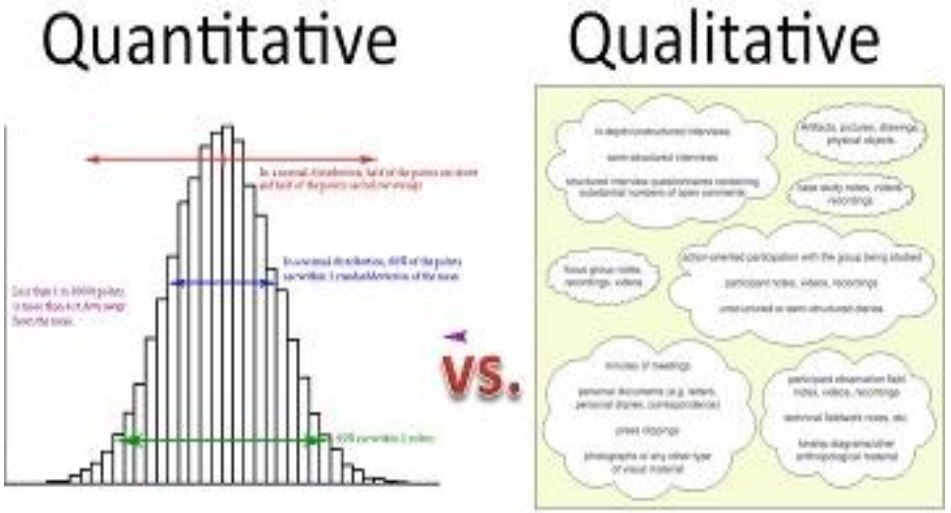
Data analysis - understanding data for qualitative quantitative inquiry

Data collection and sampling

Are our care practices effective, consistent and equitable?

Quantitative research

- Describe Variables
- Examine Relationships
- Determine Differences
- Test a Treatment
- A Combination of these



Data collection and sampling

PROBABILITY SAMPLING (REPRESENTATIVE SAMPLING)

Random sampling = all have a chance

Cluster sample reduce costs / interviews

Simple random	pulling out of a hat
Systematic random	tables of random numbers
Stratified sample	homogenous sub-groups

(e.g. hypertension)

Data collection and sampling

Non probability sampling (non Random)

1.Convenience sampling– easiest to access/ cheaper / pragmatics

2.Purposive (Judgemental) sampling – judgement of the researcher – homogenous group / maximise diversity

3.Self selection sampling – the participant chooses to be involved in the research

4.Quota sampling - proportional group e.g. males and females.

5.Snow balling sampling– difficult sub populations to identify (e.g. marginalized groups)

Data collection and sampling

SAMPLE SIZE

Sample depends on the size of the effect

Generally think 25 participants are required at a minimum.

Generally when comparing (univariate comparison of only one variable) of 2 groups - 25 participants in each group.

Many researchers plan to recruit anywhere from 5% to 10% extra, to make sure they have a robust sample at the end of the day.

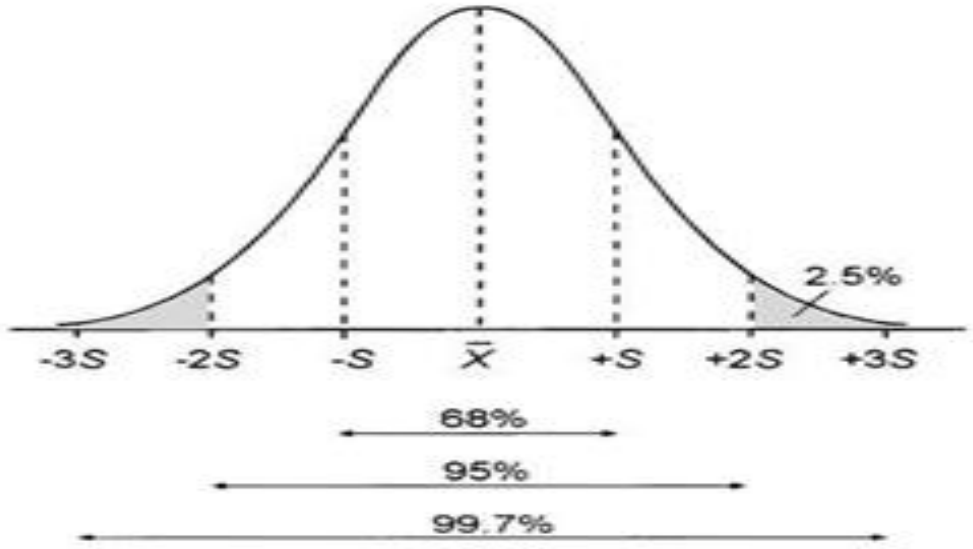
Depends on the variability of the data

10 outcomes per independent variables for multiple logistic regression

20 participants per independent variable in multiple linear regression

Generally at least 25 per group in a simple 2 - group comparison

Introduction to quantitative analysis statistics



Introduction to statistics

Descriptive Statistics	Are about describing samples or populations
	Correlation describes the magnitude of the relationship between two measures. It can be positive or negative correlation
	Summarise data
	Frequency distributions
	Measures of central tendency
Measurement scales	Ratio scale: equal intervals; zero; magnitude e.g blood pressure
	Interval scale: equal intervals; magnitude e.g temperature
	Ordinal scale: magnitude e.g. triage codes (categories)
	Nominal scale: no zero, magnitude or equal intervals e.g. gender

