A Proposed Measure of Parental Vaccine Acceptance: The V-ABC

(*Vaccine Attitudes Beliefs and Concerns*)

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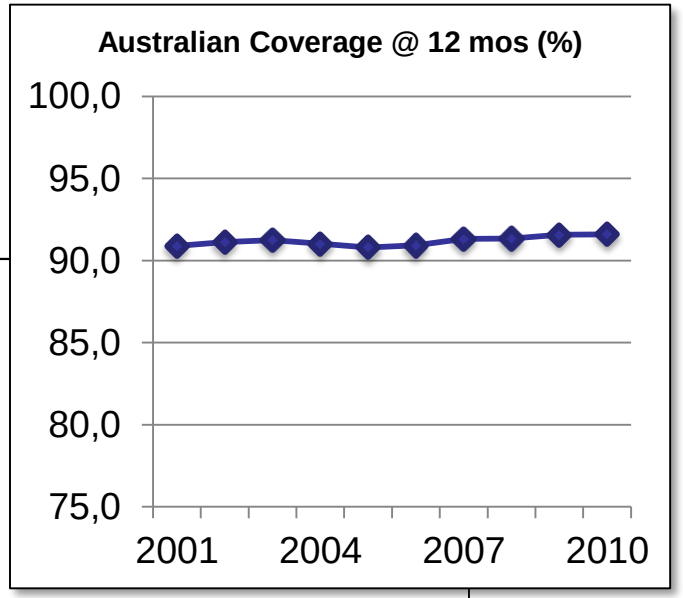
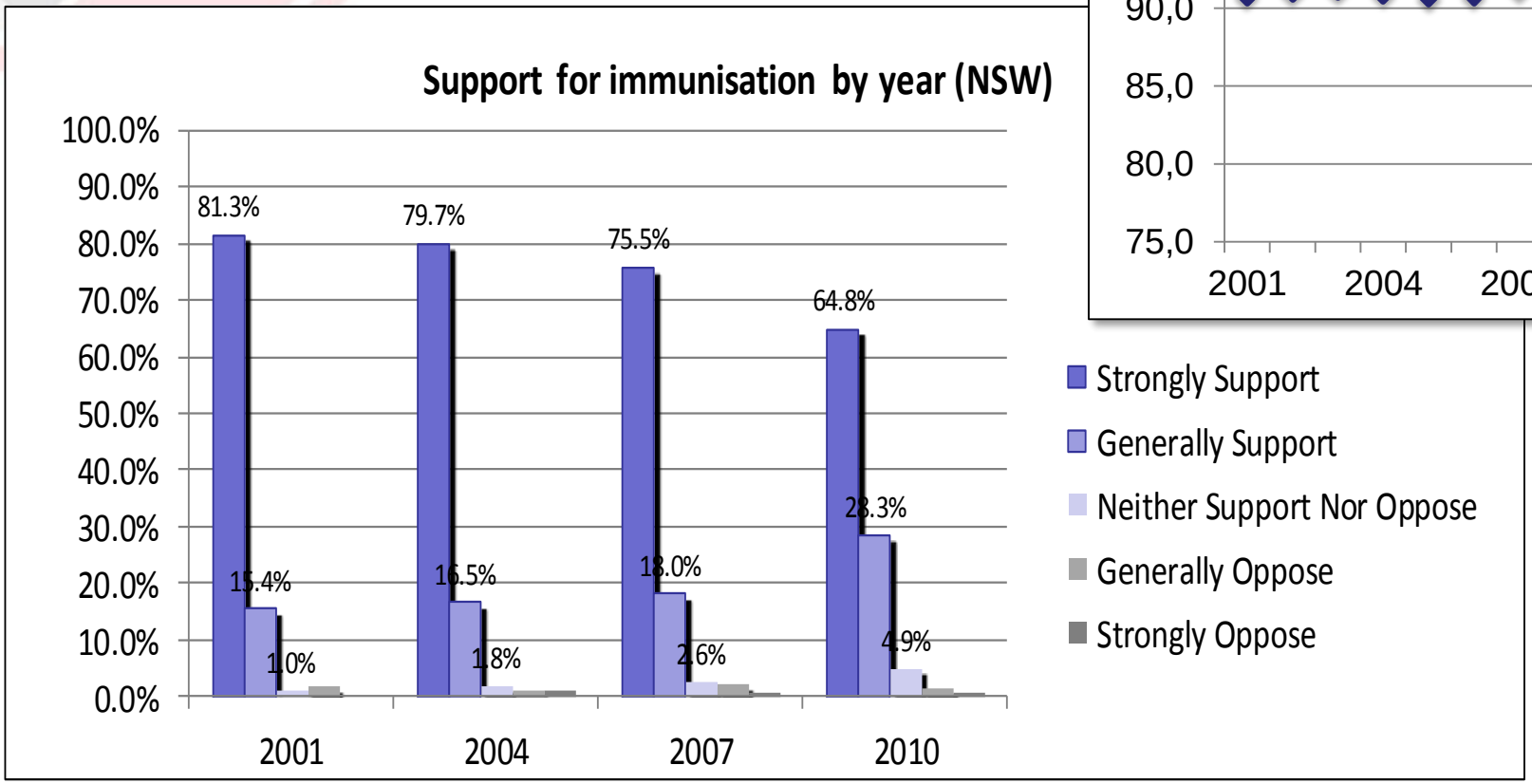
School of Public Health, Sydney Medical School
& The National Centre for Immunisation Research & Surveillance
(Australia)

Coverage | Acceptance





Source: NSW Health Survey Program

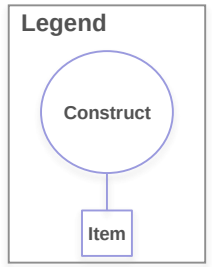
Source: Australian Childhood Immunisation Register (Compliments B. Hull)

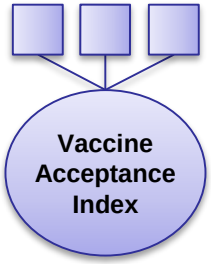
Desirable properties of the measure

- **Suited to context, constraints, and user needs**
  - Reflects “structure” of attitudes and beliefs
  - Single global score
  - Sub-factor scores
  - Integrated across ‘levels’ of granularity
- **Psychometrically ‘sound’**
  - Latent psychological constructs – Reflective/Formative
  - Parsimonious, Continuous
- **Balanced an inductive and deductive development**
  - respects and incorporates previous research

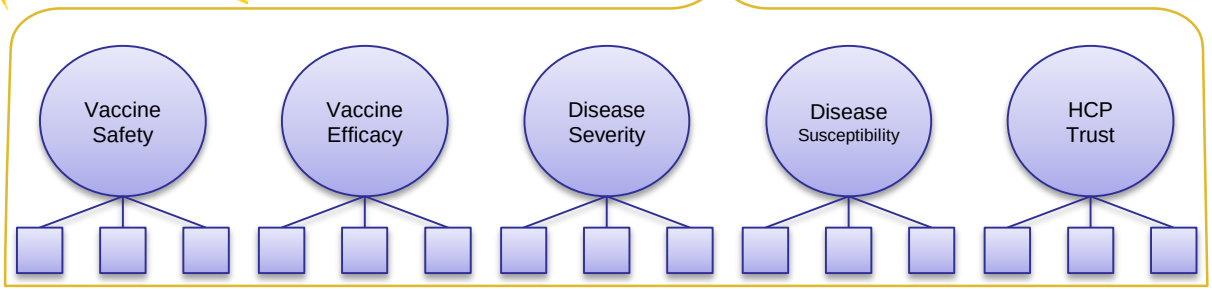
→ **Engenders confidence, especially from public policy**

