Samantha Abbato And Associates

Evaluation, Research, Strategic Planning

GETTING THE BEST RESULTS FROM EVALUATION STATISTICS

ASKING THE RIGHT QUESTIONS

AUGUST 25 2011

Sam Abbato PhD MPH

FEAR OF SPIDERS=
ARACHNOPHOBIA

FEAR OF NUMBERS!

Numerophobia
Arithmophobia
Tetraphobia=fear of number 4
Triskaidekaphobia= fear of number 13
Hesakosioihexekontahexaphobia= 666

"Statistical thinking will be one day as necessary for efficient citizenship as the ability to read and write"

H.G. Wells (1866-1946)

“Do not put your faith in what statistics say until you have carefully considered what they do not say”

William W Watt

“THE ONLY STATISTICS YOU CAN TRUST ARE THOSE YOU FALSIFIED YOURSELF”

WINSTON CHURCHILL

ASKING THE RIGHT QUESTIONS

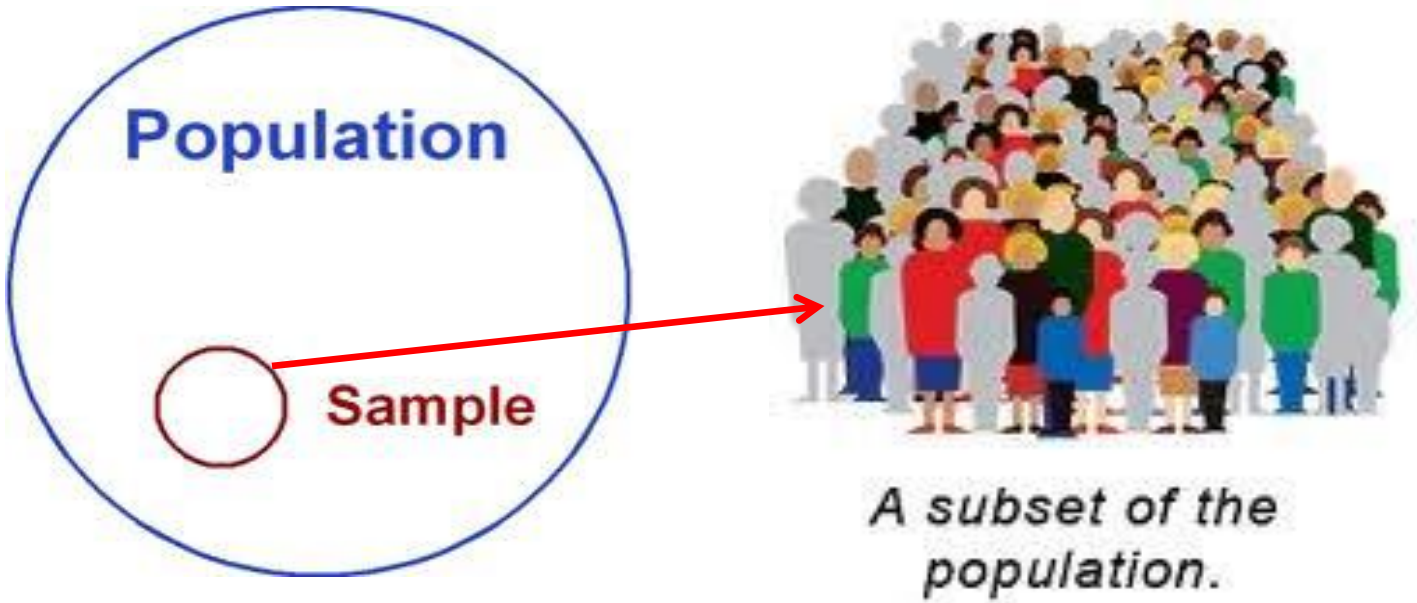
1. Sampling, summary values and error
2. Data management
3. Getting close to your own data
4. Statistical analysis- managing, understanding and interpreting

1. SAMPLING - *Where it all starts!*

"The result of a sampling study is no better than the sample it is based on"

