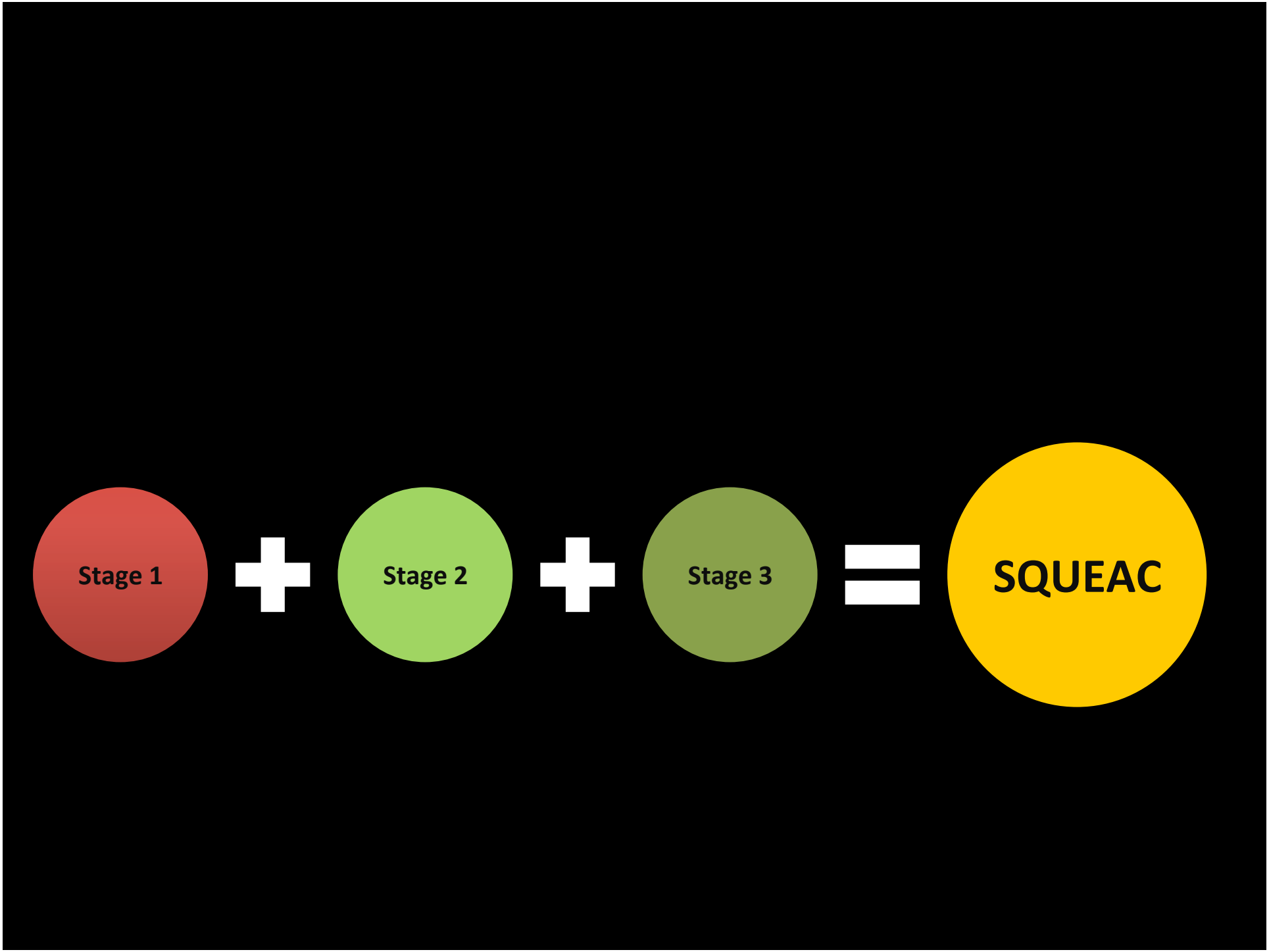
STAGE 3

Together, these three element are now known as SQUEAC


Stage 1
Stage 2
Stage 3
SQUEAC

Small are surveys and, where relevant, small surveys and small studies are used to confirm hypotheses of homogeneity/heterogeneity of coverage across the programme area