Proposed Structure of the V-ABC

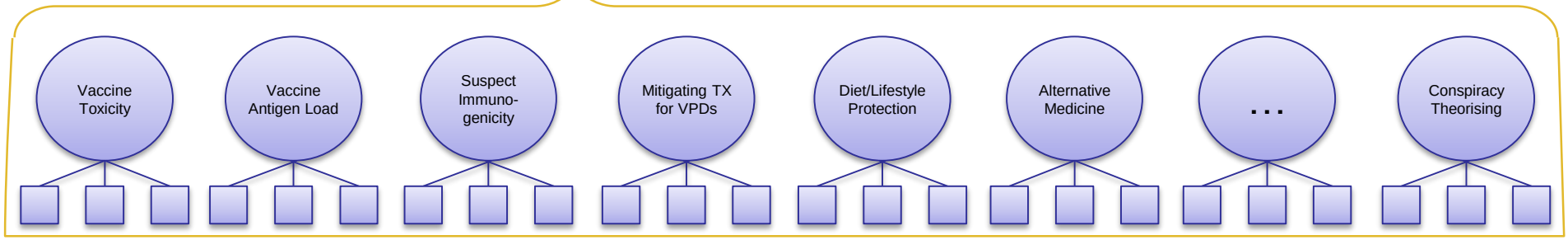




"**VAI**": ~3 items to assess *global* vaccine acceptance

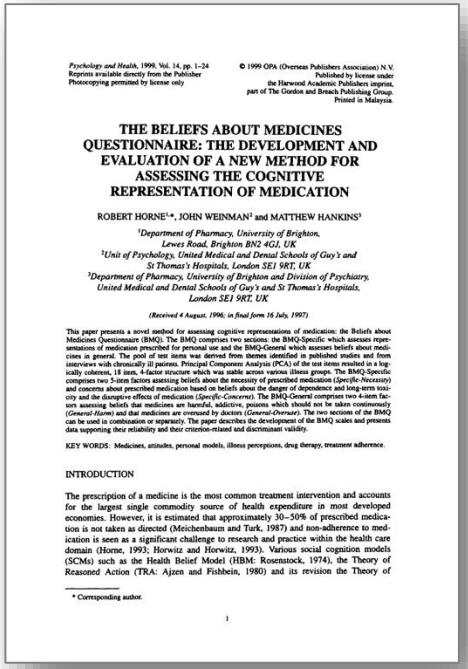


"**Short V-ABC**": ~15 items assess ~5 key domains of acceptance.



"**Long V-ABC**": ~45-60 items assess 15-20 specific attitudes, beliefs, and concerns.

VAI Origins



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THE BELIEFS ABOUT MEDICINES QUESTIONNAIRE: THE DEVELOPMENT AND EVALUATION OF A NEW METHOD FOR ASSESSING THE COGNITIVE REPRESENTATION OF MEDICATION

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This paper presents a novel method for assessing cognitive representations of medication; the Beliefs about Medicines Questionnaire (BMQ). The BMQ comprises two sections; the BMQ-Specific which assesses representations of medication prescribed for personal use and the BMQ-General which assesses beliefs about medicines in general. The pool of test items was derived from themes identified in published studies and from interviews with chronically ill patients. Principal Components Analysis (PCA) of the test items resulted in a logically coherent, 18 item, 4-factor structure which was stable across various illness groups. The BMQ-Specific comprises two 5-item factors assessing beliefs about the necessity of prescribed medication (*Specific-Necessity*) and concerns about prescribed medication based on beliefs about the danger of dependence and long-term toxicity and the disruptive effects of medication (*Specific-Concerns*). The BMQ-General comprises two 4-item factors assessing beliefs that medicines are harmful, addictive, poisons which should not be taken continuously (*General-Harm*) and that medicines are overused by doctors (*General-Overuse*). The two sections of the BMQ can be used in combination or separately. The paper describes the development of the BMQ scales and presents data supporting their reliability and their criterion-related and discriminant validity.

KEY WORDS: Medicines, attitudes, personal models, illness perceptions, drug therapy, treatment adherence.

INTRODUCTION

The prescription of a medicine is the most common treatment intervention and accounts for the largest single commodity source of health expenditure in most developed economies. However, it is estimated that approximately 30–50% of prescribed medication is not taken as directed (Meichenbaum and Turk, 1987) and non-adherence to medication is seen as a significant challenge to research and practice within the health care domain (Horne, 1993; Horwitz and Horwitz, 1993). Various social cognition models (SCMs) such as the Health Belief Model (HBM: Rosenstock, 1974), the Theory of Reasoned Action (TRA: Ajzen and Fishbein, 1980) and its revision the Theory of

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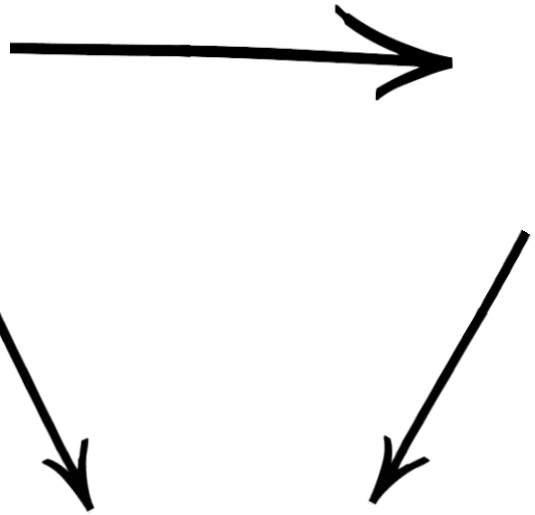
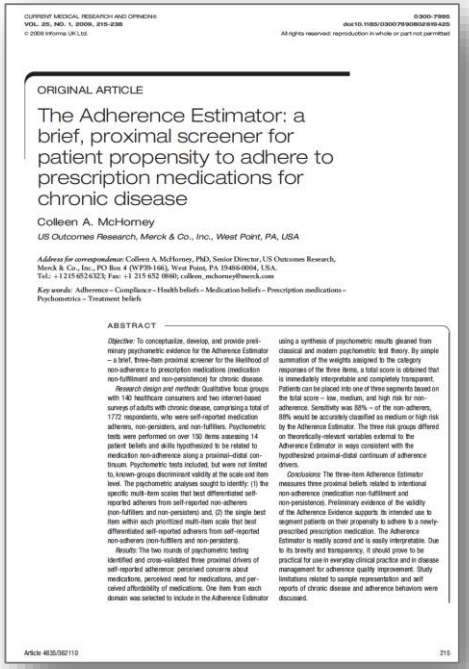
Necessity-Concerns Framework
(Horne et al, 1999)





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ORIGINAL ARTICLE

The Adherence Estimator: a brief, proximal screener for patient propensity to adhere to prescription medications for chronic disease

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Key words: Adherence – Compliance – Health beliefs – Medication beliefs – Prescription medications – Psychometrics – Treatment beliefs

ABSTRACT

Objective: To conceptualize, develop, and provide preliminary psychometric evidence for the Adherence Estimator – a brief, three-item proximal screener for the likelihood of non-adherence to prescription medications (medication non-fulfillment and non-persistence) for chronic disease.

Research design and methods: Qualitative focus groups with 140 healthcare consumers and two internet-based surveys of adults with chronic disease, comprising a total of 1772 respondents, who were self-reported medication adherers, non-persisters, and non-fulfillers. Psychometric tests were performed on over 150 items assessing 14 patient beliefs and skills hypothesized to be related to medication non-adherence along a proximal–distal continuum. Psychometric tests included, but were not limited to, known-groups discriminant validity at the scale and item level. The psychometric analyses sought to identify: (1) the specific multi-item scales that best differentiated self-reported adherers from self-reported non-adherers (non-fulfillers and non-persisters) and, (2) the single best item within each prioritized multi-item scale that best differentiated self-reported adherers from self-reported non-adherers (non-fulfillers and non-persisters).