Darrell Huff

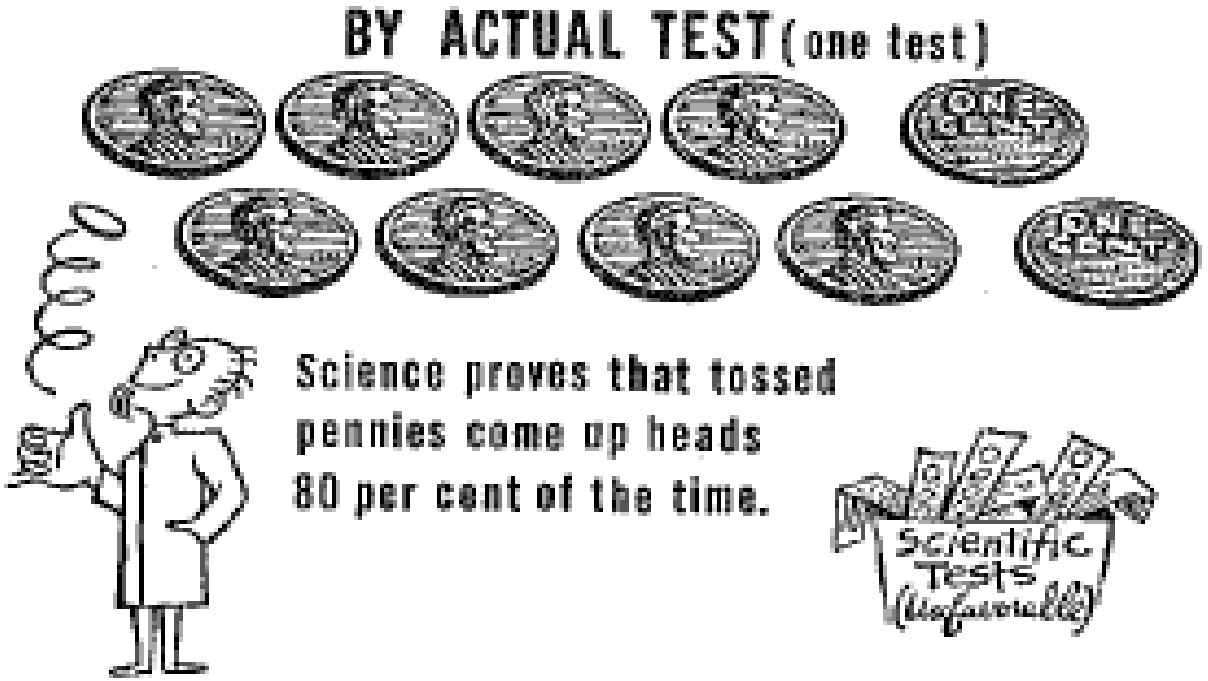
1. SAMPLING



1. SAMPLING

“8 out of 10 cats love Whiskers” commercial

1. THE SAMPLE

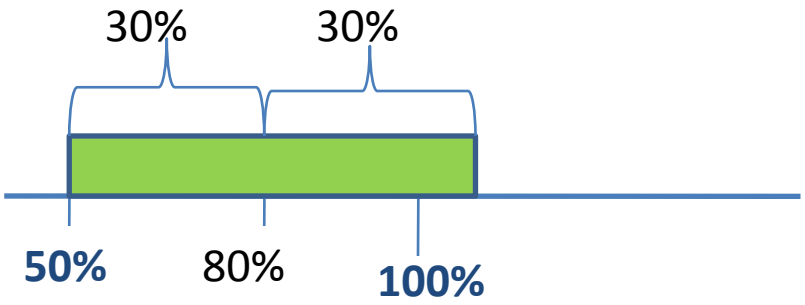

BY ACTUAL TEST (one test)
ONE CENT
ONE CENT
Science proves that tossed pennies come up heads 80 per cent of the time.
Scientific Tests (Unfavorable)

Do 80% of Cats really love whiskers?

N=10

Calculating confidence bands (error)

➡ 30% precision



8/10 in my sample

Mean 80% ± 30%

95% chance **TRUE** population proportion is between 50% and 100%

What you need to know about SAMPLE SIZE

- The concern about SAMPLE SIZE is to have the statistical ability to represent a factor in the **population** or to show a difference that exists in the population
- Sample size depends on 2 factors
  - The precision (amount of error) we require
  - The extent of variation in the population in regard to the characteristic (e.g. Expected proportion)

More than just centre

- Like looking at the SIGNAL and NOISE around the signal
- “In public discourse and research measures of centre have been over-emphasised at the expense of variability”

  Shaughnessy 1997
- When making inferences or comparing groups we need to look at CENTRE (e.g. average) and spread together

“29 PERCENT OF WOMEN SPEND MORE TIME SHOPPING FOR SHOES THAN LOOKING FOR A LIFELONG MATE.”

“ONE IN THREE MEN PICK THEIR NOSE WHILST DRIVING.”

“58.4% OF US CALLED INTO WORK SICK WHEN WE WEREN’T”

TYPES OF SAMPLING

PROBABILTY-REPRESENTATIVE

- Sources of bias have been removed
- E.g.
  - Random
  - Stratified random
  - Cluster

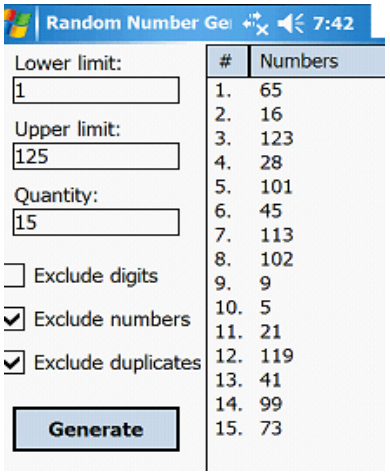
NON-REPRESENTATIVE

- Quick, inexpensive, convenient
- Sometimes the only option
- Not representative
- Limited in generalising to population

RANDOM SAMPLE

Every thing/person in the population has an equal chance of being included in the sample.

Requires a LIST or SAMPLING FRAME-
e.g. List of all patients of the hospital in last 12 months
Telephone list of region

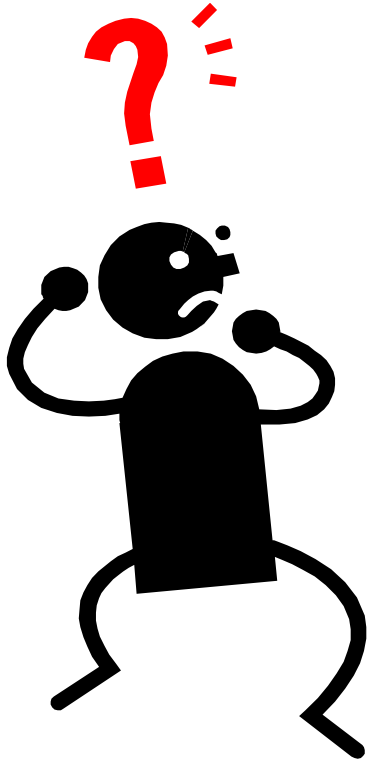


BEWARE THE CONVENIENCE SAMPLE!

Sampling the first “n” population units to come along- You take what you get!

RESULT: THE SAMPLE MAY BE VERY DIFFERENT TO THE POPULATION THEY COME FROM. THEY ARE IN MOST CASES, NOT REPRESENTATIVE

HOW DO WE IMPROVE OUR SAMPLING?



RESPONSE RATE

- Response rates are becoming more of an issue in survey research.
  - Usual response rate in 1950s-90%
  - Usual response rates in 1980s-<70%

Weisberg, Krosnick and Bowen, 1989

- It has been estimated that many general surveys have response rates of between 2 and 10 percent.
  - Think about the impact of the 90-98% non-respondents when you are interpreting the statistical finding!!

RESPONSE RATE

LESSONS

- ALWAYS ASK ABOUT THE RESPONSE RATE!

