Module 4

Data, Analysis and Presentation
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<table>
<thead>
<tr>
<th><strong>ABBREVIATIONS</strong></th>
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<tbody>
<tr>
<td>ACT</td>
<td>artemisinin-combination therapies</td>
</tr>
<tr>
<td>ANC</td>
<td>antenatal care</td>
</tr>
<tr>
<td>ART</td>
<td>antiretroviral therapy</td>
</tr>
<tr>
<td>BCC</td>
<td>behavior change communication</td>
</tr>
<tr>
<td>BMI</td>
<td>body mass index</td>
</tr>
<tr>
<td>CAS</td>
<td>complex adaptive system</td>
</tr>
<tr>
<td>CHW</td>
<td>community health worker</td>
</tr>
<tr>
<td>CMS</td>
<td>Cooperative Medical Scheme</td>
</tr>
<tr>
<td>COS</td>
<td>Community of Science</td>
</tr>
<tr>
<td>DOT</td>
<td>directly-observed therapy</td>
</tr>
<tr>
<td>ERC</td>
<td>ethics review committee</td>
</tr>
<tr>
<td>FGD</td>
<td>focus group discussion</td>
</tr>
<tr>
<td>HDI</td>
<td>Human Development Index</td>
</tr>
<tr>
<td>HIV</td>
<td>human immunodeficiency virus</td>
</tr>
<tr>
<td>HRP</td>
<td>Special Programme of Research, Development and Research Training in Human Reproduction</td>
</tr>
<tr>
<td>IC</td>
<td>informed consent</td>
</tr>
<tr>
<td>ICF</td>
<td>intensified case finding</td>
</tr>
<tr>
<td>IDRC</td>
<td>International Development Research Centre</td>
</tr>
<tr>
<td>IEC</td>
<td>information, education and communication</td>
</tr>
<tr>
<td>iKT</td>
<td>integrated knowledge translation</td>
</tr>
<tr>
<td>IR</td>
<td>implementation research</td>
</tr>
<tr>
<td>IRB</td>
<td>institutional review board</td>
</tr>
<tr>
<td>IRP</td>
<td>Implementation Research Platform</td>
</tr>
<tr>
<td>KT</td>
<td>knowledge translation</td>
</tr>
<tr>
<td>KZN</td>
<td>KwaZulu-Natal</td>
</tr>
<tr>
<td>LLIN</td>
<td>long-lasting insecticide-treated net</td>
</tr>
<tr>
<td>LOI</td>
<td>letter of intent</td>
</tr>
<tr>
<td>LSHTM</td>
<td>London School of Hygiene and Tropical Medicine</td>
</tr>
<tr>
<td>LTFU</td>
<td>loss to follow-up</td>
</tr>
<tr>
<td>M&amp;E</td>
<td>monitoring and evaluation</td>
</tr>
<tr>
<td>MDR-TB</td>
<td>multidrug-resistant tuberculosis</td>
</tr>
<tr>
<td>NGO</td>
<td>nongovernmental organization</td>
</tr>
<tr>
<td>NSF</td>
<td>National Science Foundation</td>
</tr>
<tr>
<td>NTBCP</td>
<td>national TB control programme</td>
</tr>
<tr>
<td>OER</td>
<td>Office of Extramural Research</td>
</tr>
<tr>
<td>PI</td>
<td>principal investigator</td>
</tr>
<tr>
<td>PLHIV</td>
<td>person/people living with the human immunodeficiency virus</td>
</tr>
<tr>
<td>PMTCT</td>
<td>prevention of mother-to-child transmission</td>
</tr>
<tr>
<td>QDA</td>
<td>qualitative data analysis</td>
</tr>
<tr>
<td>RFP</td>
<td>request for proposals</td>
</tr>
<tr>
<td>SAGE</td>
<td>Strategic Advisory Group of Experts</td>
</tr>
<tr>
<td>SARS</td>
<td>severe acute respiratory syndrome</td>
</tr>
<tr>
<td>SMART</td>
<td>specific, measurable, achievable, realistic and timebound</td>
</tr>
<tr>
<td>SOP</td>
<td>standard operating procedure</td>
</tr>
<tr>
<td>SWOT</td>
<td>strengths, weaknesses, opportunities and threats</td>
</tr>
<tr>
<td>TB</td>
<td>tuberculosis</td>
</tr>
<tr>
<td>TDR</td>
<td>Special Programme for Research and Training in Tropical Diseases</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
</tr>
<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>
INTRODUCTION

The purpose of this module is to outline the fundamentals of IR data analysis and interpretation, (step 4 in the IR cycle). It also describes design of data analysis, presentation and interpretation for the target audience, with the objective of enhancing the uptake and use of research findings.