Results: The two rounds of psychometric testing identified and cross-validated three proximal drivers of self-reported adherence: perceived concerns about medications, perceived need for medications, and perceived affordability of medications. One item from each domain was selected to include in the Adherence Estimator using a synthesis of psychometric results gleaned from classical and modern psychometric test theory. By simple summation of the weights assigned to the category responses of the three items, a total score is obtained that is immediately interpretable and completely transparent. Patients can be placed into one of three segments based on the total score – low, medium, and high risk for non-adherence. Sensitivity was 56% – of the non-adherers, 88% would be accurately classified as medium or high risk by the Adherence Estimator. The three risk groups differed on theoretically-relevant variables external to the Adherence Estimator in ways consistent with the hypothesized proximal–distal continuum of adherence drivers.

Conclusions: The three-item Adherence Estimator measures three proximal beliefs related to intentional non-adherence (medication non-fulfillment and non-persistence). Preliminary evidence of the validity of the Adherence Evidence supports its intended use to segment patients on their propensity to adhere to a newly-prescribed prescription medication. The Adherence Estimator is readily scored and is easily interpretable. Due to its brevity and transparency, it should prove to be practical for use in everyday clinical practice and in disease management for adherence quality improvement. Study limitations related to sample representation and self reports of chronic disease and adherence behaviors were discussed.

Article 4835/062110

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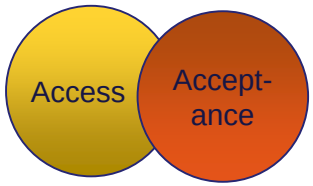
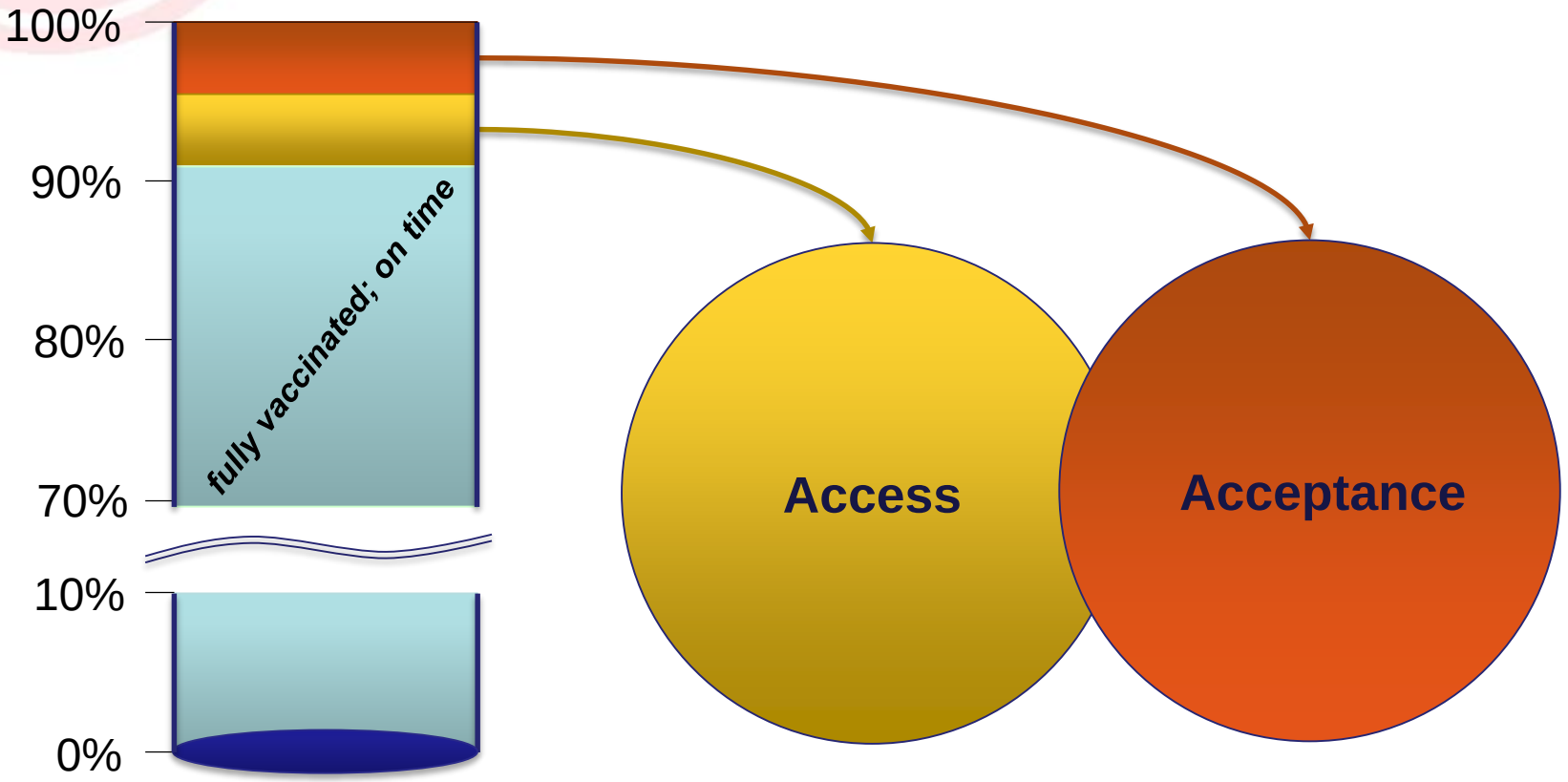
Brief Adherence Estimator
(McHorney et al, 2009)

Vaccine Acceptance Index



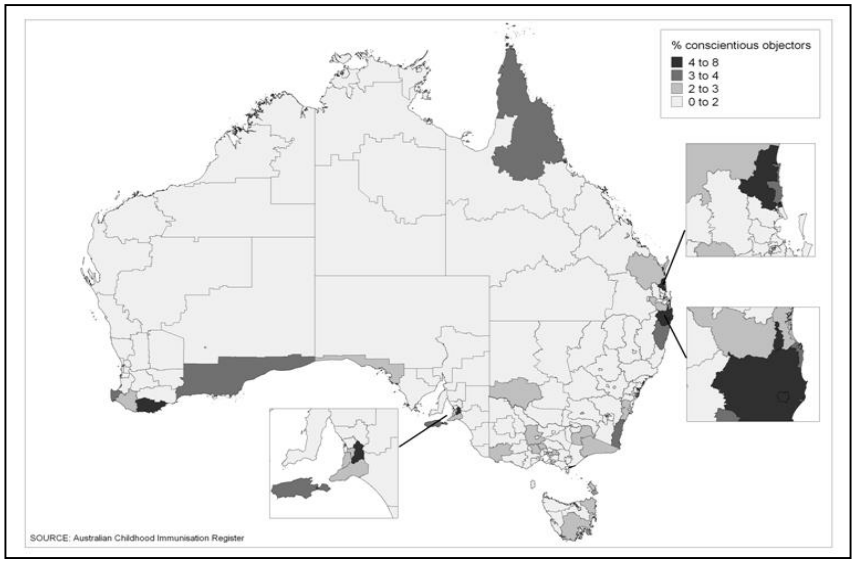
1. *I am convinced of the importance of vaccines for my child.*
1. *I worry that vaccines will do my child more harm than good.*
1. *The current vaccine schedule is appropriate for my child.*
1. *It is difficult for me to get my child vaccinated.*