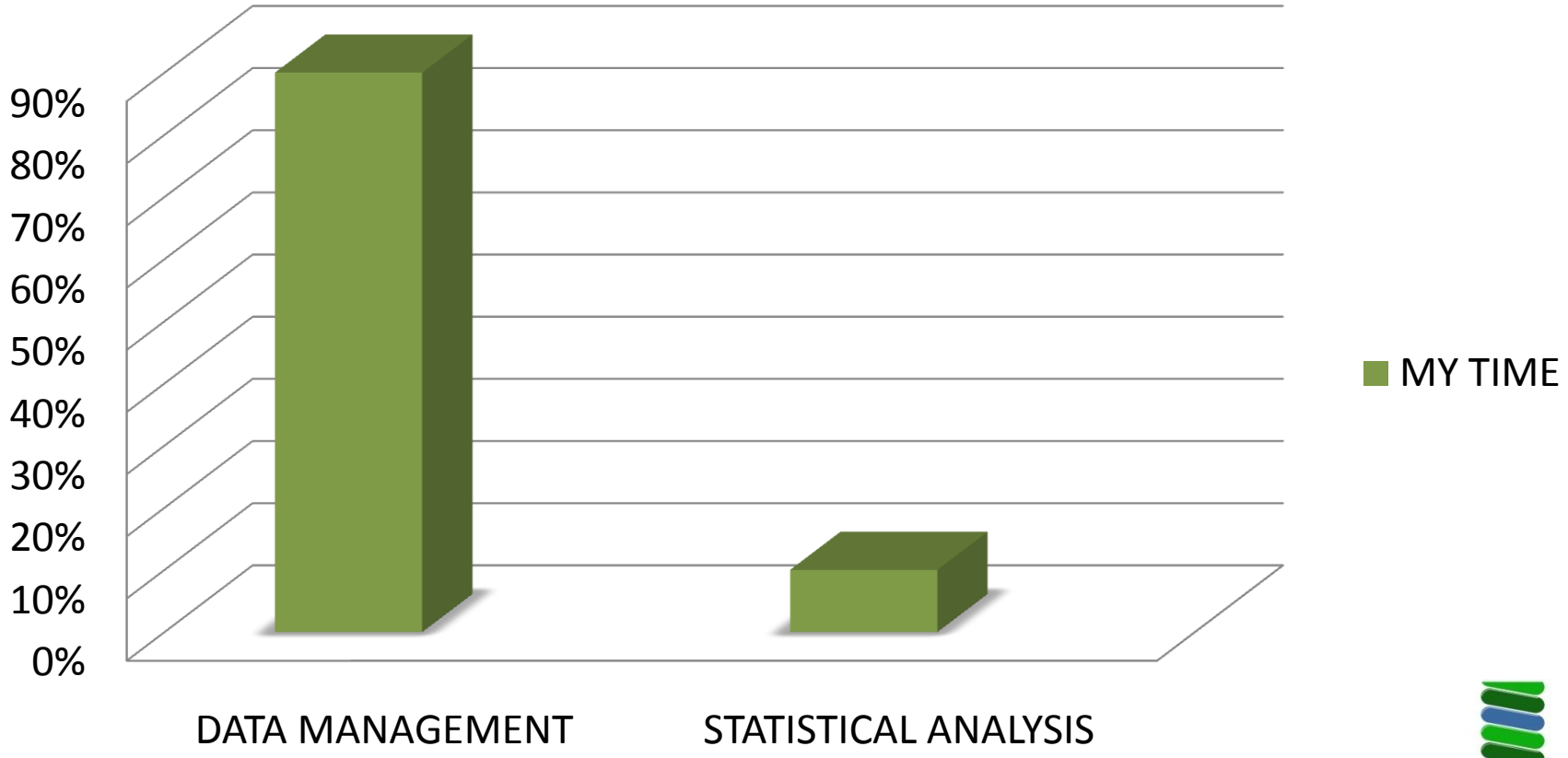
-ALWAYS REPORT THE RESPONSE RATE.

-CONSIDER (AND DISCUSS) HOW THOSE THAT DON’T RESPOND MAY BE DIFFERENT

EQUIPPING YOURSELF WITH QUESTIONS TO ASK ABOUT SAMPLING

QUESTIONS ABOUT SAMPLING
1. What is the size of the sample? (Is there likely to be a precision issue?)
2. Was the spread(error) presented (e.g.confidence intervals) as well as the summary value?
3. What type of sampling was used? (Was it probability sampling or non probability sampling?)
4. What biases are likely to be introduced by the sampling? (e.g. How are the people not in the sample likely to be different from those participating?
6. What is the response rate?
7. In what ways are the non-respondents likely to be different from the respondents? And how will this affect the evaluation result?

2. DATA MANAGEMENT



2. DATA MANAGEMENT

“A small error at the outset can lead to great errors in final conclusions”

Saint Thomas Aquinas

2. DATA MANAGEMENT

STEP 1: DESIGN OF EVALUATION

STEP 2: PLANNED ANALYSIS

STEP 3: SET UP DATA MANAGEMENT

E.G. BE HEALTHY MARANOA-
A MULTILEVEL REGIONAL INTERVENTION TO REDUCE CHRONIC DISEASE

BE HEALTHY MARANOA
An initiative of Maranoa Regional Council.