Upon completion of this module, you will be able to:

• Describe appropriate data analysis planning processes for both quantitative and qualitative data.
• Understand the appropriate measures for statistical analysis in quantitative research.
• Describe the data analysis processes in a qualitative study.

The module is divided into two main sections: the first focuses on quantitative data management, analysis and presentation, and the second one qualitative data management, analysis and presentation.

Before we begin…

We assume you are already familiar with these two approaches and tools of data collection (from Module 2). As a brief reminder you will be asked by the facilitator to identify some of the main differences between them (Table 1).

Table 1. Comparing qualitative and quantitative approaches

<table>
<thead>
<tr>
<th></th>
<th>Qualitative</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social theory</td>
<td>Action</td>
<td>Structure</td>
</tr>
<tr>
<td>Methods</td>
<td>Observation, interview</td>
<td>Experiment, survey</td>
</tr>
<tr>
<td>Reasoning</td>
<td>Inductive</td>
<td>Deductive</td>
</tr>
<tr>
<td>Sampling</td>
<td>Theoretical</td>
<td>Statistical</td>
</tr>
<tr>
<td>Strength</td>
<td>Validity</td>
<td>Reliability</td>
</tr>
</tbody>
</table>

KEY CONCEPTS

Data analysis plan

Most IR proposals use mixed methods in which qualitative and quantitative techniques are combined. Under the right circumstances, a mixed-methods approach can provide a better understanding of the problem than either approach alone.

To ensure that the analysis is undertaken in a systematic manner, an analysis plan should be created first. The analysis plan contains a description of the research question and the various steps that will be carried out in the process.

Designing analysis for use

Designing analysis for use in an IR project is based on the premise that the IR aims to: (i) understand the implementation processes, focusing on mechanisms that support or constrain those processes; and (ii) communicate that understanding of the implementation process to multiple stakeholders, who may consequently contribute to the integration of findings into current and/or future research.
Few of the stakeholders in the IR project team are likely have specialized knowledge of both quantitative or qualitative research methods. It is therefore essential that the analysis and most importantly, the presentation of findings, be carefully considered to avoid potential misinterpretations that could lead to inappropriate conclusions and/or responses.

Emphasis should be placed on simplicity and interpretability because stakeholders need to both understand the information provided and also be able to interpret it correctly (1). Data analysis should take place along with the data collection process. This continual data analysis process facilitates regular sharing and discussion of findings.

Emphasis on quantitative analysis should be on simple summary statistics, such as changes in:

- counts, means, medians, ranges, percentiles;
- rates, trends, ratios and (for some stakeholders) risks;
- frequency distributions, proportions and percentages.

**Designing analysis by purpose**

An important preliminary consideration when designing data analysis plan is to clearly define the primary objectives of the analysis by identifying the specific issues to be addressed. It is important to remember that data from IR is by nature intended not to simply describe the intervention but also to improve it.

For example, IR research may focus on:

- **Effectiveness**: Aims to modify implementation procedures in order to improve the generation of benefits.
- **Efficiency**: Attempts to assess the implications of possible modifications to the implementation process in order to increase the benefits in relation to resources.
- **Equity**: Focuses on distributional issues, i.e. how benefits and resource costs are distributed.
- **Sustainability**: Focuses on identifying essential inputs, potential constraints on their availability and other possible barriers to medium and long-term sustainability.

**Quantitative data analysis**

In IR, quantitative data analysis will include one or more of the following considerations:

- Frequency distribution and summary statistics.
- Relationships and confounding variables.
- Sub-group analysis.
- Statistical models.
- Generalizing from samples to populations.
- Trend analysis.

Variables in quantitative analysis are usually classified by their level of measurement, as indicated below.