Results are classified using LQAS and can be extrapolated to areas with similar characteristics

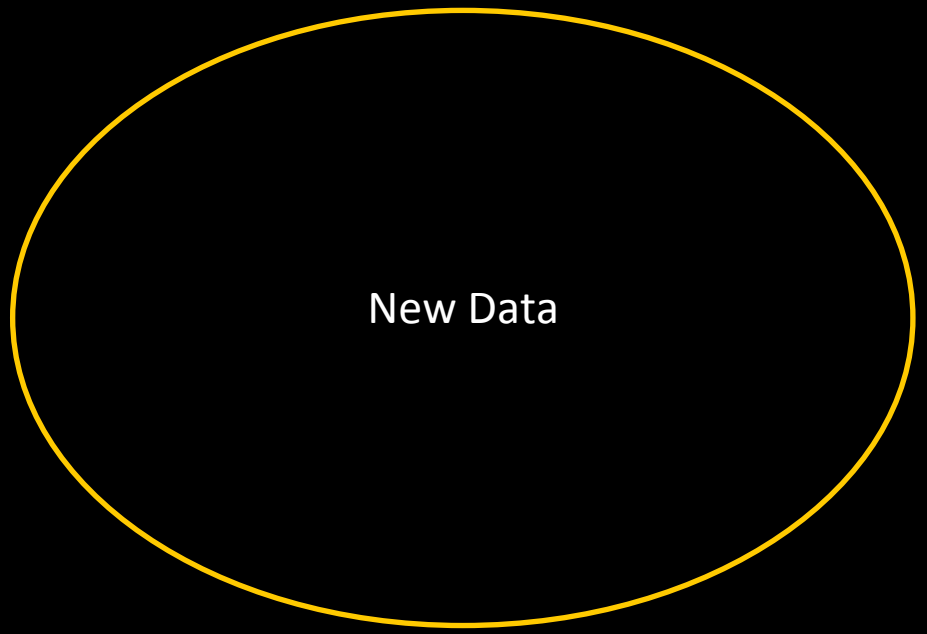
The outcome of Stage 2 determines whether it is in fact appropriate to proceed to Stage 3 (if coverage is patchy then a headline estimate for the whole programme area will have little value)

Stage 3:

Provide an estimate of overall programme coverage using Bayesian techniques.

Think back to the earlier point

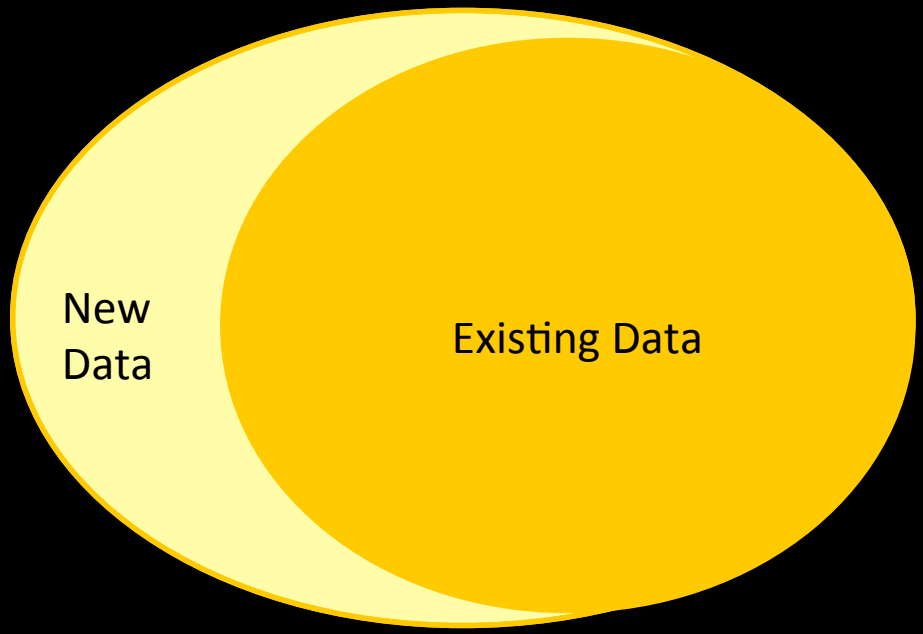
In traditional "surveys", the results are based on the **frequency** on which certain elements appear from a sample of new data collected