STEP 1: DESIGN

PILOT PHASE

INDIVIDUAL AND ENVIRONMENTAL LEVEL INTERVENTION

2010 2011 2013

SURVEY MEASURING CHANGE IN AWARENESS, KNOWLEDGE AND BEHAVIOUR

DESIGN=REPEATED MEASURES OVER TIME

STEP 2: PLANNED ANALYSIS

DESIGN=REPEATED MEASURES OVER TIME

ANALYSIS: NON PARAMETRIC REPEATED MEASURES 3+

- FRIEDMAN (LIKERT SCALES)
- COCHRAN (YES/NO)

STEP 3: SET UP DATA MANAGEMENT

How many serves of VEGETABLES do you usually eat each day

[1] ☐ 1 serve or less [2] ☐ 2 serves [3] ☐ 3 serves [4] ☐ 4 serves [5] ☐ 5 serves [6] ☐ 6 serves or more [7] ☐ Don't eat vegetables

50. Have you accessed vegetables from a community garden in the past 2 weeks? [1] ☐ Yes [0] ☐ No

IDNUM	VEG_TIME1	VEG_TIME2	VEG_TIME3
1	0	3	0
2	1	3	2
3	2	3	4
4	3	3	2
5	4	4	4
6	5	5	5
7	6	6	6
8	0	0	0
9	1	1	1
10	2	2	2
11	3	3	3
12	4	4	4
13	5	5	3
14	6	6	3
15	0	0	3

IDNUM	ACCESS_TIME1	ACCESS_TIME2	ACCESS_TIME3
1	0	0	1
2	0	0	1
3	0	0	1
4	0	0	0
5	0	0	1
6	0	0	0
7	0	0	1
8	0	0	1
9	0	0	0
10	0	1	1
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0

MANAGING DATA STEP BY STEP

- **STEP 3.1:** PRE-CODE INSTRUMENT/QUESTIONNAIRE
- **STEP 3.2:** SET-UP DATA ENTRY SPREADSHEET (DATABASE)
- **STEP 3.3:** CREATE A CODEBOOK
- **STEP 3.4:** ENTER DATA OR OUTSOURCE DATA ENTRY
- ***STEP 3.5:*** *VALIDATE YOUR DATA USING DESCRIPTIVE ANALYSIS*
- ***STEP 3.6:*** *DOCUMENT EVERYTHING YOU DO TO THE DATA (INCLUDING ANALYSIS)*

PRE-CODE QUESTIONNAIRE

THIS PART TO BE COMPLETED BY INTERVIEWER PRIOR TO ADMINISTRATION OF SURVEY

ALLOCATED ID NUMBER:_____ INTERVIEWER ID:_____

LOCATION/EVENT:_____

DATE SURVEY ADMINISTERED:____/____/_____ MODE: ☐ Face-to-face ☐ Phone

SECTION 1: AWARENESS OF HEALTH CAMPAIGNS AND REGIONAL ACTIVITIES

Please rate your awareness of the following on a scale of 1 to 5 where 1 is "not at all aware" and 5 is "extremely aware".

1= Not at all aware; 2= Slightly aware; 3= Somewhat aware; 4= Moderately aware; 5 = Extremely aware

	1	2	3	4	5
1. The "Be Healthy Maranoa" Project.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
2. The "Go for 2 and 5" campaign- the one with the man made out of vegies	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
3. The "Measure Up" campaign- the one with the man walking along the tape measure	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
4. The "Eat well, Be active" campaign about physical activity and nutrition	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
5. The "Food Cents" Program	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
6. The "Find your 30" campaign where Pat Rafter chases a cartoon "30"	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
7. The "10,000 Steps" campaign about walking 10,000 steps a day for health	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
8. The Heart Foundation's Walking Program	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

47. This question is about your usual consumption of vegetables, including fresh, frozen and tinned vegetables.

(Note to interviewer- Use PROMPT CARD HERE)

How many serves of VEGETABLES do you <u>usually</u> eat each day

[1]☐ 1 serve or less [2]☐ 2 serves [3]☐ 3 serves [4]☐ 4 serves [5]☐5 serves [6]☐ 6 serves or more [7]☐ Don't eat vegetables

48. Since this time 6 months ago, has the amount of vegetables you consume, increased, decreased or stayed about the same?

[1]☐ Increased [2]☐ Decreased [3]☐ Stayed about the same

49. Have you accessed vegetables from a community garden in the past 2 weeks? [1]☐Yes [2]☐ No

50. Have you accessed vegetables from a home vegetable garden in the past 2 weeks? [1]☐ Yes [2]☐No

51. This question is about your usual consumption of fruit, including fresh, frozen and tinned fruit.

(Note to interviewer- Use PROMPT CARD HERE)

How many serves of FRUIT do you <u>usually</u> eat each day

[1]☐ 1 serve or less [2]☐ 2 serves [3]☐ 3 serves [4]☐ 4 serves [5]☐5 serves [6]☐ 6 serves or more [7]☐ Don't eat fruit

52. Since this time 6 months ago, has the amount of fruit you consume, increased, decreased or stayed about the same?

[1]☐ Increased [2]☐ Decreased [3]☐ Stayed about the same

53. Do you smoke? [1]☐Yes [2]☐Ex-smoker [3]☐Never smoked

54. How many smokes do you usually have each day?

[1]☐ 1 or less [2]☐ 2-5 [3]☐ 6-10 [4]☐11-15 [5]☐ 16-20 [6]☐ More than 20

55. Since this time 6 months ago, has the amount of smokes you have, increased, decreased or stayed about the same?

[1]☐ Increased [2]☐ Decreased [3]☐ Stayed about the same

BEWARE!

Yes	1	No	2
Yes	1	No	2
No	2	Yes	1

DATA ENTRY SPREADSHEET

IDNUM	INTID_1	LOCATIONEVENT_1	DATEINT_1	MODE_1	AWARE1_1	AWARE2_1	AWARE3_1	AWARE4_1

CODEBOOK

Note: Missing data has been recoded in the following way
999=no answer
888=invalid response
777=variable/question not applicable (either because a. the question was not relevant because of answer to previous companion question,b. the question was not relevant to the personal situation of the participant)

Variable name	Description	Stage	Instrument of origin	Values defined	Missing values	Notes
IDNUM	Identification number	1	NA	none	none	
INTID_1	Interviewer id number	1	NA	none	none	
LOCATIONEVENT_1	Place of interview	1	NA	none	none	
DATEINT_1	Date of Interview	1	NA	none	none	
AWARE1_1	Awareness of Be Healthy Maranoa Project	1	NA	1=Not at all aware 2= Slightly aware 3= Somewhat aware 4=Moderately aware 5=Extremely aware	999=no answer 888=invalid response	
AWARE2_1	Awareness of Go for 2 and 5 campaign	1	NA	1=Not at all aware 2= Slightly aware 3= Somewhat aware 4=Moderately aware 5=Extremely aware	999=no answer 888=invalid response	
AWARE3_1	Awareness of Go for 2 and 5 booklet	1	NA	1=Not at all aware 2= Slightly aware 3= Somewhat aware 4=Moderately aware 5=Extremely aware	999=no answer 888=invalid response	
AWARE4_1	Awareness of "Measure up" and "swap it, don't stop it".	1	NA	1=Not at all aware 2= Slightly aware 3= Somewhat aware 4=Moderately aware 5=Extremely aware	999=no answer 888=invalid response	