Introduction to statistics

Descriptive Measures

Frequency tally

Histogram/ Polygon (continuous) spread, skewness variability

Central Tendency

Mean sum divided by the number

Median - 50%

Mode - frequent number

Variability (dispersion)

Range highest minus lowest

Standard Deviation +/-differ from the average (mean)

Introduction to statistics

	A	B
1	*Column1*	
2		
3	Mean	6.103773585
4	Standard Error	0.878916392
5	Median	3
6	Mode	1
7	Standard Deviation	9.048998098
8	Sample Variance	81.88436658
9	Kurtosis	13.81299585
10	Skewness	3.39746436
11	Range	57
12	Minimum	1
13	Maximum	58
14	Sum	647
15	Count	106
16	Confidence Level(95.0%)	1.742728797
17		

Level 1 Data

- Descriptive Statistics (mean, standard deviation or median, IQR)

Differences statistics (p value)

T-Test chi square ANOVA, Kruskall-Wallis

Association statistics (relationships – cause and effect)

Probability and p-values

What is the p-value that you get from a statistical test?

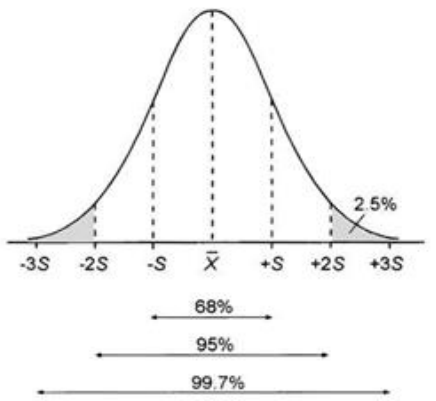
- The probability that the test statistic would take the observed value if there is no difference.

  The assumption is considered true (i.e. there is no difference) if the p-value is large (p>0.05, e.g. p=0.50). The results happened by chance (i.e. sampling variation)

  Researcher selects the level **0.05, 0.01, or 0.001** to be the maximum value for statistical significance

It is just chance that we observed ungraduated health professional's average (mean) height population. The assumption is considered false if the p-value is small – (p<0.05)

– It was not by chance

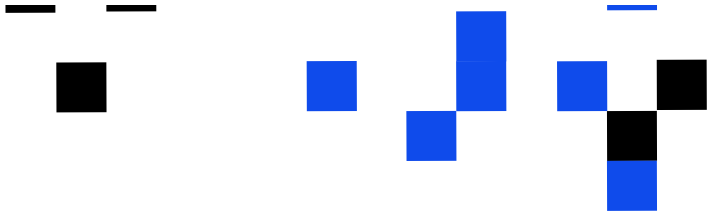


Introduction to statistics

Error Types

Your conclusion ↓	H_0 true In REALITY the groups are the SAME – there is NO difference	H_0 false In REALITY the groups are DIFFERENT – there IS a difference
Accept H_0 *You conclude that new treatment is NOT more effective*	True -ve Correct conclusion	False -ve Type II error, β
Reject H_0 *You conclude that new treatment IS more effective*	False +ve Type I error, α	True +ve Correct conclusion

Introduction to statistics



Inferential statistics **are not descriptive**

- They enable generalisation of the sample to populations

  Populations are too big for a sample to truly reflect them

Need a sub group

To draw **inferences** about a population on the basis of sample data

probability

The ratio of the numbers of favourable outcomes to the total number of possible outcomes

Statistical Tests: Parametric and non parametric testing

Introduction to statistics

Inferential statistics (correlation)

Non parametric - **(ordinal / nominal data)** Chi square / fisher exact – proportions of data

Assumption: Distribution is not normal – rankings

To test percentages, medians, ranks

Parametric – **(interval / ratio data)** compares means – more powerful

t Test / Pearson's correlation / Odds Ratio

Assumptions normal distribution

Introduction to statistics

Correlation is a measure of the association between two continuous variables (probability)

Correlation Coefficient is one measure of such association (*r*)

Perfect correlation = 1

Positive or negative relationship only

- Values range from -1 to 1
  - Strong correlation > 0.5
  - Moderate correlation 0.2-0.4
  - Weak correlation < 0.10

Introduction to statistics

Correlational - scatter plots

Anxiety and Pain Score

Triage code and pain score

Pearson's correlation *r*

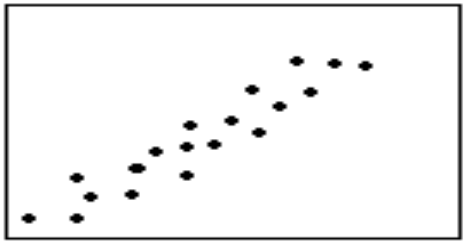
Scatter diagrams

+1 = maximum positive correlation straight line

Strong correlation r=.80 positive or -.50

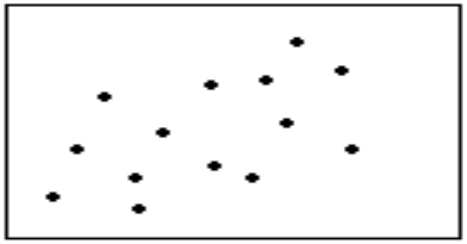
Completely **unrelated = 0** no linear line (r=0)

