goals do they cover? What impact goals are not included? What are the implications for the relevance to the hypotheses to be investigated?

4) What sampling method was chosen? Are the statistical tests used appropriate for the sample size and method? Does the analysis look not only at averages but also measures of spread and the implications of outliers?

5) What practical problems were encountered in the research process? Did any contextual factors affect the reliability of responses on the different indicators? Did any problems affect either the randomness of the sample or purposive sampling? What are the implications?

6) How credible are the statements of inference made from any statistical tests or relationships? Have any assumptions of causality been backed up by other data?

QUALITATIVE ANALYSIS

1) What are the underlying understandings and biases of the researcher which might affect the investigation process and its analysis?

2) How far have contextual factors been taken into account in analysis of responses? What might be the significance of any omissions or lines of inquiry which are avoided by the respondent?

3) Why have particular cases been chosen? Because they are thought to be representative? Because they demonstrate exceptions and limitations of the hypothesis? Are these assumptions and the analysis made on this basis credible?

4) What methods have been used to make causal and other inferences from the information? How systematic and rigorous has this process been?

5) How far have any conclusions and recommendations been discussed? Were the people interviewed reliable and informed?

PARTICIPATORY METHODS

1) Why were particular exercises chosen? What are the underlying assumptions about the development process? What are their advantages and limitations?

2) Who participated? Who did not participate and why? What are the implications for the reliability or generalisability of the findings?

3) Was consensus reached and how? What are the implications for the generalisability of findings?

4) Are any contextual factors likely to have affected the outputs? Power relations during the participatory process itself? Unrealistic expectations or fears of consequences following the investigation?

5) How far have these factors been taken into account in the conclusions and recommendations presented?

SECTION 2: DISSEMINATING INFORMATION: HOW TO CONTRIBUTE TO PRACTICAL IMPROVEMENT

2.1 Disseminating information: an ongoing process

Many impact assessments have little influence on practical change within projects, programmes of the policy environment. This is the case even with useful assessments which have a contribution to make to practical improvement. This is partly because dissemination is often seen as a one-off event at the end of the assessment rather than a strategic and ongoing process which progressively gets different stakeholders involved. It is only through the involvement of a range of stakeholders that the findings of any assessment will come to be generally accepted. In the real world this is also likely to involve negotiation of potentially conflicting interests. In particular it will involve the participation of intended beneficiaries in order to ensure downward as well as upward accountability and implementation of pro poor changes.

There are two key dimensions to dissemination:

- synthesis of the information findings in reports
- face-to-face dissemination through participatory workshops

Both of these need to be seen as periodic rather than one-off events, particularly in larger scale more rigorous assessments.

2.1 Guidelines for writing reports

As with data analysis, the writing of reports should be a cumulative process. Many assessments start with an Inception Report which serves as a framework highlighting the points which require investigation. Clearly ideas may change depending on the findings of the investigation and ongoing analysis. But particularly in short assessments it is often very useful to have a relatively clear idea of how the final report might look in terms of tables, diagrams and the types of case studies needed at the beginning. This then serves as a point of reference to which changes can be made over time as analysis progresses. This will assist in focusing the investigation and the refinement process.

It is also useful to begin reporting on findings and discussing their implications with different stakeholders throughout the investigation process. The use of participatory methods at different stages of the investigation provides a useful forum for testing out ways of presenting information and the likely reaction of different stakeholders. It is also possible to discuss preliminary findings and their practical implications with key stakeholders in qualitative interviews. Until one is sure about the reliability of information and conclusions however the tentative nature of these should be stressed. This dissemination must also obviously be very carefully thought through in order not to prejudice the rest of the investigation. This means taking into account potential conflicts of interest and also potential repercussions of certain findings for different stakeholders.

At the end of the assessment a final report is generally required. The length, contents and level of detail may or may not be specified in Terms of Reference. Box 2 gives broad guidelines for writing final reports where this is not otherwise specified in TOR.

It is very important to know the audience for which any report is intended. In some cases resources permit a number of different versions of a report for different audiences. In others reports will inevitably be an uneasy compromise between simplicity for some readers and detailed analysis for others. In general reports should make the main body of the text as short and focused as possible, leaving detailed analysis of findings to annexes and appendices which are available for crosschecking and justification of conclusions as necessary. Whatever the length and content of the full report, it is always advisable to produce a short version for wider dissemination and possibly translation into local languages.

BOX 2: GUIDELINES FOR WRITING FINAL REPORTS

INTRODUCTION

This should cover:

- Why was the research done?
- Who commissioned and paid for the research?
- Who conducted the research?
- When was the research done?

- What information was collected?
- What methods were used in sampling?
- What practical problems were met during the fieldwork?

PRESENTATION AND ANALYSIS OF DATA

General presentation:

- avoid unsupported claims and be honest about the reliability of the information and discuss any methodological issues relevant to its interpretation
- assessments should have integrated practical questions in the methodology of the investigation including discussion of feasibility of recommendations made and details of this should appear either at the end of each section or in a separate section as appropriate

Structure:

- make an outline summarising the main hypotheses and conclusions in relation to each and use this to structure the report
- each section should have a heading and subheading, and preferably paragraph numbers
- in general the main point for each paragraph should come at the beginning.

Language:

- language should be as simple as possible to make it accessible to non-English speakers.
- avoid long and complicated sentences. Several short sentences are usually clearer than one long one. It is often clearer to present things in bullet point form rather than as continuous text. Use simple link words.
- avoid complicated tenses. Use simple present, past or future whenever possible. Choose active sentences rather than passive ones as this has more impact.
- give the meaning of abbreviations, colloquial words and acronyms
- do not give long lists of numbers because these are difficult to digest. Only use the most important figures and say what they mean.