- **Rational** – e.g. weight of child, number of vaccinations.
- **Interval (based on predetermined equal intervals)** – e.g. temperature, some disability measures.
- **Ordinal (ranks)** – e.g. facility levels, quality of life indices.
- **Nominal (categories)** – e.g. district names.
**Distributions and summary measures**

Quantitative research generates large volumes of data that require organization and summarizing. These operations facilitate a better understanding of how the data vary or relate to each other. The data reveals distributions of the values of study variables within a study population. For example:

- The number of children under five years in various households in a given population.
- Daily outpatient attendance in a health facility.
- The birth weights of children born in a particular health facility over a period of time.
- Educational levels of mothers of children born in a particular health facility.

Analysis of the type of data described above essentially involves the use of techniques to summarize these distributions and estimate the extent to which they relate to other variables. For example, in a sample of newborns we might summarize the distribution of birth weights by calculating the frequency of low, normal and high birth weights, classifying as normal those in some standard range. If we also calculated the frequency of different education levels for the mothers of those newborns, we could then estimate the strength of a possible relationship between these two variables.

The use of frequency distributions for this purpose has several advantages:

- useful for all types of variables.
- easy to explain and interpret for audiences without specialist knowledge.
- can be presented graphically and in different formats to aid interpretation (e.g. tables, bar charts, pie chart, graphs, etc.).

**Defining intervals for frequency distributions**

A key decision in constructing a frequency distribution relates to the choice of intervals. For example:

- Ordinal: Level of health facility (e.g. primary, secondary, tertiary).
- Interval: Body temperature (e.g. below normal, normal, above normal).
- Rational: Body mass index (BMI) (e.g. <25, 25–29, 30+).

There are two conflicting objectives when determining the number of intervals:

- Limiting the loss of information through the use of a relatively large number of intervals.
- Providing a simple, interpretable and useful summary through the use of a relatively small number of intervals.

Distributions based on unequal intervals should be used with caution, as they can be easily misinterpreted, especially when distributions are presented graphically.

**Data presentation formats**

Data reporting should be presented in both textual and visual formats (such as diagrams, maps, graphs, tables). Organizing and displaying the data in visual formats is useful in identifying trends and forecasts. The example below presents the same data in a variety of formats (e.g. table of frequencies, table of proportions/percentages, bar chart, pie chart, etc.).
Table 2: Provider education expressed as frequency table (example)

<table>
<thead>
<tr>
<th>Level of education of private providers</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>106</td>
</tr>
<tr>
<td>Basic literacy</td>
<td>74</td>
</tr>
<tr>
<td>Primary school certificate</td>
<td>57</td>
</tr>
<tr>
<td>Secondary school certificate</td>
<td>11</td>
</tr>
<tr>
<td>Higher level qualification</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250</strong></td>
</tr>
</tbody>
</table>

Figure 1: Provider education expressed as a bar chart (example)

Table 3: Provider education presented as proportion, percentage and cumulative percentage (example)

<table>
<thead>
<tr>
<th>Level of education</th>
<th>Proportion</th>
<th>Percentage</th>
<th>Cumulative percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>0.424</td>
<td>42.4</td>
<td>42.4</td>
</tr>
<tr>
<td>Basic literacy</td>
<td>0.296</td>
<td>29.6</td>
<td>72.0</td>
</tr>
<tr>
<td>Primary school certificate</td>
<td>0.228</td>
<td>22.8</td>
<td>94.8</td>
</tr>
<tr>
<td>Secondary school certificate</td>
<td>0.044</td>
<td>4.4</td>
<td>99.2</td>
</tr>
<tr>
<td>Higher level qualification</td>
<td>0.008</td>
<td>0.8</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1.000</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>
Table 4: Joint frequency distributions for two or more variables (example)

<table>
<thead>
<tr>
<th>Highest level</th>
<th>Men</th>
<th>Women</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>42</td>
<td>64</td>
<td>106</td>
</tr>
<tr>
<td>Basic literacy</td>
<td>45</td>
<td>29</td>
<td>74</td>
</tr>
<tr>
<td>Primary school certificate</td>
<td>32</td>
<td>25</td>
<td>57</td>
</tr>
<tr>
<td>Secondary school certificate</td>
<td>8</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Higher level qualification</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>128</td>
<td>122</td>
<td>250</td>
</tr>
</tbody>
</table>