Degree of Correlation



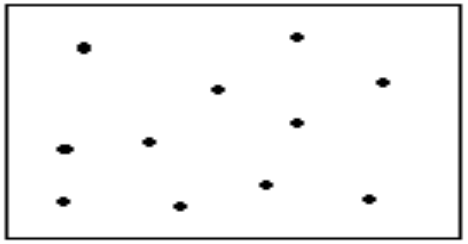
Strong Positive

Strong Negative

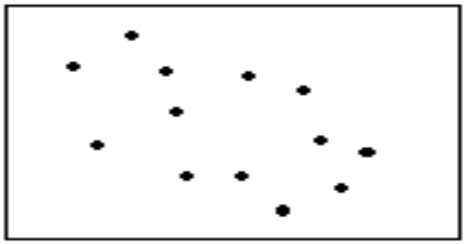


Weak Positive

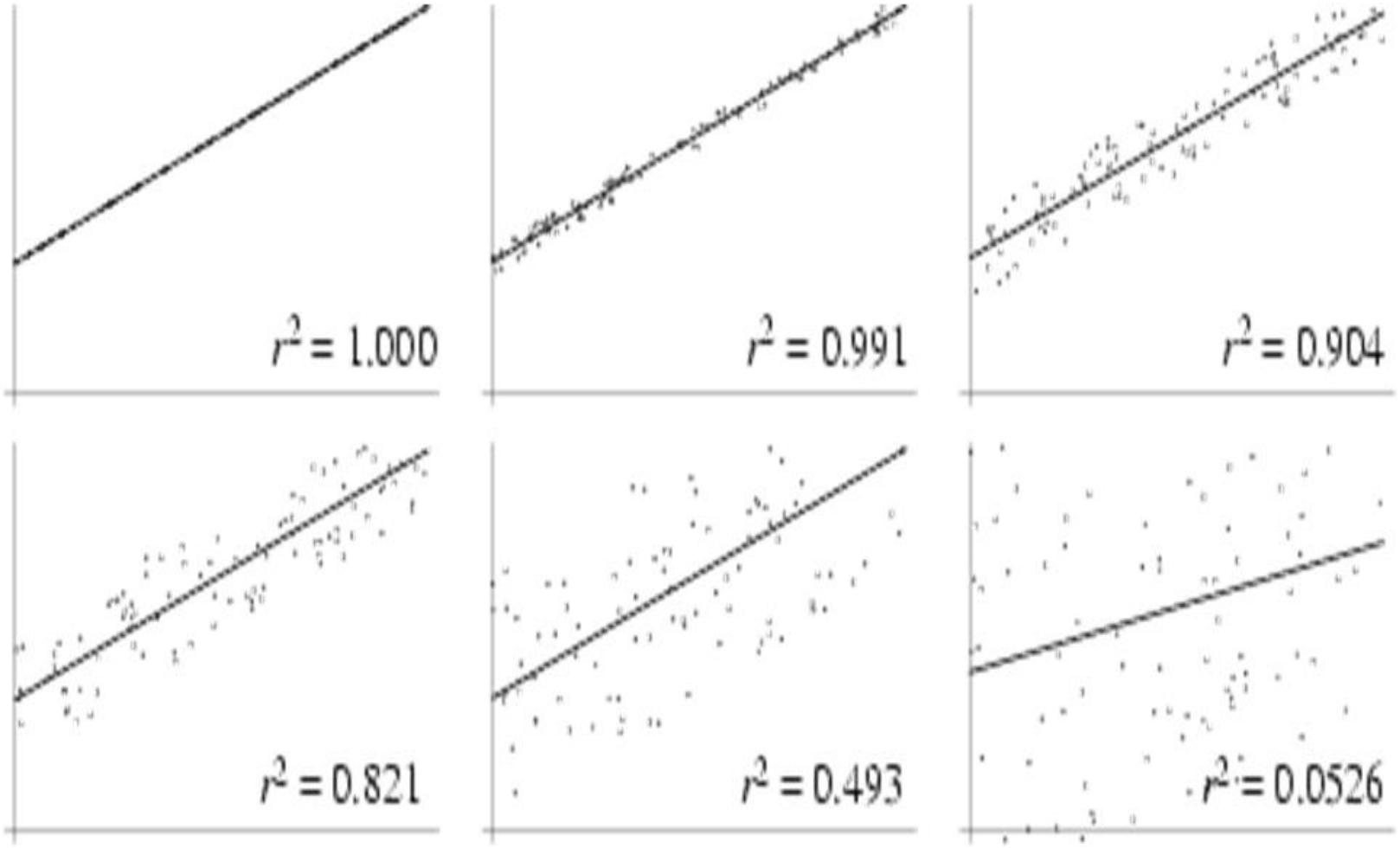
Moderate Negative



None



Weak Negative


$r^2 = 1.000$
$r^2 = 0.991$
$r^2 = 0.904$
$r^2 = 0.821$
$r^2 = 0.493$
$r^2 = 0.0526$

Introduction to statistics

Skewness

Just simply measure skewness

Can be positive or negative

Easy to see using a histogram

The more similar the database the less the skew

Does it look heavy tailed or light tailed?