EQUIPPING YOURSELF WITH QUESTIONS TO ASK ABOUT DATA MANAGEMENT

QUESTIONS ABOUT DATA MANAGEMENT
1. How was the data managed?
2. How was questionnaire coded? Were there any likely errors from coding?
3. How were errors in data entry minimised (e.g. double data entry of 10-15%, data validation/drop downs)
4. What records were kept of data entry, data cleaning, data manipulation/transformation and data analysis?

3.GETTING CLOSE TO YOUR OWN DATA

USING PIVOT TABLES IN EXCEL

- Format data as TABLE in EXCEL
  - HOME>STYLES>FORMAT AS TABLE

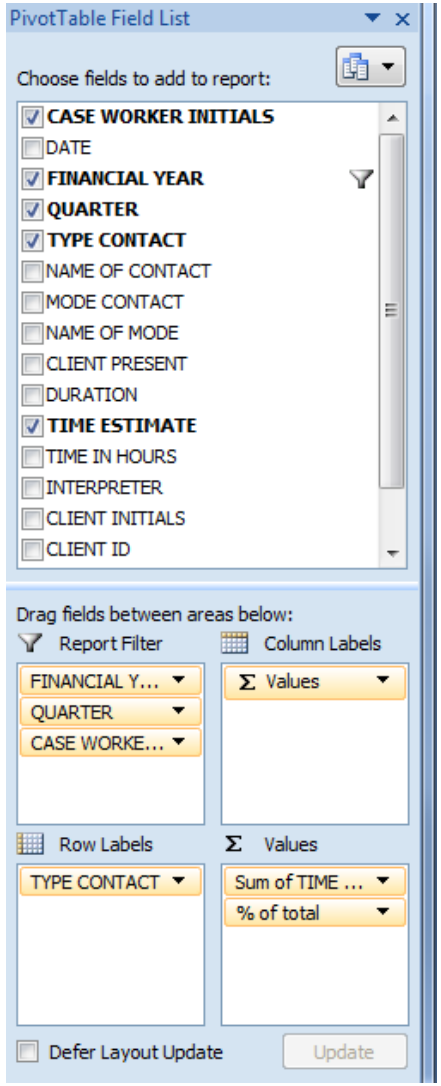
CASE WORKER INITIALS	DATE	FINANCIAL YEAR	QUARTER	TYPE CONTACT	MODE CONTACT	CLIENT PRESENT	TIME ESTIMAT	INTERPRETE
RPE	4/01/2011	2010/11	Quarter 3	OT	PH	N	7.5	N
RPE	4/01/2011	2010/11	Quarter 3	RW	ND	N	7.5	N
RPE	4/01/2011	2010/11	Quarter 3	OT	ND	N	7.5	N
RPE	4/01/2011	2010/11	Quarter 3	OT	PH	N	7.5	N
RPE	4/01/2011	2010/11	Quarter 3	RW	ND	N	7.5	N
RPE	4/01/2011	2010/11	Quarter 3	OT	ND	N	7.5	N
RPE	4/01/2011	2010/11	Quarter 3	RW	ND	N	7.5	N
RPE	4/01/2011	2010/11	Quarter 3	OT	PH	N	7.5	N
RPE	4/01/2011	2010/11	Quarter 3	OT	PH	Y	7.5	N
RPE	4/01/2011	2010/11	Quarter 3	RW	ND	N	7.5	N

Note: All client data has been altered to protect confidentiality

3.GETTING CLOSE TO YOUR OWN DATA

USING PIVOT TABLES IN EXCEL

FINANCIAL YEAR	2010/11	
QUARTER	(All)	
CASE WORKER INITIALS	(All)	
	Values	
Row Labels	Sum of TIME ESTIMATE	% of total
Non-clinical counselling	36345	23%
Care Planning/Implementation	35925	23%
Other Case Management	28965	19%
Report writing/case notes	23250	15%
Case discussion/review	13860	9%
Assessment/Screening	13590	9%
Advocacy	3765	2%
Grand Total	**155700**	**100%**