Two A's



Monitor and Predict Vaccine Uptake

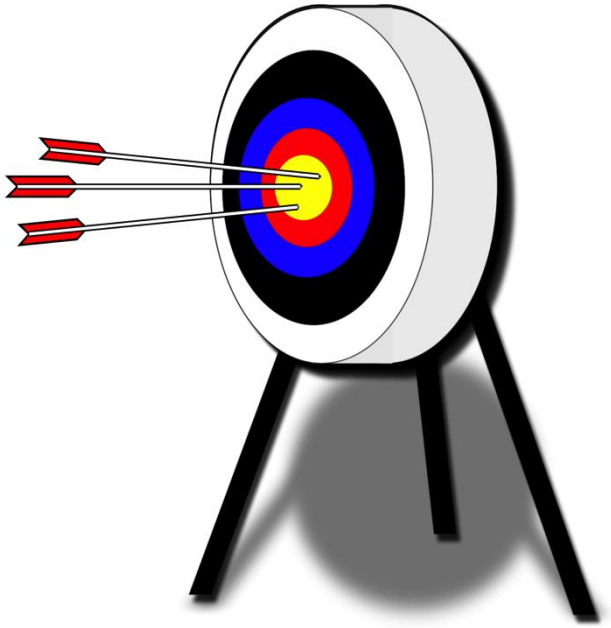
Triangulate estimates of coverage



Monitoring to forewarn downturns

Diagnose and Treat

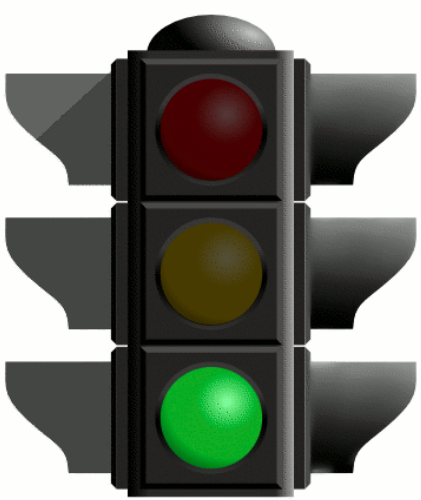
Inform <u>target</u> of interventions



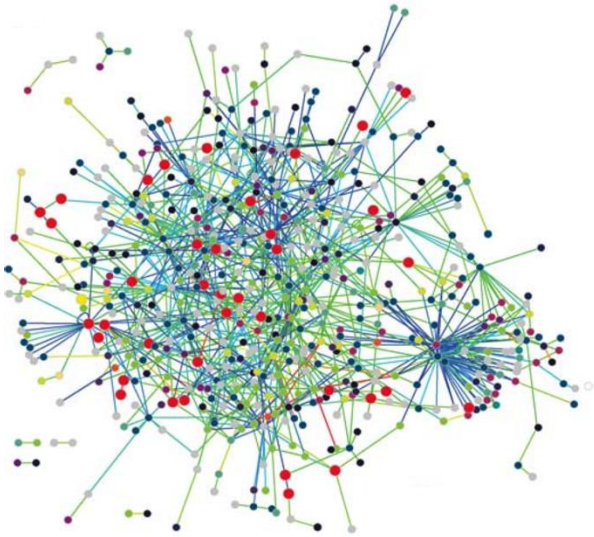
Inform <u>timeliness</u> of interventions