Skewness for normal distribution is equal to 1

Kurtosis

Normal distribution is equal to 3

Examining the tails of the distribution is important – what is going on?

Thematic analysis - understanding the raw data of qualitative inquiry

'Naturalistic Inquiry' : 'Why' 'how' 'what' of "everyday life"

Qualitative research provides insight into social, cultural, emotional and experiential aspects of health and health care.

Not usually interventional

Provides rich description of the world

Complimentary rather than in competition

Deeper meaning to life experiences

Descriptive/ Exploratory/Discovery (emergent)

Interactive participant with the research

Outcomes

Thematic – capturing critical elements of the data in relation to the question

Conceptual / theory generating

Thematic analysis - understanding the raw data of qualitative inquiry

Thematic analysis the how

Why "everyday life"

Qualitative researchers provide insight into social, cultural, emotional, language and experiential aspects of life.

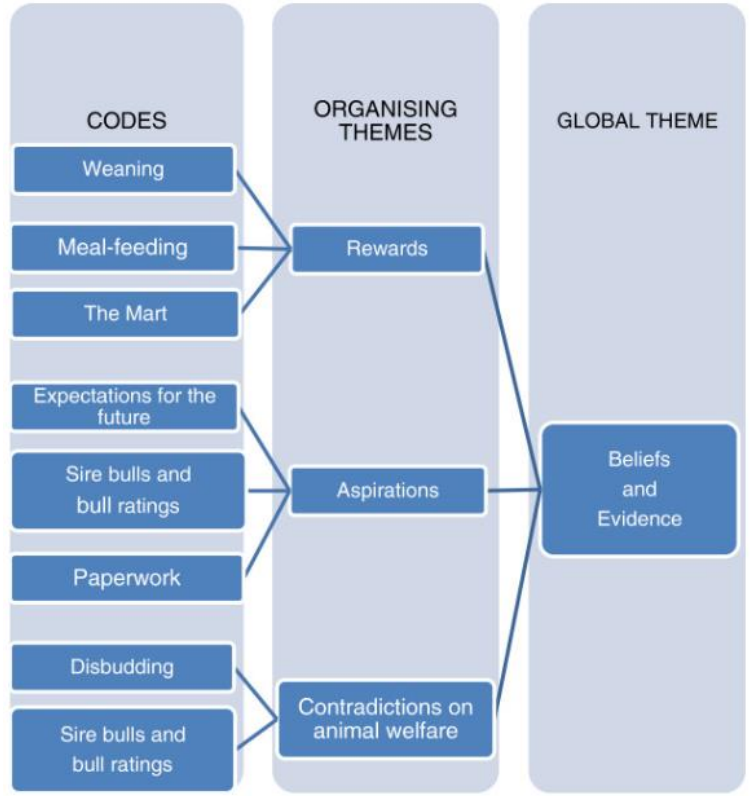
Deeper meaning to life experiences and processes- Understanding of processes rather than a measurable outcome

Provides richer description

Complimentary rather than in competition

Understanding of process rather than outcome

Not usually interventional



Thematic analysis - understanding the raw data of qualitative inquiry

Qualitative methods

Not usually an Intervention / Blinded

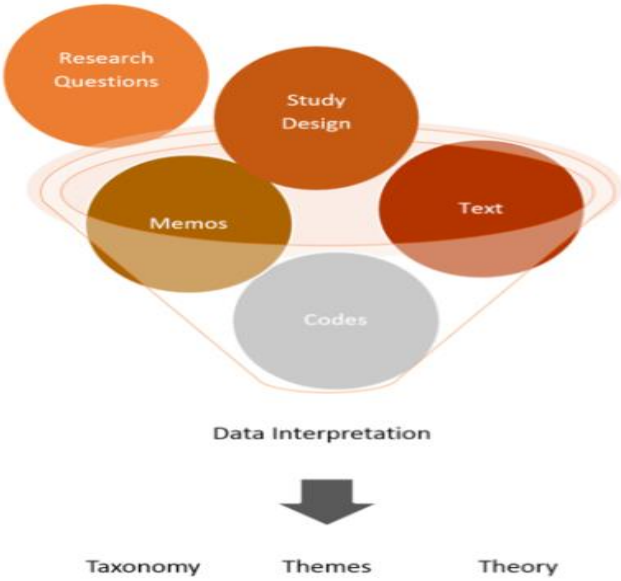
- Interviews (recoding and transcribing)
- Survey tools
- Field Observation
- Secondary sources

Data analysis (units)

- What are the types of data collection used?
- Do the themes fit with the data?

Analysing texts

- What is the question: content analysis; cultural analysis; statistical analysis etc
- Textual meaning derived by researcher when and how ?
- How do you measure that ?
- How large is your sample ?