Tables, diagrams and pictures: each must have a title, number, reference to the source of information, reference to the sample size, full description of what each row and column refers to and/or each category of information used

Case studies: should have a name or reference, state key relevant background details, make clear where information is in the words of the respondent and where based on interpretation by the interviewer.

Photos: simple caption indicating the main subject of photograph followed by who, when and where the photograph was taken, name of any organisation. The photographer's name should appear down the side.

CONCLUSIONS AND RECOMMENDATIONS

- justify any conclusions through brief reference to the main body of text and make sure that the text clearly explains how such conclusions are reached
- any practical recommendations arising at the end of the investigation should be discussed with the relevant stakeholders to ensure their

feasibility. Details of these discussions should be given to highlight any potential problems or risks and/or differences between stakeholders
- indicate any issues on which further information is needed

SUMMARY

- make this self-contained as it may be the only thing many readers read
- use the same headings as the main report
- this could also be combined with one or two tables and slightly extended into a short article for wider dissemination

2.2 Guidelines for dissemination workshops

Participatory workshops should be an integral part of the assessment process. The frequency and content will depend on the length of the assessment and the resources involved.

Ideally there should be an initial workshop with key stakeholders to:

- identify potential sources of information and hence where any assessment should focus to complement rather than duplicate existing information

- where possible enlist the support and interest of a range of different stakeholders to both assist with the assessment itself and also with dissemination at the end.

- clarify potential differences and conflicts of interest which will need to be taken into account in definition of issues to be investigated, analysing the data and disseminating to different stakeholders

There should then be periodic interviews, informal meetings or more formal workshops to discuss interim findings. This is crucial in exploring the possible practical implications of findings as they arise. It is also important for identifying any changes which might be necessary to make sure that the assessment process is as relevant, reliable and credible to different stakeholders as possible.

A final dissemination workshop/s should be held when the report is in its final draft stage i.e. sufficiently sure of its findings but before the final recommendations are agreed. One or more workshops should then be held with different stakeholders in order to gain acceptance and consensus as far as possible. It may be necessary to have one or more workshops in local languages with programme beneficiaries and field staff. Representatives from these might then attend a high-level workshop with senior staff and possibly members of local government, donor agencies, researchers and so on.

Having periodic dissemination and workshops of this type need not significantly increase the cost of the assessment. In many cases it will be a

question of integrating ongoing dissemination of particular findings into the assessment process itself as a means of exploring practical options for changes in projects programs or the policy environment. Official representation from government, NGOs or researchers will often be self funding provided the assessment is sufficiently relevant to their needs. This is particularly the case if these people are also asked to present their own work as an input to proceedings. The main costs would be inclusion of grassroots representatives in the workshops. Including a budget for this is however justified in terms of capacity building and also ensuring downward accountability to the findings of the assessment.

APPENDIX 1: STATISTICAL ANALYSIS: SUMMARY OF METHODS, USES AND PITFALLS

Averages: The averages a measure of where the centre, or middle, of a distribution lies. In statistics are three commonly used forms of average:

- ***The mean***: this is how we usually understand the word average. It is calculated by adding up a set of items and then dividing that total by the total number of items in the set. This is not very useful where there are a few and very extreme and possibly erroneous values.

- ***The median:*** this is the middle value when the data are arranged in order of size. Where there is an even number of cases and no single middle value it is obtained by adding the two middle values and dividing by two. This method is less influenced by extreme values but is more difficult to calculate manually with a large sample size.

- ***The mode:*** this is the most frequent value.

Measures of spread:

- ***The range:*** calculated by subtracting the lowest value of the data from the highest value. This is unreliable because it depends on just two values.

- ***Interquartile range:*** This divides the values into quarters. The three dividing values are called quartiles. The middle quartile is the same as the median. The interquartile range is found by subtracting the lower quartile from the upper quartile.

- ***Percentiles:*** which divides the sample into 100 equal-sized groups. These are useful with income data if for example you want to define a project target group as the 25% of households with the lowest income.

- ***The standard deviation:*** gives an indication of the average amount that values in a particular sample deviate from the mean value. To calculate the standard deviation, each deviation is squared and then take the mean for some squared deviations, which is called the variance. The square root of the variance gives the standard deviation. Standard deviations indicate how reliable the sample averages and percentages are a statement about the target population. If there is a lot of spread in the sample i.e. the standard deviation is large, you cannot make a very accurate statement about the whole target population from summary measures of the sample.

Tables, graphs and charts

- ***Cross tabulation*****:** a two-way table involving categorising the data in terms of two variables. For example the number of households by

economic class and income increase from an enterprise programme. This is one of the simplest and most useful ways of presenting information. It is however crucial to give a full description of what each row and column refers to, units of measurement used and sample size. Percentages must always be accompanied by sample size. They should also not be used for very small total sample size e.g. less than 30 because this gives a false impression of accuracy.

- ***Bar chart:*** a graph where the length of each bar varies with the data it presents.

- ***Histogram:*** is used to illustrate a data which is grouped. They are similar to buy charts except that the bars are touching and their area is very important.

- ***Scatter diagrams:*** used to study the relationship between two numerical variables which have exact values. Each pair of sample values are plotted onto a graph. Where the points seem to fall along a straight or curved line, this suggests a relationship between the two variables. This statistical relationship does not necessarily imply a causal relationship, and says nothing about the direction of causation.

RESOURCES

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