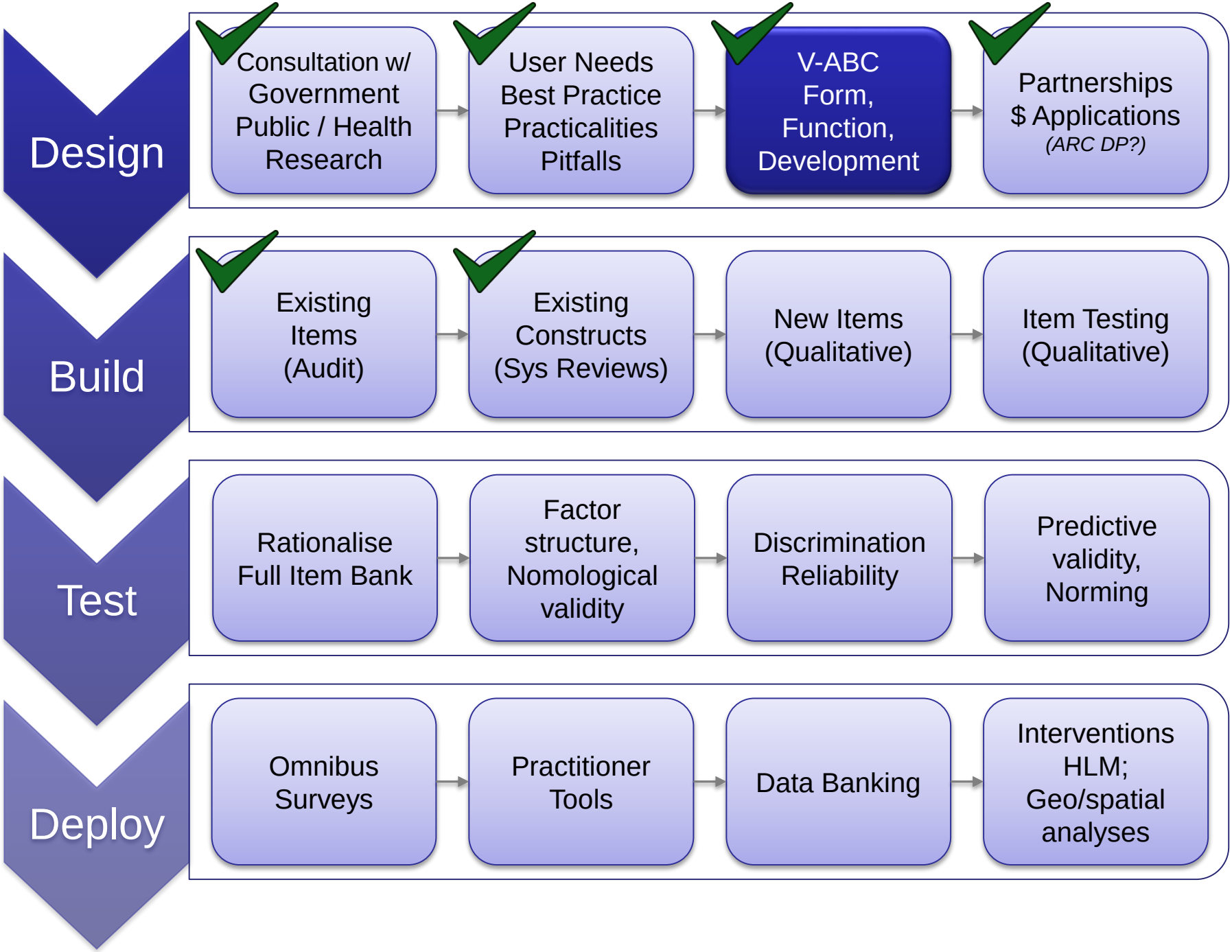
Plan

Better economic forecasting for proposed vaccines



Better hypothetical simulation for novel scenarios

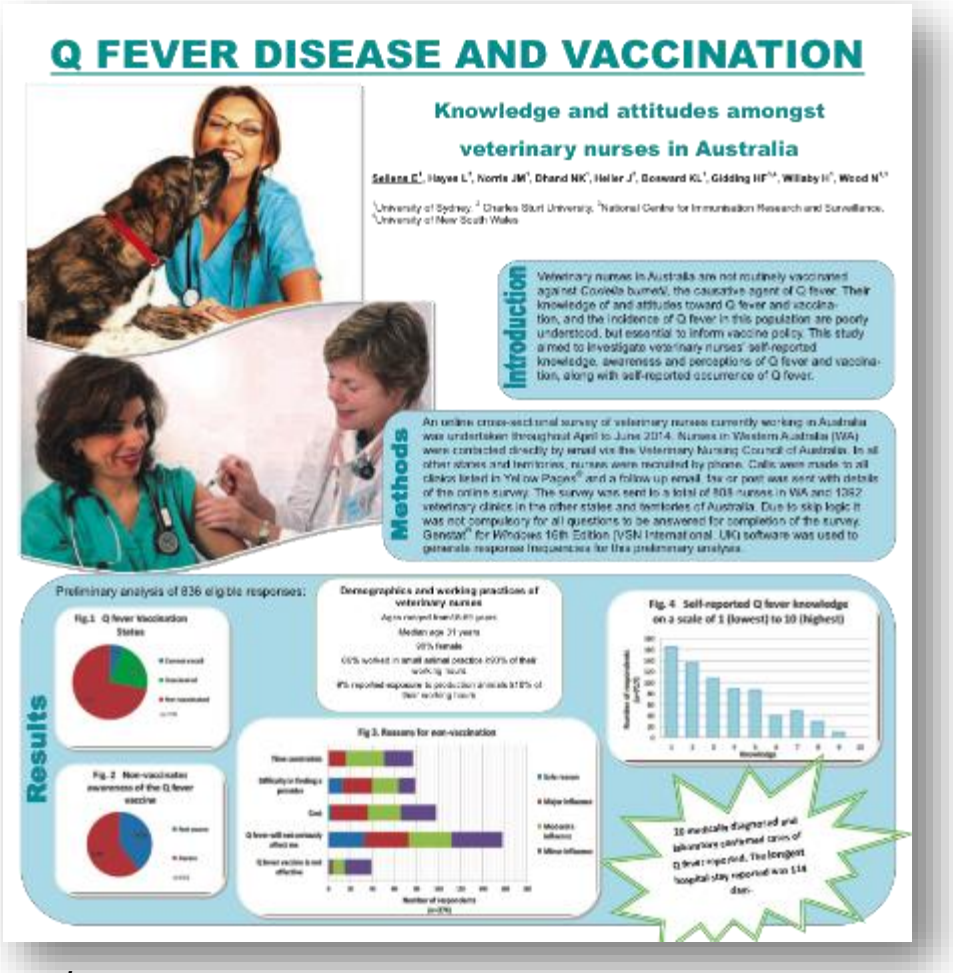



Design
Consultation w/ Government Public / Health Research
User Needs Best Practice Practicalities Pitfalls
V-ABC Form, Function, Development
Partnerships $ Applications (ARC DP?)
Build
Existing Items (Audit)
Existing Constructs (Sys Reviews)
New Items (Qualitative)
Item Testing (Qualitative)
Test
Rationalise Full Item Bank
Factor structure, Nomological validity
Discrimination Reliability
Predictive validity, Norming
Deploy
Omnibus Surveys
Practitioner Tools
Data Banking
Interventions HLM; Geo/spatial analyses

Questions from the Q Fever Survey

VAI Items	
Important	*I am convinced of the importance of QF vaccine.*
° **Not Worried**	*I worry that QF vaccine will do more harm than good.*
° **Easy**	*It is difficult for me to get vaccinated against QF.*

° *Original items are reverse coded in subsequent reporting*



Questions from the Q Fever Survey

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Important	*I am convinced of the importance of QF vaccine.*
° **Not Worried**	*I worry that QF vaccine will do more harm than good.*
° **Easy**	*It is difficult for me to get vaccinated against QF.*

~ S-VABC Items	
Exposure	How concerned are you that you could be exposed to the bacteria causing QF?
Severity	Q fever is a serious illness with significant health consequences.
Safety	The Q fever vaccine is safe if appropriately administered.
Effective	The Q fever vaccine is effective in preventing Q fever.
Expense	The Q fever vaccine is too expensive.

° *Original items are reverse coded in subsequent reporting*

Questions from the Q Fever Survey

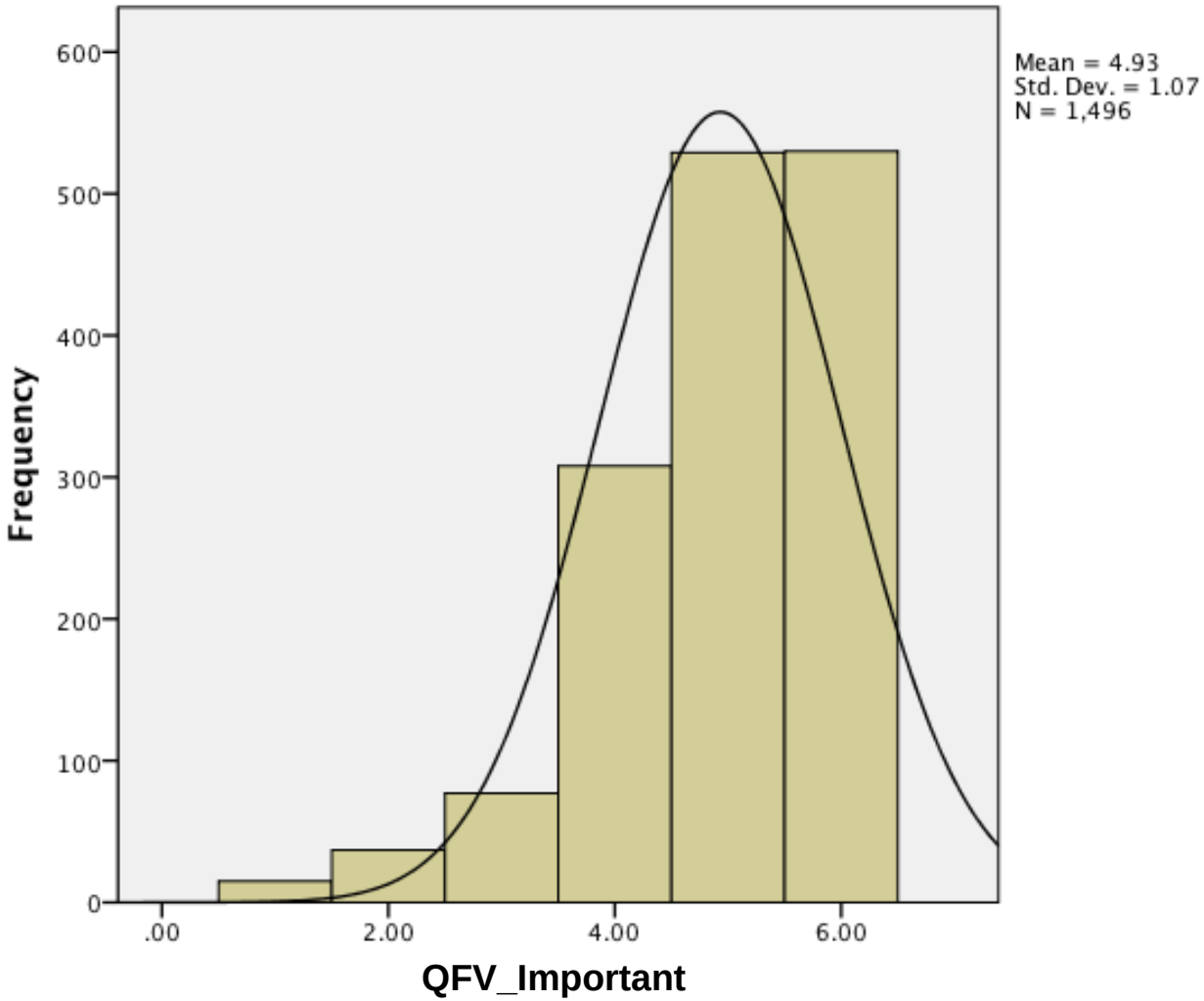
VAI Items			~ S-VABC Items	
Important	*I am convinced of the importance of QF vaccine.*	VPD	**Exposure**	How concerned are you that you could be exposed to the bacteria causing QF?
			Severity	Q fever is a serious illness with significant health consequences.
° **Not Worried**	*I worry that QF vaccine will do more harm than good.*	VAX	**Safety**	The Q fever vaccine is safe if appropriately administered.
			Effective	The Q fever vaccine is effective in preventing Q fever.
° **Easy**	*It is difficult for me to get vaccinated against QF.*	Cost	**Expense**	The Q fever vaccine is too expensive.