Thematic analysis - understanding the raw data of qualitative inquiry

Thematic analysis the how

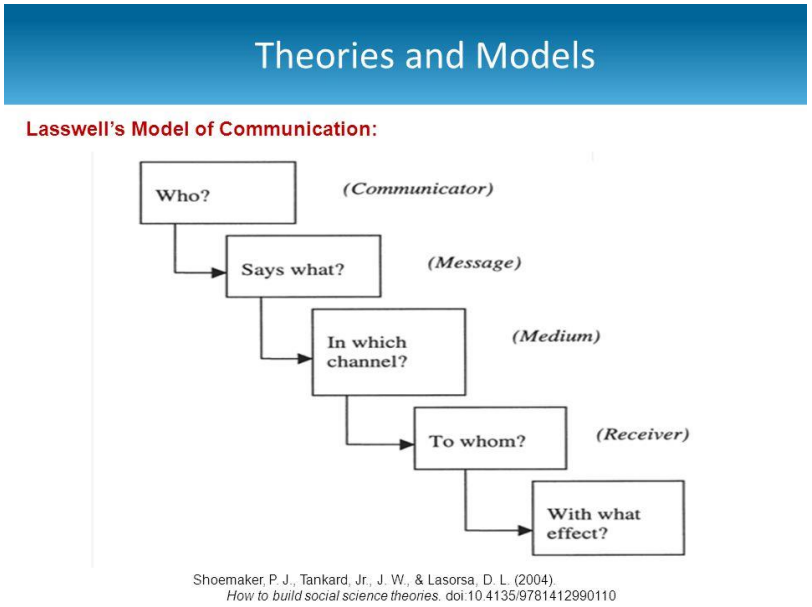
Thematic analysis is a method for identifying, analysing, and reporting patterns (themes) within data.

It organises and describes your data set in (rich) detail.

A level of interpretation by the researcher occurs.

The *range* of different possible thematic analyses frameworks will be determined by the lens through which you look.

The lens determines the framework



Thematic analysis - understanding the raw data of qualitative inquiry

‘Theoretical’ Thematic Analysis

Grounded theory

Deductive – priori theoretically driven analysis

Less rich description of the data as a whole

Explicit analyst- driven

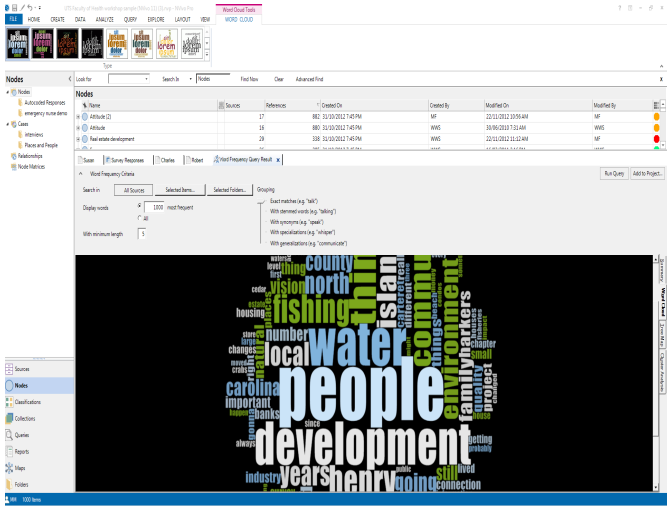
Maps the theoretical priori

Ethnography

Evolve through the coding process

Maps the inductive approach

Meaning is socially produced socio-cultural contexts and structural conditions – constructionist perspective



Thematic analysis - understanding the raw data of qualitative inquiry

Thematic analysis – data collected

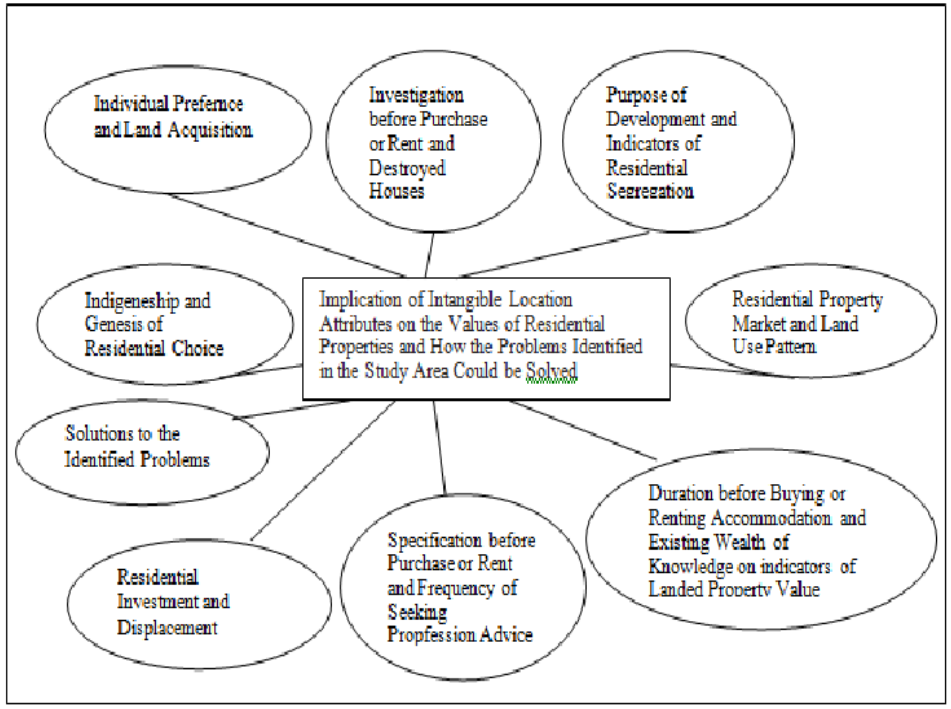
- Identifying
- Analysing
- Reporting patterns (themes)
- ? Make clear the assumptions of the process.