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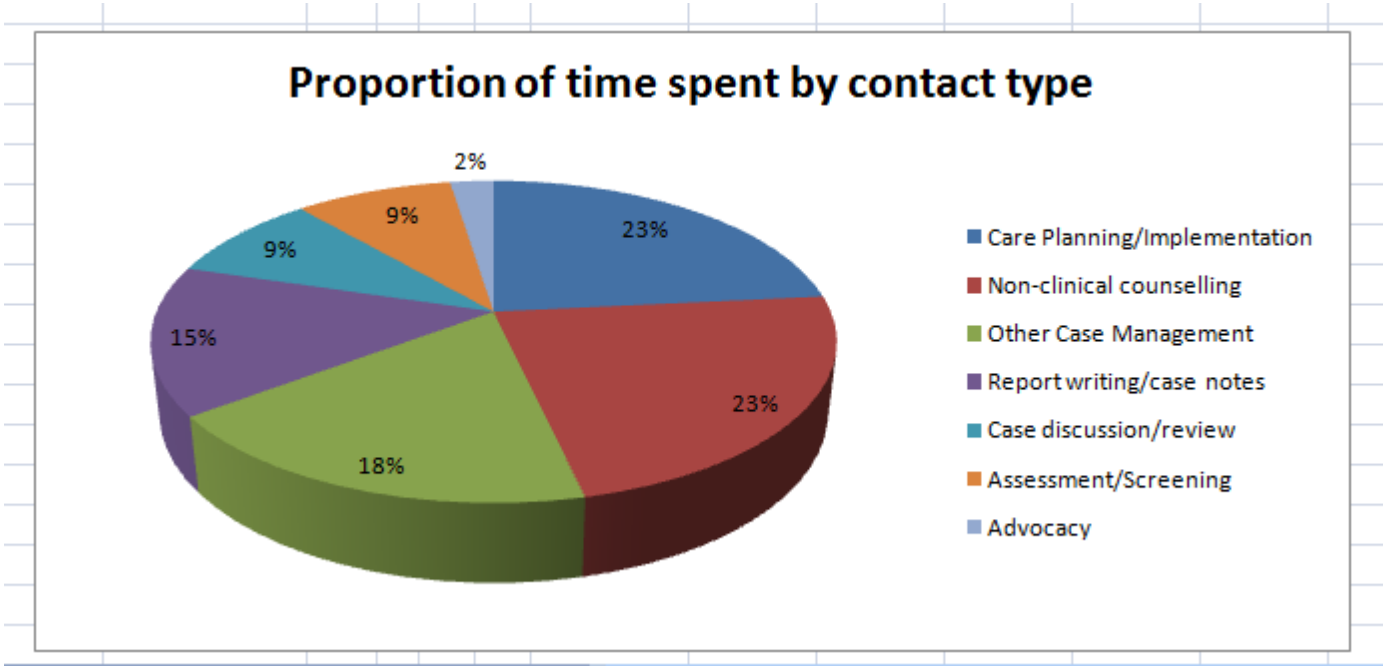
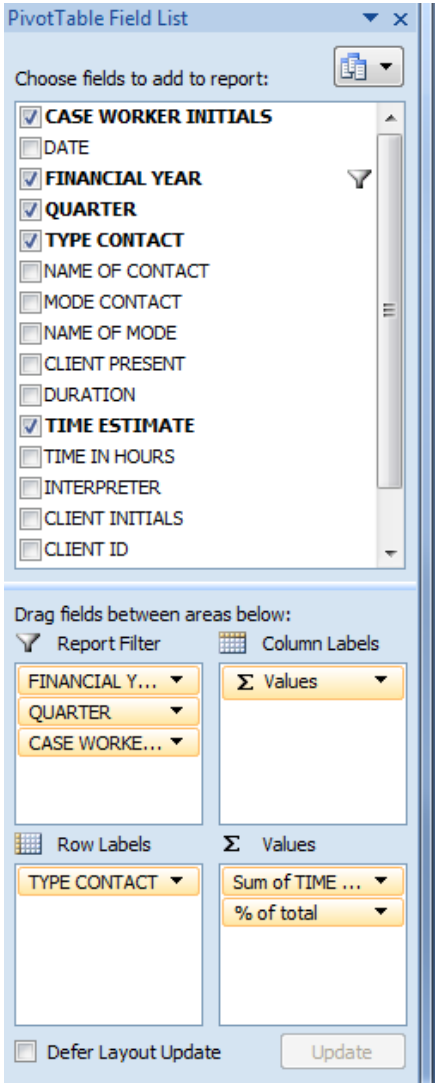
3.GETTING CLOSE TO YOUR OWN DATA

USING PIVOT TABLES IN EXCEL





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3.GETTING CLOSE TO YOUR OWN DATA

USING PIVOT TABLES IN EXCEL

2	ID NUMBER	DATE	PROFESSIONAL DISCIPLINE	DISTRICT	Q16PST	Q17PST	Q18PST	Q19PST	Q20PST	Q21PST
3	TE0537	2/02/2011	Admin	METRONORTH	3	3	4	4	4	4
4	TE0001	30/06/2010	Admin	WIDEBAY	5	4	5	5	5	5
5	TE0003	30/06/2010	Admin	WIDEBAY	4	5	5	5	4	4
6	TE0004	30/06/2010	Admin	WIDEBAY	3	4	3	4	3	4
7	TE0005	30/06/2010	Admin	WIDEBAY	5	4	5	4	5	5
8	TE0006	30/06/2010	Admin	WIDEBAY	5	4	5	5		5
9	TE0007	30/06/2010	Admin	WIDEBAY	3	5	5	5	3	5
10	TE0008	30/06/2010	Admin	WIDEBAY	4	4	4	4	4	4
11	TE0009	30/06/2010	Admin	WIDEBAY	5	3	5	5	5	5
12	TE0010	30/06/2010	Admin	WIDEBAY						
13	TE0011	30/06/2010	Admin	WIDEBAY	5	4	5	5	4	4
14	TE0012	30/06/2010	Admin	WIDEBAY	5	3	5	5	5	5
15	TE0013	30/06/2010	Admin	WIDEBAY	5	4	5	5	5	5
16	TE0015	30/06/2010	Admin	WIDEBAY	5	5	5	5	5	5