Table 5: Row percentages (example)

<table>
<thead>
<tr>
<th>Highest level</th>
<th>Men</th>
<th>Women</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>39.6</td>
<td>60.4</td>
<td>100.00</td>
</tr>
<tr>
<td>Basic literacy</td>
<td>60.8</td>
<td>39.2</td>
<td>100.00</td>
</tr>
<tr>
<td>Primary school certificate</td>
<td>56.1</td>
<td>43.9</td>
<td>100.00</td>
</tr>
<tr>
<td>Secondary school certificate</td>
<td>72.7</td>
<td>27.3</td>
<td>100.00</td>
</tr>
<tr>
<td>Higher level qualification</td>
<td>50.0</td>
<td>50.0</td>
<td>100.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>51.2</strong></td>
<td><strong>48.8</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>
Table 6: Column percentages (example)

<table>
<thead>
<tr>
<th>Highest level</th>
<th>Men</th>
<th>Women</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>32.8</td>
<td>52.5</td>
<td>42.4</td>
</tr>
<tr>
<td>Basic literacy</td>
<td>35.2</td>
<td>23.8</td>
<td>29.6</td>
</tr>
<tr>
<td>Primary school certificate</td>
<td>25.0</td>
<td>20.5</td>
<td>22.8</td>
</tr>
<tr>
<td>Secondary school certificate</td>
<td>6.3</td>
<td>2.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Higher level qualification</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.00</strong></td>
<td><strong>100.00</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

Summary statistics and frequency distribution

Careful examination of the frequency distribution of a variable is a crucial step and can be an extremely powerful and robust form of analysis. There can be a tendency to move too quickly to the calculation of simpler summary statistics that are intended (but often fail) to capture the essential features of a distribution.

Summary statistics usually focus on deriving the measure indicating the overall location of a distribution (e.g. how sick, poor or educated a study population is, on average) OR to indicate the extent of variation within a population. However, the reasons for selecting a particular summary statistic should relate to the purpose for which it is intended.
To find out if a recently implemented intervention reduced the problem of malnutrition among five year-old children in a given village, a researcher may ask: “Which summary statistic is most appropriate?”

- Change in mean or median daily calorie intake of all five year-olds in village?
- Change in proportion of five year-olds in village falling below predetermined minimum calorie requirement?

The criteria for making such choices include:
1. Face validity (i.e. is the statistic relevant to the specific concern?).
2. Whether stakeholders understand how the data was derived.
3. Whether stakeholders are able to interpret the findings as intended.

Use of mean or median

The mean, or average, is the most commonly used summary measure of location. However, it is often inappropriately used as the standard measure of central location because the mean is simple to calculate and manipulate. For example, it is straightforward to combine the mean of sub-populations to calculate the overall population mean. The mean is also frequently misinterpreted as the typical value in a population. For example, the GDP of a certain middle-income country was calculated as 3200 US$. Interpreting this as the income of an ‘average’ person in that country does not reflect reality (in fact, it was closer to 1200 US$). The mean is often unrepresentative when the underlying distribution is skewed.

The median, defined as the middle value, is relatively easy to explain. The magnitudes of other values are irrelevant. For example, if the largest value in a given range increases or the smallest value decreases, the median remains unchanged.

When a data set is not skewed (or when data are distributed ‘normally’), the mean and the median will be the same (Figure 4).

Figure 4: Normal distribution: The mean is the measure of central location
In a skewed distribution, the mean is more difficult to interpret.

**Measures of risk**

Although measures of risk are widely used in health research, they are not always well understood. For example, risk and odds are often used interchangeably however do not mean the same thing.

- **Risk** (P): number of people experiencing an event/population exposed to the event.
- **Relative risk** (PA/PB): risk in group A compared to risk in group B.
- **Odds**: number experiencing versus number not experiencing = P / (1-P)
- **Odds ratio**: [(PA/(1-PA)) / (PB/(1-PB))]

Furthermore, reduction in risk is not equivalent to reduction in odds:

- PB (malaria before intervention) = 0.5
- PA (malaria after intervention) = 0.1
- Reduction in risk = 0.1/0.5 = 0.2
- Reduction in odds = (0.1 / 0.9) / (0.5 x 0.5) = 0.11

**The ‘denominator problem’**

When calculating risk, it is essential to know the overall size of the population at risk. In implementation studies, it is often difficult to calculate or reliably estimate these summary statistics because the denominator is not reliably known. For example, we may only have an estimate of the number of children who should be immunized or should be sleeping under a mosquito net in a given district. Similarly, the catchment population of a facility or actual number of births over a period of time are often unknown. For these reasons, denominators are usually based on projected populations resulting in reported coverage of over 100% in some instances.