Great variety in steps and different frameworks

Narrative analysis

Discourse analysis

Content analysis



Thematic analysis - understanding the raw data of qualitative inquiry

Thematic analysis – data collected

RIGOUR AND TRUSTWORTHINESS IN QUALITATIVE DATA:

Measures used to establish rigour are explicated by Lincoln & Guba (1985)

1. **CREDIBILITY** – INTERPRETATIONS OF DATA ARE VERIFIED BY STUDY PARTICIPANTS

2. **DEPENDABILITY** – ALL STUDY PROCESSES NEED TO BE CONSISTENT FOR ALL PARTICIPANTS

3. **CONFIRMABILITY** – ALL ASPECTS OF THE STUDY NEED TO BE AUDITABLE, IE METHODOLOGICAL DECISIONS ARE MADE EXPLICIT AND DATA COLLECTION AND ANALYSIS DOCUMENTS ARE AVAILABLE FOR SCRUTINY BY ALL THE RESEARCHERS AND OTHERS IF REQUIRED

4. **TRANSFERABILITY** – THE STUDY FINDINGS CAN EXPLAIN THE EXPERIENCES AND PERCEPTIONS OF OTHER SIMILAR POPULATION GROUPS-SUFFICIENT DATA EXPLANATION EXISTS TO ALLOW OTHERS TO REPLICATE THE STUDY AND IDENTIFY THE REPRESENTATIVENESS IN THE FINDINGS.

REFERENCE: CLARKE 2006 LINCOLN, Y. & GUBA, E. 1985, *NATURALISTIC INQUIRY*, SAGE, LONDON.

Thematic analysis - understanding the raw data of qualitative inquiry

The benefit of a framework

BERNARD'S FRAMEWORK

14-stage thematic content analysis framework

Clarke, A. 2006, 'Qualitative interviewing: encountering ethical issues and challenges', *Nurse Researcher*, vol. 13, no. 4, pp. 19-29

Miles & Huberman's conceptual framework (1984)

GIBBS FRAMEWORK

A 6–stage framework provides a systematic process for dat analysis

Add rigor provides an audit trail

A framework provides a systematic process for data analysi

Add rigor provides an audit trail

Thematic analysis - understanding the raw data of qualitative inquiry

Saturation means data adequacy

Collect data until no new information emerges for all forms of occurrences and it is important to value variation over quantity.

All data needs to be given equal consideration

Cohesive sample, theoretical sampling, ‘negative case’ perspective is saturated, rich and full.

No new coding / patterns emerge within your data

Thematic analysis - understanding the raw data of qualitative inquiry

Thematic analysis

Explores across the complete data set, rather than within a data item such as an individual interview or interviews from one person

- Work closely with the data and answer the questions that arise during coding, categorising, and integrating- but also the research question

Thematic analysis differs from other 'analytic' thematic methods that seek to describe theory related - patterns in data

- Thematic discourse analysis
- Thematic decomposition analysis
- Grounded theory
- Content analysis

Thematic analysis - understanding the raw data of qualitative inquiry

Thematic analysis

Thematic analysis is a method for identifying, analysing, and reporting patterns (themes) within data.

It organises, finds patterns and describes your data set in (rich or not) detail.

A level of interpretation by the researcher occurs.

The *range* of different possible thematic analyses frameworks will be determined by the lens through which you look.

Themes are abstract constructs- interpretation

Themes are an iterative process finalised through writing

Thematic analysis - understanding the raw data of qualitative inquiry

Coding:

Read all of the data, re-read,

Highlight sections of the text,

Make comments in the margins regarding anything that is striking (e.g. overall Impressions, points of interest, plans for working with data etc.)

During analysis be:

systematic / consistent

What key clusters (patterns) can you find?

What is not being said / what is not strong?

Thematic analysis - understanding the raw data of qualitative inquiry

Categorising – patterns / grouping

Go through the data again and again and again

Cut out / highlighted sections of the text

Group them into categories in separate files or folders, take each file and read through clippings (sub-categories)

Look for relationships between the categories (e.g., confirming, disconfirming cases, deviant cases or consequences)

Draw a diagram / concepts / pictures of connections

Check negative cases, label categories using the same language as the data

Write descriptive paragraphs about the categories

Checking qualities of your categories for their internal and external homogeneity.

Thematic analysis - understanding the raw data of qualitative inquiry

Approaches to data analysis

Detailed description (thick)