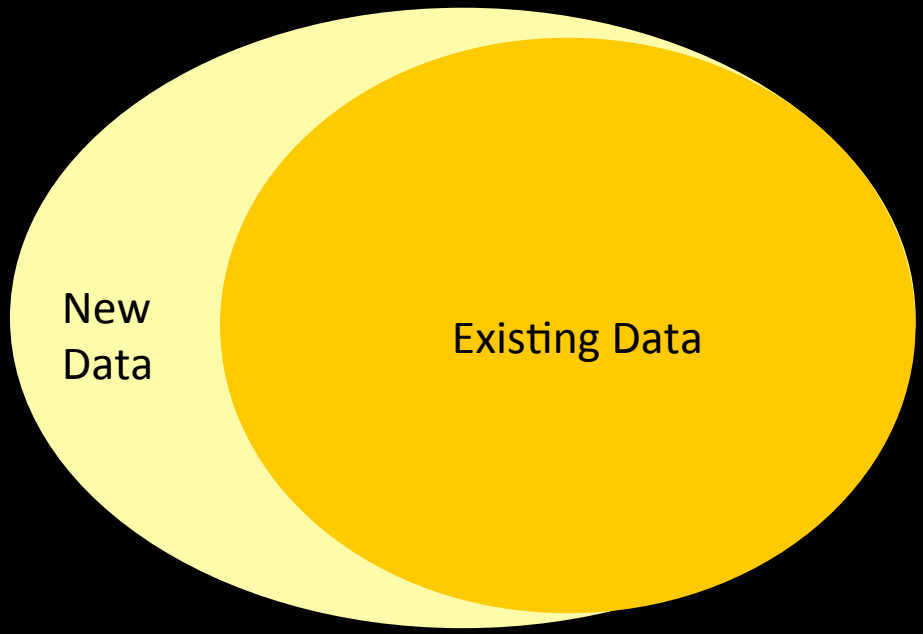
The problem is that to achieve the required confidence in this proportion, a large sample is required

For coverage monitoring to be fast, practical (but still reliable) a way around this had to be found

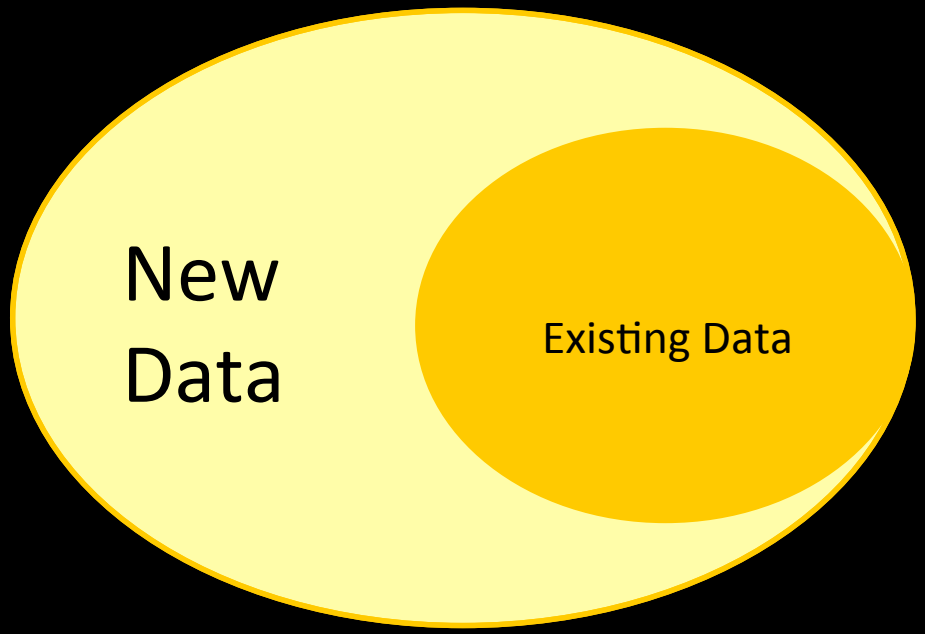
SQUEAC combines existing information about coverage with a smaller sample to come up with the estimation



The method recognises that the amount of existing data, and its reliability, will vary and adapts to it