Because of this uncertainty, it is good practice to provide the estimates of both the numerator and denominator alongside any proportion, percentage or risk estimate and indicate the sources used in the calculation.
**Measures of variation**

How much variability occurs in a given population?

- **Low variability:** Measures of location can be seen as reasonably representative of the overall population; there is limited loss of information through aggregation.
- **High variability:** Representative measures of location are less useful; there is a substantial risk of losing information by aggregation unless the nature of the distribution is well understood.

**Choice of measures**

Variances, standard deviations and coefficients of variation are widely used in statistical analysis. As with the mean, this is not because they are always the best measures of variability (they can be easily interpreted for normally distributed variables but not for other distributions), but mainly because they can be readily calculated and manipulated.

For example, given the variances of two population sub-groups it is easy to combine them to calculate the overall population variance. However, while they may have technical advantages, these measures have serious limitations in terms of policy application.

**Alternative measures**

More readily interpreted measures include quartiles and percentiles.

Quartiles: divide data into four quarters (Q1 to Q4) – 25% in each:
- 1. Q2 is the median.
- 2. Q1 is the median of the data points below the median.
- 3. Q3 is the median of the data points above the median.
- 4. Q3-Q1 is the inter-quartile range, comprising the middle 50% of a population.

Percentiles divide the data into two parts:
- p percent have values less than the percentile.
- (100 – p) percent have greater values.
- 50th percentile = median; 25th percentile = first quartile.
- Other common percentiles:
  - 20th (which defines the first quintile group).
  - 10th (which defines the first decile group).

**Sub-group analysis**

The outcomes of an intervention may vary substantially between different sub-groups of the target population. Sub-group analysis can be complex if the sub-groups are not pre-defined. Investigating a relationship within a sub-group because it appears interesting could bias the findings.

Data mining (i.e. exploring data sets to discover apparent relationships) is useful in formulating new hypotheses but requires great caution in IR. The context within which this sub-analysis is undertaken should be considered carefully, because relationships between inputs and outcomes may be mediated by contextual variables. For example, we might assume that it would be useful to undertake an analysis of chronic illness by age group and sex, as shown in Table 7. For meaningful interpretation of the results, the type of chronic illness and the background of the patients experiencing them are important variables to consider.
Table 7. Background variables of patients with chronic illnesses

<table>
<thead>
<tr>
<th>Age group</th>
<th>Chronic illness prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
</tr>
<tr>
<td>15–24</td>
<td>0.55</td>
</tr>
<tr>
<td>25–44</td>
<td>1.79</td>
</tr>
<tr>
<td>45–64</td>
<td>4.91</td>
</tr>
<tr>
<td>65</td>
<td>12.86</td>
</tr>
<tr>
<td>All</td>
<td>1.77</td>
</tr>
</tbody>
</table>

**Controlled and confounding variables**

In the example of chronic illness (Table 7), we often describe such an analysis as one that assesses the relationship between inputs and outcomes by controlling for age group and sex. However, we know that in practice, a very large number of other factors may influence this relationship, for example occupation, level of education, socioeconomic status, household size, type of dwelling, rural/urban location, etc. Random allocation of subjects to intervention and control groups would allow us to argue that the potentially confounding effects of such variables average out. If that is not possible, we should find some way to control for these effects. Because IR takes place in real life and within complex adaptive systems, these effects may be difficult to control, however they must be considered.

**Analysis of qualitative data**

There are many traditions of qualitative research and it has been argued that “there cannot and should not be a uniform approach to qualitative methods.” Similarly, there are few “agreed-on” canons for qualitative data analysis, in the sense of shared ground rules for drawing conclusions and verifying sturdiness. Many qualitative studies adopt an iterative strategy – collect some data, construct initial concepts and hypotheses, test against new data, revise concepts and hypotheses, etc. This approach implies that data collection and analysis are embedded in a single process and undertaken by the same individuals.