° *Original items are reverse coded in subsequent reporting*

1. ***I am convinced of the importance of the QF vaccine.***

1. *I worry that the QF vaccine will do more harm than good.*

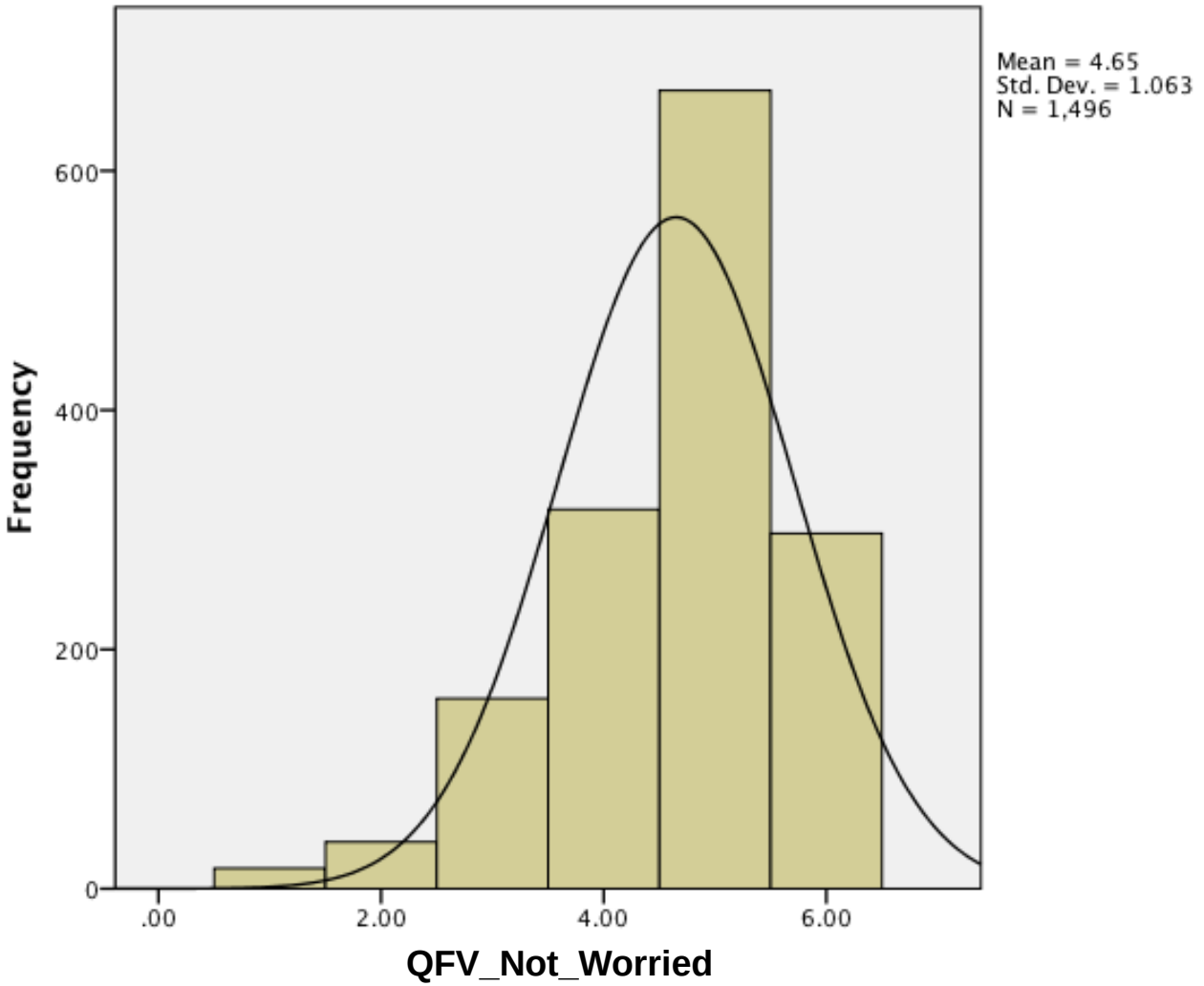
1. *It is difficult for me to get vaccinated against QF.*



1. *I am convinced of the importance of the QF vaccine.*

1. ***I worry that the QF vaccine will do more harm than good.***

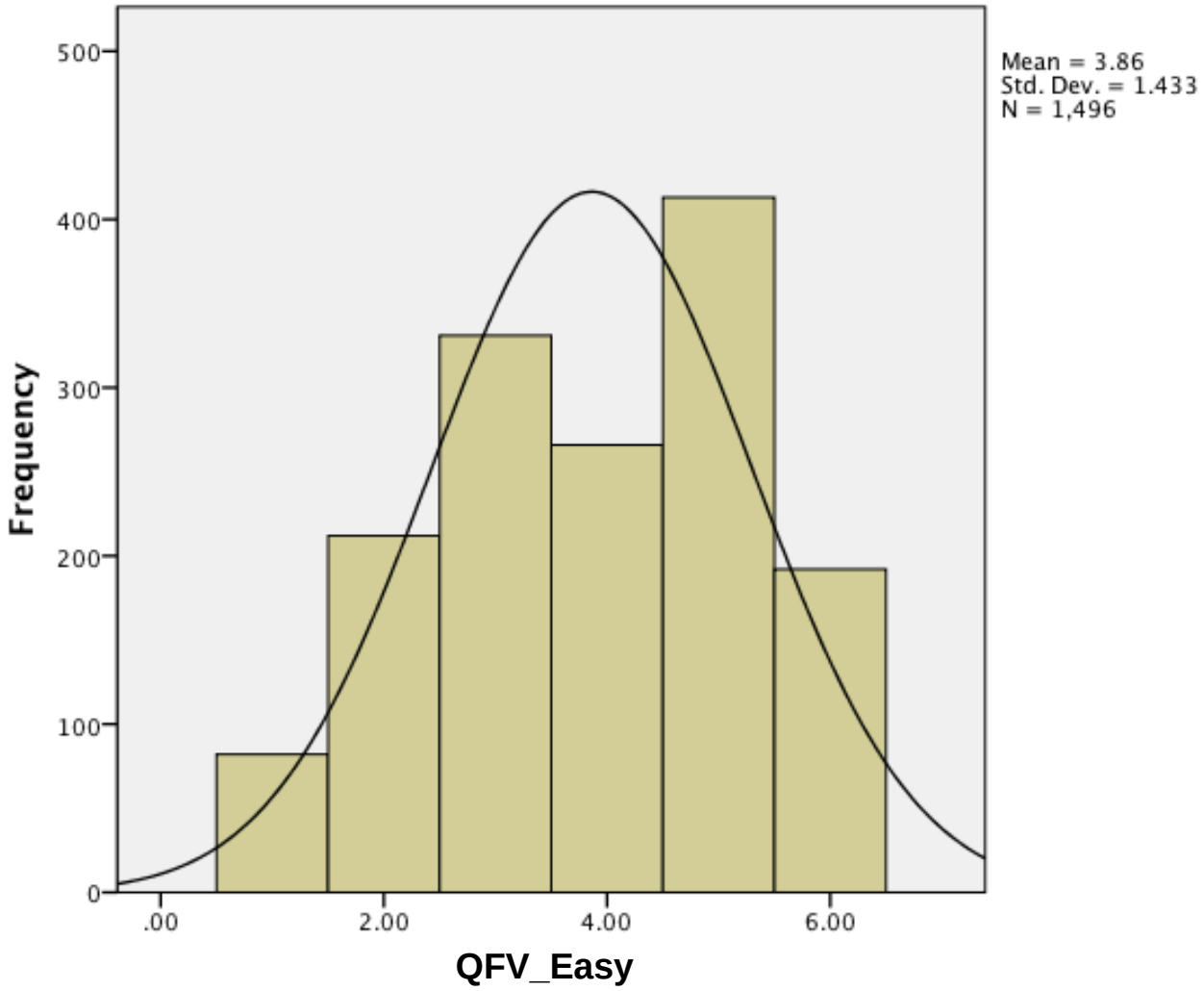
1. *It is difficult for me to get vaccinated against QF.*