Context

Intentions & meanings

Evolution or consequence

Classification

Conceptual framework

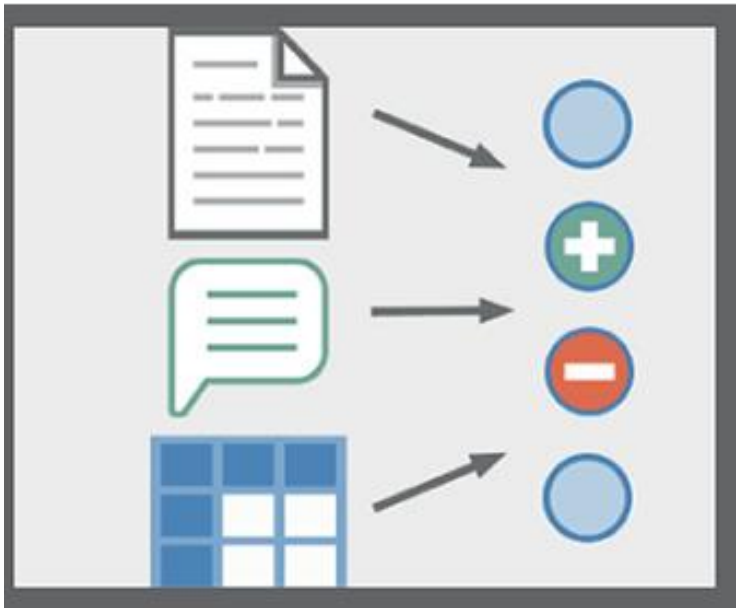
Connections

Regularities & relationships

Thematic analysis - understanding the raw data of qualitative inquiry

Integrating the categories and finding themes

- How are the categories related?
- What main patterns keep recurring in the data?
- What conclusions can be drawn?



Integrating all of the data

- Put qualitative and quantitative data together, or other qualitative data together
- Look for contradictions between the data
- Inductive analysis – no priori (data driven)

Thematic analysis - understanding the raw data of qualitative inquiry

Thematic analysis - writing of themes

- Text analysis
- Analytical points illustrate and support
- Make sense of the data

Writing conventions

- Majority (number,%)
- Convince the reader it is true

Proof of data

- Quotes - illustrate and support
- Confirming/disconfirming
- Narrative strongly linked to data
- Internally coherent and connected
- Adequate exemplars
- Research question coherence

Thematic analysis - understanding the raw data of qualitative inquiry

Trustworthiness – address coding bias / sample bias etc (intercoder) reliability

Credibility: interpretation of the data are consistent with the data collected, and resonates with the study population.

Key techniques to establish credibility include: looking for disconfirmatory data, testing other interpretations, and examine explanations that appear inconsistent after triangulation.

Dependability: not often relevant but replicating the study results and methods used to obtain results.

Confirmability: be aware of their own subjectivity and to track the analysis to reduce research/er bias.

Transferability: Transferability refers to the ability to apply study findings in the same context, or in another context. In qualitative research, transferability of the data may be difficult to apply, but is most frequently applied to studies designed to test a model or build a theory.

Thematic analysis - understanding the raw data of qualitative inquiry

Why is the triage role so challenging to teach and undertake?

Many measurable triage performance outcomes

Commonwealth triage education manual

Yet these did not explain or provide insight into:

- How triage was achieved?
- What orients behaviour, practice and interaction?
- What are the processes embedded in triage practice?

Thematic analysis - understanding the raw data of qualitative inquiry

Trawling the data

'At triage we either let them know they can come in or not. You have to tell them how sick they are. You decide what are the best investigations and when they are inside then…' N1 Obs 2 line 234-237

'inside outside'

Thematic analysis - understanding the raw data of qualitative inquiry

Trawling the data

"At the end of the day I am responsible for them" At the end of the day I am responsible for them [patient]" "The hardest thing about triage is that the whole department runs on me I think"

"So I'm thinking, OK where is the most appropriate place in the department where they are going to get their treatment expedited"

'Being responsible'

Thematic analysis - understanding the raw data of qualitative inquiry

Trawling the data

“You can’t use the same techniques you use on the ward. Here if they use the same ones it doesn’t work”

“It’s a different nurse in the ED. They’re verbal, more outgoing, and confident, they are quick decision-makers. I love it you are on the go and the sickies you make them better”

‘Being different’

Thematic analysis - understanding the raw data of qualitative inquiry

Trawling the data

“You have a positive bag sign, when I see the ambulance pull up and the bag’s on the trolley. I just immediately think, right, you’re in the waiting room”

The suitcase is a bad sign, the patient has expectations about coming in’

“She asked for a bed before I even triaged her”

“ Patients expect more treatment, they expect it sooner”

“Rules of engagement”

Thematic analysis - understanding the raw data of qualitative inquiry

Trawling the data

“I find if I update patients they don’t get annoyed”

“If you don’t talk to patients about waiting times they end up getting annoyed with you”.

“its part of your assessment. You have to think how much do they deserve a bed, you know illness severity”

“managing the wait”

Thematic analysis - understanding the raw data of qualitative inquiry

Belief 1: Respecting space and privacy

The first belief of 'respecting space and privacy' surfaced when exploring expectations and attitudes towards patient conduct as they approached the triage window. Mathew, Karen, and Toni commonly spoke of the need for patients to 'respect' other patient's space. These nurses, each from different sites, expressed many instances of disappointment with patients who failed to comply with the notion of respecting space and privacy. The nurses viewed physical distance as a means to securing privacy and confidentiality for all patients being assessed at triage. Tanya explained, *"sometimes the privacy issue is a problem. They line up and everyone hears what they have to say".*

A consistent and typical pattern of nurse behaviour was highlighted during one particular interaction between Karen and a patient arriving at the triage door. This exemplar highlights the belief of respecting space and privacy.