However, with the increasing use of qualitative research in epidemiology and health research, objectives are pre-defined prior to data collection. Qualitative data analysis can be done manually or with proprietary software like the examples listed below:

- **Atlas-ti** deals with large data sets, unstructured coding, mimic paper code and sort.
- **NVivo** handles relatively less data, caters for unstructured coding, find patterns/relationships in codes.
- **MaxQDA** provides powerful tools for analysing interviews, reports, tables, online surveys, videos, audio files, images and bibliographical data sets.

There is a considerable range of choice in software for analysing qualitative data. Researchers should feel free to use whatever analysis method (with or without software) they are comfortable with. Whatever approach is used, all qualitative analysis involves making sense of large amounts of data, identifying significant patterns and communicating the essence of what the data reveal.

The three core requirements of qualitative analysis are:

1. Detailed description of techniques and methods used to select samples and generate data.
2. Carefully specified analysis, with attention to issues of validity and reliability.
3. Triangulation with other data collection method.
Validity and reliability in qualitative research

Validity in qualitative studies focuses on internal validity, with researchers seeking an in-depth understanding that will allow them to counter alternative explanations for their findings. Qualitative studies often rely on purposive sampling, which tend to detract from claims for external validity (generalizability).

In quantitative studies, ‘reliability’ means repeatability and independence of findings from the specific researchers generating those findings. The term reliability is most often associated with quantitative research. However in qualitative research, reliability implies that given the data collected, the results are dependable and consistent. The strength of qualitative research lies in validity (closeness to the truth). Good qualitative research, using a selection of data collection methods, should touch the core of what is going on rather than just skimming the surface.

4. Analysis of textual material

The basic process for the analysis of text derived from qualitative interviews or discussions is relatively straightforward and includes:

1. Identification of similar phrases, themes and relationships between themes.
2. Identification of similarities and differences between population sub-groups (e.g. men/women, rural/urban, young/old, richer/poorer, etc.).
3. Initial attempts to generalize by identifying consistent patterns across or within sub-groups.
4. Critical review and revision of generalizations, paying particular attention to contradictory evidence and outliers.

Example: Focus group discussions

As far as possible, outputs of focus group discussions (FGD) should be verbatim records. The notes taken by the recorder should be compared to a recording of the discussion. The recorder and moderator should agree on a final transcript. The transcripts (from multiple FGDs) should provide the material for systematic analysis.

FGD analysis will typically address a number of specific research topics and sub-topics, such as eliciting additional topics of local concern, which can be used to define the broad domains for analysis. These can be sub-divided further into themes, sub-themes, etc. and allocated systematic codes.

The initial descriptive analysis should also capture: (i) most common themes mentioned; (ii) less common themes; (iii) common associations between themes; and (iv) similarities and difference between sub-groups.

The critical review and revision should: (i) review original text to assess the extent to which it conforms to the above analysis; and (ii) pay particular attention to any contradictory evidence, minority viewpoints, etc.

Domain/theme analysis

One relatively simple approach is based on the identification of key topics, referred to as ‘domains’, and the relationships between them.

There are four stages in domain/theme analysis:

1. Identify main issues raised by the interviewees – the domains/themes.
2. Group more detailed topics within each of these domains to construct a taxonomy of sub-categories.
3. Specify what was actually said, the components within each sub-category.
4. Exploration of interrelationships between the various domains.

Box 2

Example: Focus group discussions

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The critical review and revision should: (i) review original text to assess the extent to which it conforms to the above analysis; and (ii) pay particular attention to any contradictory evidence, minority viewpoints, etc.
Domain/theme identification
- Index texts, identifying topics line-by-line.
- Collate these topics across all interviews to identify a preliminary list.
- Some will recur more frequently than others and some of the latter can be classified as sub-topics.
- Systematically combine related topics to develop a list of just a few fairly broad domains.