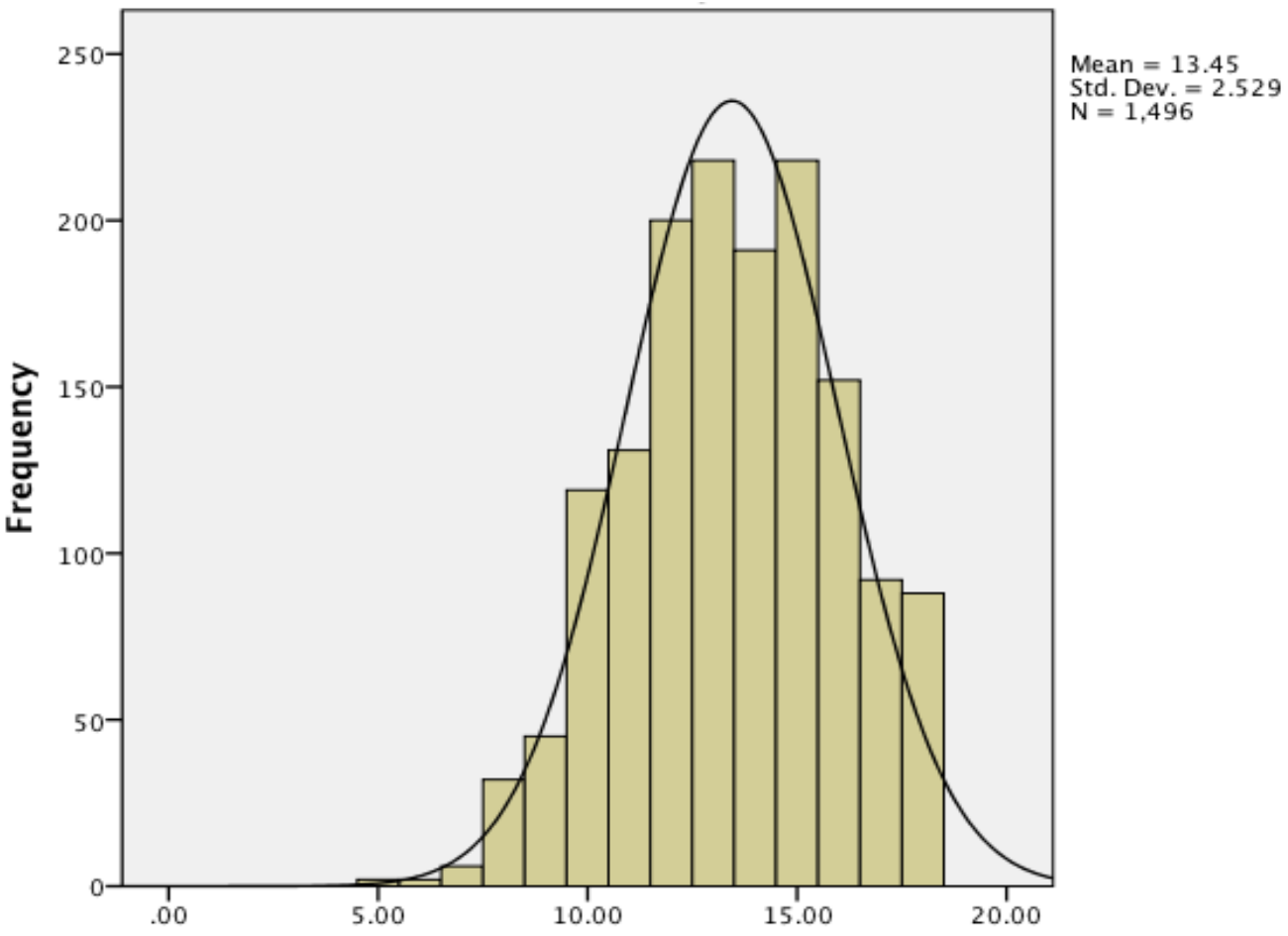
1. *I am convinced of the importance of the QF vaccine.*

1. *I worry that the QF vaccine will do more harm than good.*

1. ***It is difficult for me to get vaccinated against QF.***



Important
+ Not Worried
+ Easy
= VAI *(unweighted)*



Q Fever and Q Fever vaccination

Do the VAI items predict vaccination status for this sample (n=1,066)?

Step	Pseudo R^2		Variables Entered	B	S.E.	Wald	Sig.	Exp(B)	
1	0.100	a	**QFV_Important**	**0.715**	**0.074**	**93.524**	**0.00**	**2.044**	◀
			Constant	*-3.225*	*0.378*	*72.969*	*0.00*	*0.040*	
2	0.123	a	QFV_Important	0.546	0.08	47.164	0.00	1.727	
		b	**QFV_Not_Worried**	**0.388**	**0.075**	**26.85**	**0.00**	**1.474**	◀
			Constant	*-4.209*	*0.432*	*94.871*	*0.00*	*0.015*	
3	0.167	a	QFV_Important	0.576	0.082	49.475	0.00	1.779	
		b	QFV_Not_Worried	0.286	0.078	13.633	0.00	1.331	
		c	**QFV_Easy**	**0.351**	**0.048**	**53.505**	**0.00**	**1.420**	◀
			Constant	*-5.226*	*0.47*	*123.54*	*0.00*	*0.005*	
4	0.185	a	QFV_Important	0.680	0.382	3.177	*n.s.* 0.08	1.974	
		b	QFV_Not_Worried	-0.074	0.391	0.035	*n.s.* 0.85	0.929	
		c	QFV_Easy	1.539	0.334	21.26	0.00	4.659	
		d	**a * b**	**0.127**	**0.060**	**4.460**	**0.04**	**1.135**	◀
		e	**b * c**	**-0.071**	**0.054**	**1.726**	***n.s.*** **0.19**	**0.931**	
		f	**a * c**	**-0.162**	**0.062**	**6.751**	**0.01**	**0.851**	
			Constant	*-7.263*	*2.034*	*12.758*	*0.00*	*0.001*	

- Steps 1 – 3 indicate VAI items explain each unique incremental variance.
- Step 4 indicates that (in this sample) a practically important interaction of Importance and Ease

Prediction of VAI Importance by ~S-VABC items

Results of stepwise multiple regression of predictors of VAI items for 1,066 vets and vet nurses:

Q Fever Vaccine Importance

Variable	Beta	p	R^2	Adj R^2	Model F	Model p
Step 1						
Severity	**0.250**	0.00				
Exposure	**0.267**	0.00				
Safety	0.147	0.00	0.48	0.22	60.878	0.00
Effective	-0.102	0.00				
Expensive	-0.144	0.00				
Step 2						
Severity	0.199	0.00				
Exposure	0.272	0.00				
Safety	0.197	0.00				
Effective	-0.128	0.00	0.53	0.28	57.954	0.00
Expensive	-0.122	0.00				
Safety x Effectiveness	**-0.234**	0.00				
Severity x Exposure	-0.098	0.00				

Relative to VAX and COST,
VPD threat main effects are more predictive of 'Importance'.
However, the VPD threat interaction considerably less predictive than VAX.