Karen calls a man into the triage room and with gloved hands stands with a sterile pad viewing the 8cm forearm laceration. At this moment, a man walked through the triage door and leaned against the doorframe. Karen looked up while still holding the 'bloody' pad. The man explains he needs a dressing to his leg ulcer, as the community nurse can't come on a public holiday. Karen turned to him and said "you'll be waiting for hours there's lots of sick people. If you want to wait that's fine I'll give you a suggestion, if you have a GP or medical centre close by then they can do it. You can wait, but it will not be done before them (the sick patients). You can wait, but I'm not going to bring nurses looking after other sick patients away to do your dressing". She then turned to the first patient and said "I don't see the other patients when I'm treating someone else" [Field note Hospital 4]

During a similar incident Toni shared the meaning embedded in the belief, 'They [patients] don't respect space. They can see you're with someone in the room. I want them to move back and preserve the patient's privacy". Patients could experience real consequences by failing to respect space. Mathew illustrated:

Thematic analysis - understanding the raw data of qualitative inquiry

Belief 2: Taking control and Responsibility

The second embedded belief was commonly observed during triage assessment. The patient was expected to act responsibly towards their condition. In this context, acting responsibly was understood by all nurses to mean taking control and responsibility by individuals to ameliorate signs and symptoms before arriving in the ED. This belief applied to patients who presented with minor conditions such as pain or fever. In these cases, nurses shared an understanding that the use of antipyretics or mild analgesics prior to presentation was appropriate and efficient patient conduct.

The usual consequences of a patient failing to adhere to the belief, 'taking control and responsibility', was to receive an explanation how 'next time' it would be worthwhile doing something to control the situation. Peter's comment to a patient illustrated this belief; *"You wouldn't feel so bad at the moment if you'd taken something for it. You should have taken some Paracetamol*". On learning that a patient has not taken steps towards controlling signs and symptoms the assessment was always momentarily stopped, while nurses tried to understand why patients had not taken steps to treat themselves. The interaction then moved towards providing education for the patient on medication benefits.

Data analysis – presenting data

Fry M Elliott R Curtis K Fitzpatrick L Groth R Murphy S Jones K Hofman C 2021 Family members' perceptions of older person discharge from emergency departments. International Journal of Older Person Nursing 18/01/2021 DOI: 10.1111/opn.12365

Barcenilla-Wong, AL Cross, M, Fry M March LM 2020 Ambiguity hindering osteoporosis prevention in post-menopausal women. The Archives of Osteoporosis 15 73 https://doi.org/10.1007/s11657-020-0683-1

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Stevens L, Fry M, Browne M, Barnes A. Fast track patients' satisfaction, compliance and confidence with emergency department discharge planning. Australasian Emergency Care. 2019;22(2):87-

Kilpatrick J Elliott R Fry M 2019 Health professionals' understanding of person-centred communication for risk prevention conversations. Contemporary Nurse - Manuscript ID RCNJ-2018-0099 Journal of Health Care Quality Assurance. In Press 3/09/2019 DOI: 10.1080/10376178.2019.1664925.

Fry, M., Arendts, G. & Chenoweth, L. 2017, 'Emergency nurses' evaluation of observational pain assessment tools for older people with cognitive impairment', Journal of Clinical Nursing, vol. 26, no. 9-10, pp. 1281-90.

Fry M, Curtis K, Considine J & Shaban R. 2017 Using observation to collect data in emergency research; 20(1) : 25-30 Australasian Emergency Nursing Journal

Curtis K, Fry M, Shaban RZ & Considine J. (2016) Translating research findings to clinical nursing practice. Journal of Clinical Nursing. Accepted Author Manuscript. doi:10.1111/jocn.13586

Sarah Kourouche, Kate Curtis, Munroe B Stephen Edward Asha, Carey, I Julie Considine Margaret Fry, Lyons Jack Middleton S Rebecca Mitchell, Ramon Z. Shaban, Unworth A Tom Buckley Implementation of a hospital wide multidisciplinary blunt chest injury care bundle(ChIP) for patients: fidelity of delivery evaluation AuCC

Elliott, R, Fry, M. Psychological capital, well-being, and patient safety attitudes of nurses and midwives: A cross-sectional survey. Nurs Health Sci. 2021; 1– 8. https://doi.org/10.1111/nhs.12808

Fry M, Elliott R. Pragmatic evaluation of an observational pain assessment scale in the emergency department: The Pain Assessment in Advanced Dementia (PAINAD) scale. Australasian Emergency Care. 2018;21(4):131-6.

Fry M, Chenoweth L, Arendts G. Can an observational pain assessment tool improve time to analgesia for cognitively impaired older persons? A cluster randomised controlled trial. BMJ Emergency Medicine Journal. 2017. 2018;35:33–38. doi:10.1136/emermed-2016-206065

Introduction to statistics

Sample resources

- Interactive database of global (including Australia demographics) http://www.healthdata.org/data-visualization/gbd-arrow-diagram
- Sample size estimates https://www.checkmarket.com/2013/02/how-to-estimate-your-population-and-survey-sample-size/

Introduction to statistics

Statistic resources

- **Sample size calculator**
- https://www.checkmarket.com/market-research-resources/sample-size-calculator/

- **Sample size calculator**
- http://epitools.ausvet.com.au/content.php?page=1Proportion&Proportion=0.4&Conf=0.95&Precision=0.05&Population=4300

- **Random number generator**
- https://www.random.org/integer-sets/

- GPower for sample size http://gpower.software.informer.com/3.1/

Introduction to statistics

Table of statistical tests for research

Resources

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