The method recognises that the amount of existing data, and its reliability, will vary and adapts to it



The method recognises that the amount of existing data, and its reliability, will vary and adapts to it

This is achieved by leaving aside frequentist statistics and venturing into the world of Bayesian probability

The foundation of Bayesian techniques is that what we know about programme coverage (our feeling of what it actually is) should be incorporated into the coverage analysis

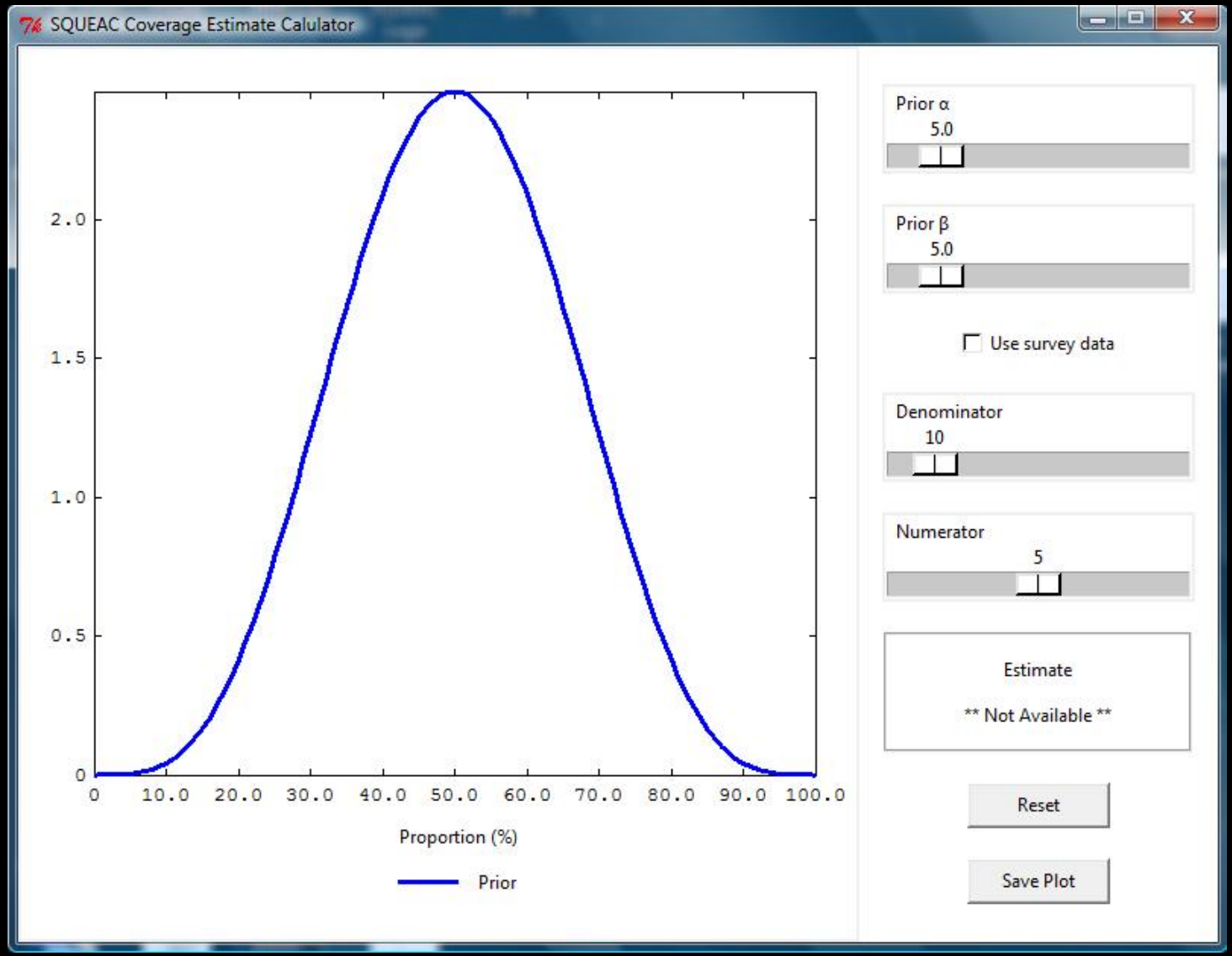
But how?