Note: All client data has been altered to protect confidentiality

3.GETTING CLOSE TO YOUR OWN DATA

USING PIVOT TABLES IN EXCEL

Question: The training program met my expectations

1= Strongly disagree

2= Disagree

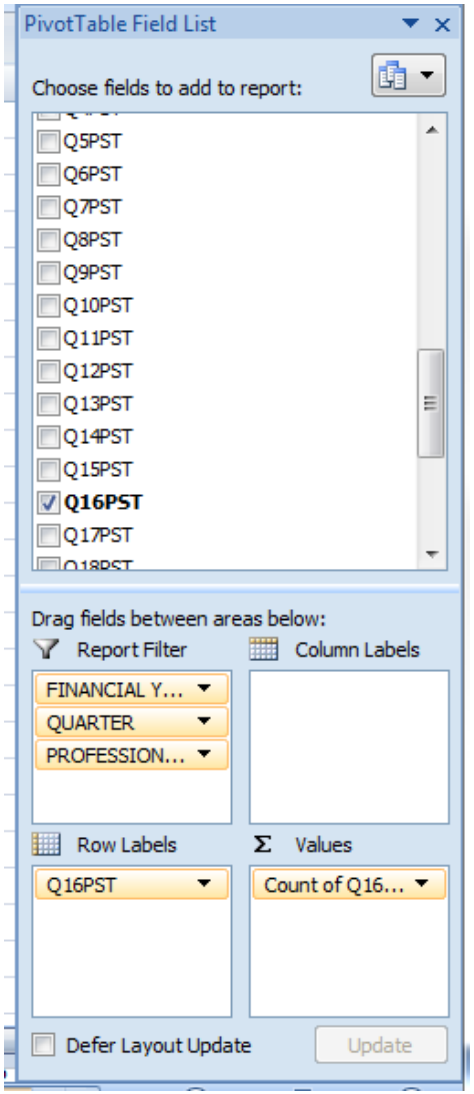
3= Neutral

4= Agree

5= Strongly agree

	A	B	C
1	FINANCIAL YEAR	(All)	
2	QUARTER	(All)	
3	PROFESSIONAL DISCIPLINE	(All)	
4			
5	**Row Labels**	**Count of Q16PST**	
6	1	2	
7	2	4	
8	3	59	
9	4	301	
10	5	183	
11	44	2	
12	55	1	
13	(blank)		
14	**Grand Total**	**552**	
15			

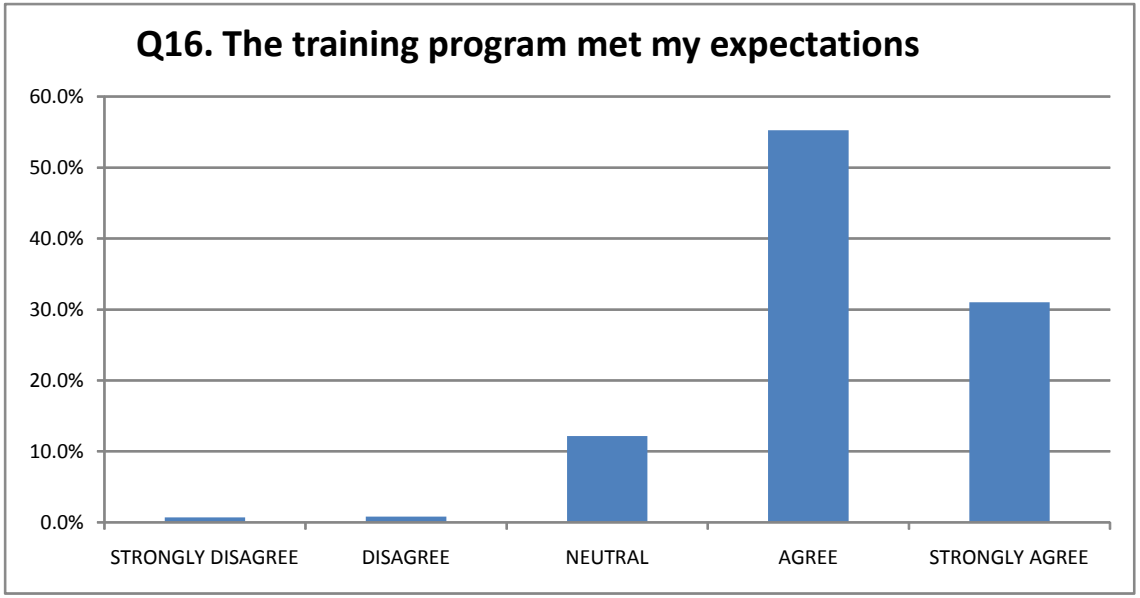
Errors in data entry



3.GETTING CLOSE TO YOUR OWN DATA
USING PIVOT TABLES IN EXCEL

	Values	
Row Labels	**Count of Q16PST**	**PERCENT**
STRONGLY DISAGREE	5	0.7%
DISAGREE	6	0.8%
NEUTRAL	88	12.2%
AGREE	399	55.3%
STRONGLY AGREE	224	31.0%
Grand Total	**722**	**100.0%**

MET MY EXPECTATIONS	**PERCENT**
STRONGLY DISAGREE	0.7%
DISAGREE	0.8%
NEUTRAL	12.2%
AGREE	55.3%
STRONGLY AGREE	31.0%
Grand Total	**100.0%**



4. STATISTICAL ANALYSIS

MANAGING, UNDERSTANDING AND INTERPRETING

- Interpreting data is based on rules (use wording based on examples in texts)- *Creative writing does not come in handy.*
- The benefit of basic “understanding” what a test is doing (different from knowing the statistical formula!)
- The role of “SYNTAX” in record keeping and efficiency of repeated analysis

Wilcoxon Signed Ranks

" Does training improve cross-cultural knowledge scores?"

Data in SPSS

IDNUMBER	MEANPREKNOWLEDGE	MEANPOSTKNOWLEDGE
TE0001	4.00	4.40
TE0003	3.40	3.20
TE0004	3.00	3.60
TE0005	3.20	4.00
TE0006	3.40	3.80
TE0007	5.00	5.00
TE0008	3.40	3.80
TE0009	3.20	4.00
TE0010	2.60	.
TE0011	.	4.40
TE0012	.	3.20
TE0013	3.20	4.00
TE0015	3.20	4.00