Prediction of VAI Not Worried by ~S-VABC items

Results of stepwise multiple regression of predictors of VAI items for 1,066 vets and vet nurses:

Q Fever Vaccine Not Worried

Variable	Beta	p	R2	Adj R2	Model F	Model p
Step 1						
Severity	0.129	0.00				
Exposure	0.086	0.00				
Safety	**0.243**	0.00	0.36	0.13	32.053	0.00
Effective	*-0.036*	0.30				
Expensive	-0.200	0.00				
Step 2						
Severity	0.098	0.00				
Exposure	0.079	0.01				
Safety	0.29	0.00				
Effective	*-0.063*	0.06	0.43	0.18	33.36	0.00
Expensive	-0.179	0.00				
Safety x Effectiveness	**-0.231**	0.00				
Severity x Exposure	*-0.029*	0.32				

‘Not worried’ is predicted most by perceptions of Safety, but by Effectiveness. The VAX interaction alone is active.

Prediction of VAI Easy by ~S-VABC items

Results of stepwise multiple regression of predictors of VAI items for 1,066 vets and vet nurses:

Q Fever Vaccine Easy

Variable	Beta	p	R^2	Adj R^2	Model F	Model p
Step 1						
Severity	*0.023*	0.47				
Exposure	-0.116	0.00				
Safety	*0.026*	0.46	0.32	0.10	23.071	0.00
Effective	*-0.024*	0.49				
Expensive	**-0.305**	0.00				
Step 2						
Severity	*0.032*	0.34				
Exposure	-0.127	0.00				
Safety	*0.037*	0.31				
Effective	*-0.033*	0.35	0.33	0.10	17.677	0.00
Expensive	-0.299	0.00				
Safety x Effectiveness	*-0.06*	0.05				
Severity x Exposure	*0.05*	0.11				

Perceptions of cost are almost alone in predicting ‘Easy’.

Prediction of VAI Index by ~S-VABC items

Results of stepwise multiple regression of predictors of VAI items for 1,066 vets and vet nurses:

Linear Q Fever VAI

Variable	Beta	p	R^2	Adj R^2	Model F	Model p
Step 1						
Severity	0.168	0.00				
Exposure	0.073	0.01				
Safety	0.175	0.00	0.42	0.18	45.487	0.00
Effective	-0.071	0.04				
Expensive	-0.324	0.00				
Step 2						
Severity	0.14	0.00				
Exposure	0.066	0.02				
Safety	0.221	0.00				
Effective	-0.097	0.00	0.48	0.22	43.619	0.00
Expensive	-0.303	0.00				
Safety x Effectiveness	-0.226	0.00				
Severity x Exposure	-0.021	0.46				

Interesting that VPD threat interaction is not predictive of VAI Index (??).
Perceptions of effectiveness are not strong related.
Note Step 2 R^2 of previous items: .28, .18, .10.

Acknowledgements

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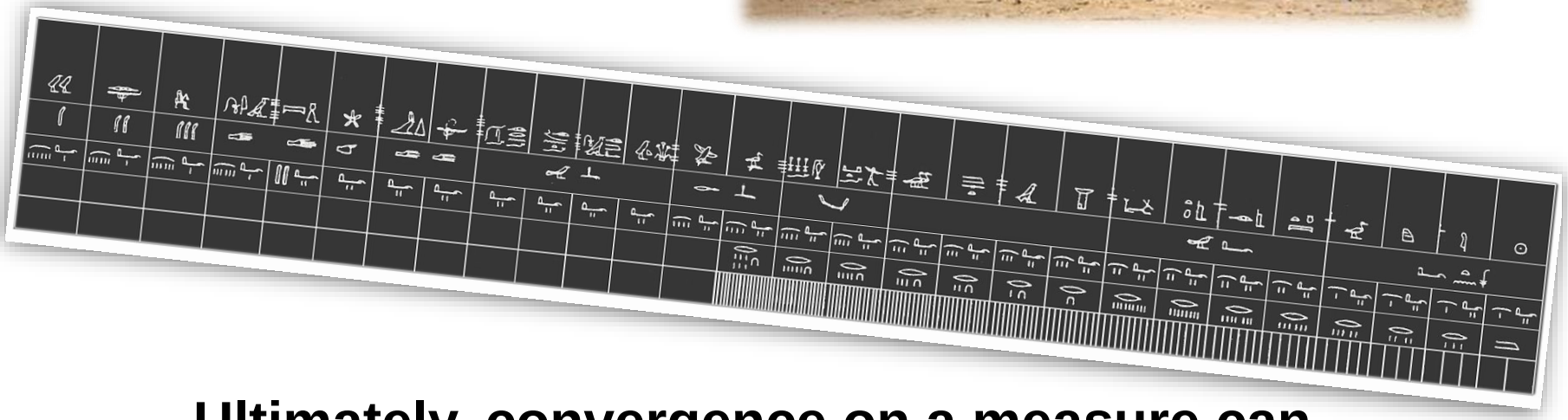
Acknowledgement of contribution and thanks:

- V-ABC Team
  - Julie Leask, Nick Sevdalis, Helen Marshall
- Q Fever Team
  - Emily Sellens, Heather Gidding, Nick Wood (see slide 12)
- Supporting staff at NCIRS
- Consultation participants



Ultimately, convergence on a measure can provide a basis for communication and coordination.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Bivariate correlations of VAI Items and ~S-VABC items

		VAI				VPD			VAX			COST
		VAI	Important	Not Worried	Easy	Severity	Exposure	Sev X Exp	Safety	Effective	Safe X Eff	Expensive
VAI	VAI		.677**	.745**	.706**	.229**	.192**	-0.012	.105**	-.057*	-.238**	-.333**
	Important	.677**		.463**	.105**	.323**	.375**	-.086**	.079**	-.076**	-.240**	-.220**
	Not Worried	.745**	.463**		.227**	.207**	.147**	-0.016	.181**	0.025	-.221**	-.206**
	Easy	.706**	.105**	.227**		0.008	-0.051	0.049	-0.007	-.062*	-.085**	-.270**
VPD	Severity	.229**	.323**	.207**	0.008		.218**	-.241**	.266**	.152**	-.066*	0.006
	Exposure	.192**	.375**	.147**	-0.051	.218**		.109**	-0.013	-.062*	-.068*	-.148**
	Sev X Exp	-0.012	-.086**	-0.016	0.049	-.241**	.109**		-0.032	-0.013	-.134**	-0.03
VAX	Safety	.105**	.079**	.181**	-0.007	.266**	-0.013	-0.032		.593**	.116**	.187**
	Effective	-.057*	-.076**	0.025	-.062*	.152**	-.062*	-0.013	.593**		-0.006	.288**
	Safe X Eff	-.238**	-.240**	-.221**	-.085**	-.066*	-.068*	-.134**	.116**	-0.006		.094**
COST	Expensive	-.333**	-.220**	-.206**	-.270**	0.006	-.148**	-0.03	.187**	.288**	.094**	

Correlations are directionally unsurprising,
except for VAI and VAX Effectiveness

A Proposed Measure of Parental Vaccine Acceptance: The V-ABC

ABSTRACT

There is currently no validated means of measuring parental vaccine acceptance that comprehensively includes known influences, is efficient for population surveillance, and can diagnose the exact drivers of vaccine non-acceptance. The Vaccine Attitudes Beliefs and Concerns (V-ABC) is under development to address these gaps. Prior to development we undertook a consultation process with stakeholders and experts from Australia, the USA and Europe to specify the design, development and application of the V-ABC.

The V-ABC is a three-tiered measure purposefully designed to: 1) conduct surveillance of population-level vaccine acceptance (top tier); 2) identify – for either the individual or a population – key classes of attitudes, beliefs and concerns that affect vaccine acceptance (middle tier); and 3) diagnose detailed influences in order to target, pre-test and evaluate public campaigns and other interventions (lowest tier). Stakeholders we consulted indicated the V-ABC would assist them in maintaining high vaccine coverage rates through mechanisms that correspond to each tier of the measure. Target users of the V-ABC include public health officials, immunisation service providers, market researchers who develop and implement vaccine information campaigns, and academic researchers of vaccine decision-making.

This presentation will detail the form and function of the V-ABC, report on current development, and highlight results from recent data collection.