Example of an initial list of topics and sub-topics (6):
- Getting and being pregnant: Signs of pregnancy, danger signs, physical problems.
- Feelings during pregnancy: Anxiety, anger/fright, worries, embarrassment, inconvenience, impressions.
- Family planning: Methods.
- Advice/activities to promote health: Exercise, activities, smoking, self-care, advice sources, information sources.
- Birth and miscarriage: Previous experiences, place, signs, caesarean/normal, birth weight.
- Antenatal care: Staff, place, experiences, meetings, tests, distance/cost, logistics, waiting time.
- General background: Family, employment, geography.

Initial list of potential domains/themes
From the above example, the following broad domains were identified:
- Motivations for antenatal care.
- Medical process (experiences of antenatal care and evaluation of that care).
- Risks during pregnancy.
- Reproductive histories.
- Socioeconomic background.

Figure 6. Taxonomy of sub-categories (from Atkinson and AbuEl Haj, 1996)
After listing the domains (Figure 6), it is useful to start arranging the actual segments of text into the primary domains. This process groups actual phrases together and allows the sub-categories to emerge directly from the interviewees’ own words.

**Relationships between domains /themes**

This stage involves identifying relationships between the domains or topics to build up an overall picture. Within the collection of actual quotations from respondents, the researcher should identify statements that relate one topic to another. For example, in the study described above, researchers were able to establish associations between the domains that linked women’s previous experiences, risk perceptions and socioeconomic situation to their evaluations of health services.

![Relationship between domains (from Atkinson and AbuEl Haj, 1996)](image_url)

**Coding schemes**

Following an initial analysis to gain an overall understanding of the main features of the data, many analysts apply a systematic coding procedure. The researchers determine the most appropriate way to conduct a systematic analysis, uncovering and documenting links between topics, themes and sub-themes (3). These codes are assigned to specific occurrences of words or phrases, highlighting patterns within the text while preserving their context, as in Table 8.
Table 8. Matrix of perceived cause and signs of malaria

<table>
<thead>
<tr>
<th>Malcause</th>
<th>Village A women</th>
<th>Village A men</th>
<th>Village B women</th>
<th>Village B men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malcause</td>
<td>Mosquitoes</td>
<td>Mosquitoes</td>
<td>Mosquitoes</td>
<td>Mosquitoes</td>
</tr>
<tr>
<td>Fresh mangoes</td>
<td>Standing in the heat</td>
<td>Standing in the heat</td>
<td>Standing in the heat</td>
<td>Standing in the heat</td>
</tr>
<tr>
<td>Yellow eyes</td>
<td>White lips</td>
<td>Yellow eyes</td>
<td>Yellow eyes</td>
<td>White lips</td>
</tr>
</tbody>
</table>

Reflection activity

We have discussed the need for an analysis plan including various methods of and tools for analysing and presenting the data.

- In your research team, discuss how you plan to analyse and present your data.
- How will you ensure validity and reliability of your data?
- What kind of analysis will you/your team undertake?
- Will you be using any software for your data analysis?
- Discuss the reasons for your decision to use (or not use) software for your analysis.
- How will you present your data?

APPLICATION OF KEY CONCEPTS

The example below describes thematic analysis, presentation and interpretation of FGD data.

Example: Njeru et al. 2011 (7)

Practicing provider-initiated HIV testing in high prevalence settings: Consent concerns and missed preventive opportunities

Background: A population-based survey was conducted among adults in the three study districts (Malindi, Mbarali & Kapiri Mposhi) in Kenya. Two HIV counselling models were compared: Model 1: Client-initiated HIV counselling and testing is commonly referred to as voluntary counselling and testing (VCT) and Model 2: Provider-initiated testing, in contrast to the client-initiated testing, is recommended by a health provider to people attending a health facility.

In-depth interviews and focus group discussions were employed to explore informants' experiences and perceptions of the HIV testing services with an emphasis on experiences with the provider-initiated testing model. The groups consisted of: female outpatients, male outpatients, pregnant women attending antenatal clinics and youths aged 18 to 24 years.

Analysis was conducted through the use of a framework analysis. Data analysis for all data sets involved five main steps: familiarization, identification of a framework, indexing, charting and interpretation.
Below are some of the results presented as verbatim quotations from the respondents and the made by the researchers' interpretation.

Objective: to explore respondents’ perceptions and experiences with counselling during HIV testing

Main theme: The value of counselling

Sub Theme: The Preventative Aspect

Opportunities for HIV prevention provided by counseling emerged as important issues in our interviews and discussions.