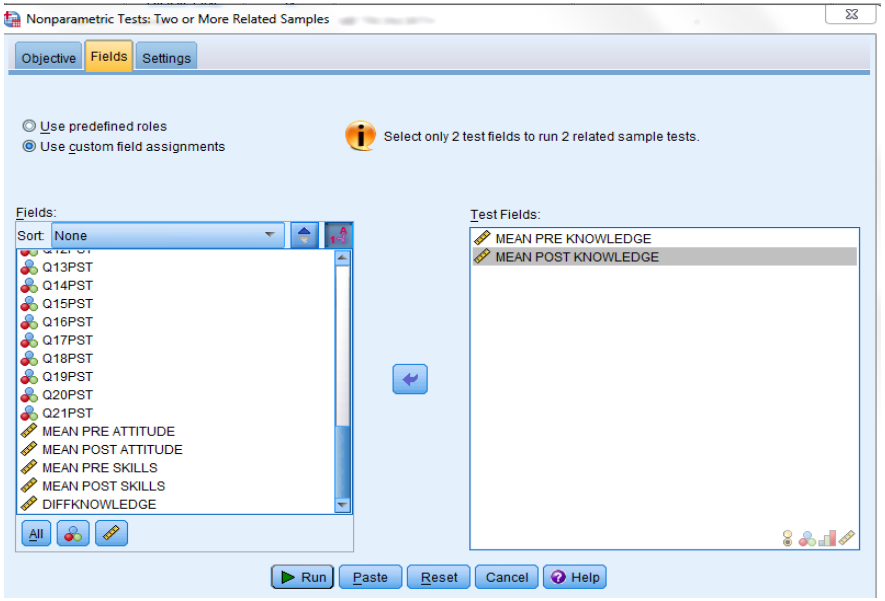
Statistics

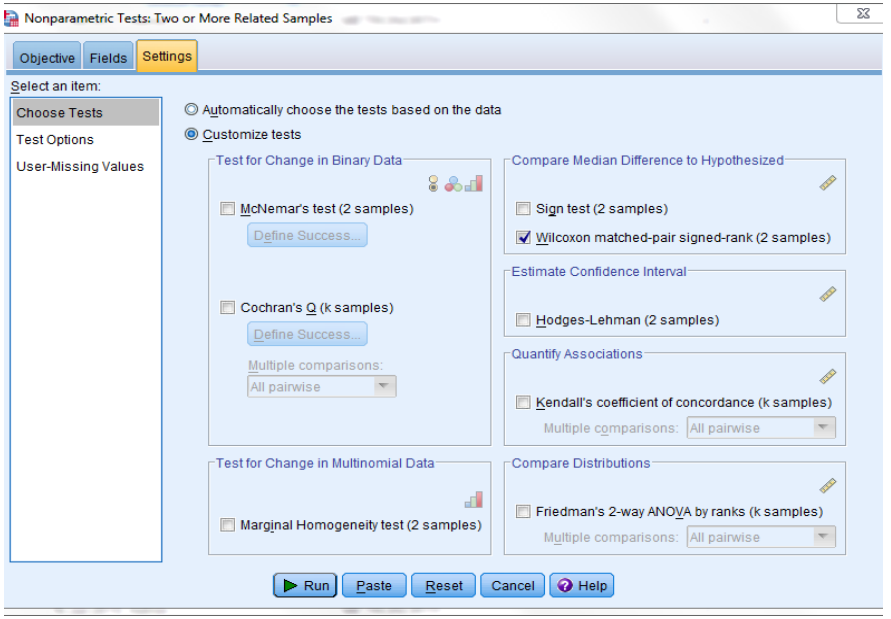
		MEAN PRE KNOWLEDGE	MEAN POST KNOWLEDGE
N	Valid	573	543
	Missing	27	57
Mean		3.4219	4.1124
Median		3.4000	4.0000

Wilcoxon Signed Ranks

" Does training improve cross-cultural knowledge scores?"

SPSS: Analyze>Non Parametric tests> Related Samples>Customise analysis





Wilcoxon Signed Ranks-Reporting

" Does training improve cross-cultural knowledge?"

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The median of differences between MEAN PRE KNOWLEDGE and MEAN POST KNOWLEDGE equals 0.	Related-Samples Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

The results of the Wilcoxon Signed Ranks test indicated that the health employees participating in cultural competence training showed significant improvement in cross cultural knowledge from pre-test (*Md=3.4*) to post-test (*Md=4.0*) ($p<0.001$)

Wilcoxon Signed Ranks-Reporting

" Does training improve cross-cultural knowledge?"

SPSS SYNTAX: NPAR TEST
/ WILCOXON = MEANPREKNOWLEDGE WITH MEANPOSTKNOWLEDGE (PAIRED).

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
MEAN POST KNOWLEDGE - MEAN PRE KNOWLEDGE	Negative Ranks	39[a]	134.88	5260.50
	Positive Ranks	396[b]	226.19	89569.50
	Ties	82[c]		
	Total	517		

a. MEAN POST KNOWLEDGE < MEAN PRE KNOWLEDGE
b. MEAN POST KNOWLEDGE > MEAN PRE KNOWLEDGE
c. MEAN POST KNOWLEDGE = MEAN PRE KNOWLEDGE

Test Statistics[b]

	MEAN POST KNOWLEDGE - MEAN PRE KNOWLEDGE
Z	-16.096[a]
Asymp. Sig. (2-tailed)	.000

a. Based on negative ranks.
b. Wilcoxon Signed Ranks Test

Suggested references
STATISTICAL ANALYSIS

REFERENCE	NOTES
Andy Field (2009) Discovering statistics using SPSS. Third edition. Sage. London	Comprehensive and practical book on statistics using SPSS written in light-hearted, entertaining style.
Frederick J Gravetter and Larry B Wallnau (2009)Statistics for the Behavioural Sciences, Eighth edition. Wadsworth, Belmont California.	Comprehensive. Focus is on parametric statistics. Includes chapters on nonparametric statistics.
Julie Pallant (2010) SPSS Survival Manual. Fourth edition. Open University Press.	Clear guide to statistics using SPSS. Chapter on non-parametric statistics.
George A Morgan (2011) IBM SPSS for Introductory statistics: Use and Interpretation	Highly recommended introductory book. Very clearly written. Includes SPSS steps.
Marjorie A Pett (1997) Nonparametric statistics for health care research. Sage, Thousand Oaks.	Comprehensive coverage of nonparametric statistics. Book is a little old now for SPSS.
UCLA STATISTICAL CONSULTING GROUP http://www.ats.ucla.edu/stat	Great site for easy to understand instructions for using SPSS syntax. Also covers SAS, Stata, R. Includes free online tutorials.

“STATISTICS ARE LIKE A BIKINI. WHAT THEY REVEAL IS SUGGESTIVE BUT WHAT THEY CONCEAL IS VITAL”

AARON LEVENSTEIN

THANK YOU!

QUESTIONS, DISCUSSION