- “The importance of counselling emerges when a person who has not been infected gets advice and follows it, because s/he will not get this disease.”  (Female 26 years old, urban Malindi). “Counselling is very important because if you are counselled you get the courage or the strength to prevent being infected as you are told the way forward.” (Female youth, FGD, urban Malindi)

- “As for me I was tested at the VCT. There they really counselled me on HIV and on how I can protect my life.” (Male adults, FGD, urban Malindi)

Sub theme: The support dimension

The need for counselling as an important dimension in supporting those already infected with HIV was a point that was brought up in both the IDIs and the FGDs across the three districts. Both male and female informants from the three countries expressed the view that sufficient post-test counselling has the potential to reduce worry, fear and blame as illustrated in the quotations below:

- “Because if you have been made aware through counselling, even if you tested positive, there will be no fear, that’s why some people declare that they are HIV positive, they had seminars where they were counselled and that is why they have that courage. But if one discloses his status as positive here people will talk about him; some will even deny him drinking water because of fear”. (Male adults, FGD, Mbarali)

Sub theme: The time dimension

The need for sufficient time during counselling to clearly convey messages emerged as vital in the testing services. In order to fully conceptualise and understand the information presented more time was identified as needed before embarking on the testing. In this manner, so that one would be prepared to receive the test results whatever the outcome might be.

- “When I say we need education, I mean we need counselling, we need counselling that is offered step by step until we are ready to test.” (Male adults, FGD, Mbarali)

- “When you enter the facility and after the counselling you are immediately asked if you are ready for the test. No! That also can cause a lack of willingness to test. The counsellor should counsel me and tell me I have the right to go for testing. Therefore, if the time for counselling is increased, I see that as an improvement.” (Female adult, FGD, rural Malindi)
Major Theme: Challenges Experienced with the Implementation of the PITC Model in HIV Testing

Sub theme: Threat to counselling
- “During the second pregnancy we were not given a choice. It was a must to get tested on HIV and then (after that) on the pregnancy. We were not asked; you enter in the room for HIV testing and then you go for other tests. To tell you the truth, some there got quite scared that day when we were suddenly tested. People panicked a lot. So people were not happy, but it was a must that they do it.” (Female 35 years old, urban Malindi)
- “It was said that according to the rules of the hospital if someone reaches the time of delivery and does not have HIV results she is not received.” (Female 35 years old, urban Malindi)
- “If you refuse to test they don’t examine your stomach. So when it is time for delivery they don’t accept you.” (Female pregnant, FGD, Urban Malindi)

Sub theme: HIV testing as mandatory
In Malindi our informants reported that the HIV test within PMTCT was no longer voluntary. A common phrase that was used to describe the new testing model was “it is a must”, a point noted by both female and male respondents:
- “I was not tested at a VCT centre, but at that place for women (ANC clinic). Because when you are pregnant, you are tested on many things, but first they must test you for AIDS.” (Female pregnant 40 years old, urban Malindi)
- “Here let’s say women and men go for (HIV) testing, but a majority of them are women because the woman must be tested when she goes to the clinic.” (Male 34 years old, urban Malindi)

Sub theme: The expressed burden on women
- These counsellors should be many to help us because we are wives, and when you ask your husband to go to test himself he stays quiet refusing to talk. He tells you ‘you get tested, if you are found to be ok, I am also ok’. He does not go.” (Female pregnant, FGD, urban Malindi)
- “You know also there are many incidents which have come up because you find that when a woman is heavy (pregnant) it’s like the husband forces the wife to go for testing, you see? If anything bad arises (meaning if she is HIV positive) he starts questioning the wife, and asks ‘where did it come from?’” (Female pregnant, FGD, rural Malindi)
CONCLUSION

Congratulations on completing Module 4 *Data Analysis and Presentation*. This module provided you with an outline of the basics of IR data analysis and interpretation. It also described the design of data analysis, and data presentation and interpretation for the target audience to enhance uptake of the findings. We hope that you have enjoyed this module and have increased your knowledge and understanding of data analysis and presentation. We encourage you to continue with Module 5 entitled, *Communicating the findings and feeding them back into the health system*. 

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REFERENCES


Additional reading