SQUEAC uses all the data analysed in Stage 1 & 2 to create a PRIOR

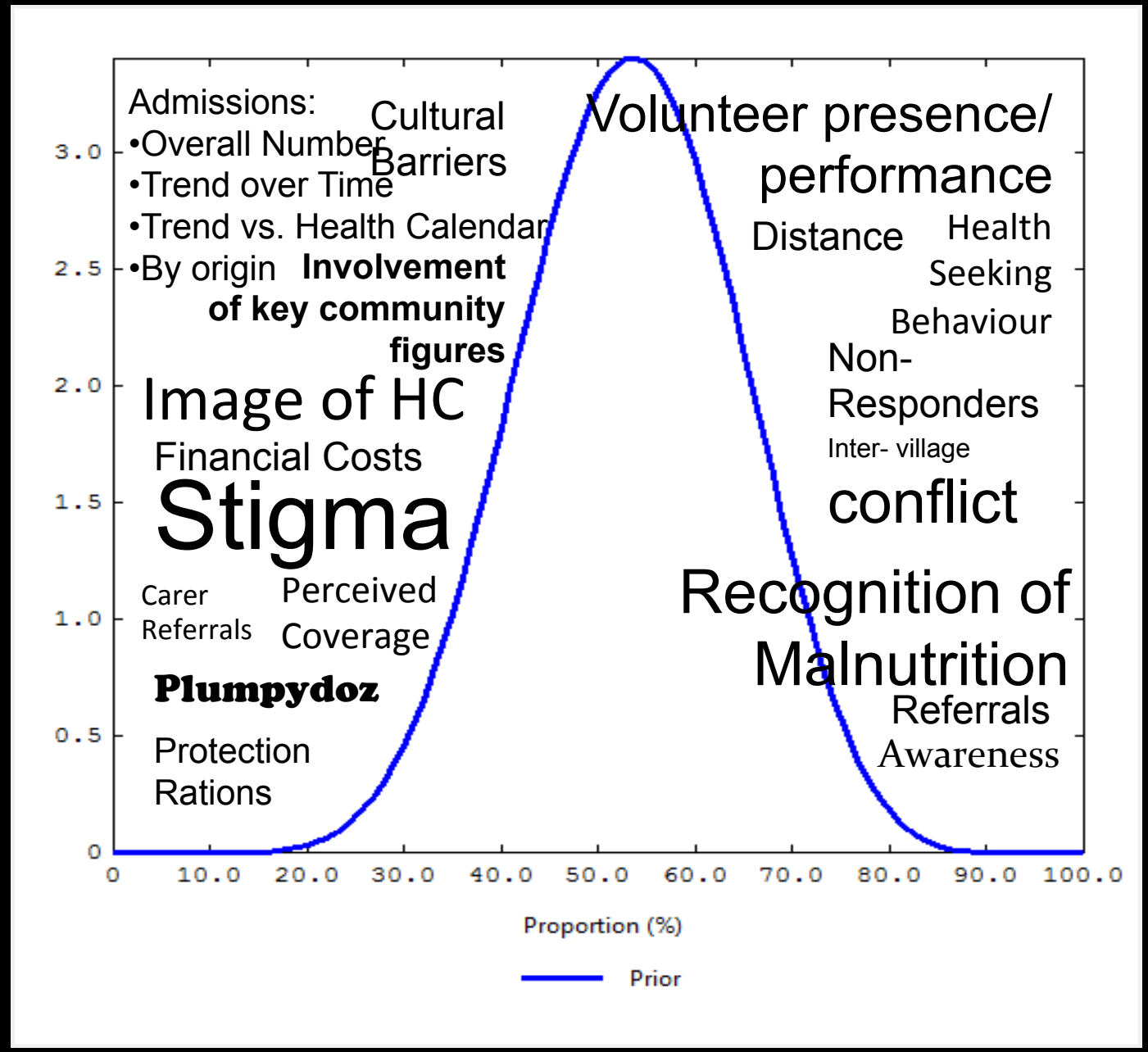
PRIOR is a statistical representation of our belief in programme coverage

To construct a **PRIOR**,
a free, open-source tool has been created

SQUEACBayes Calculator

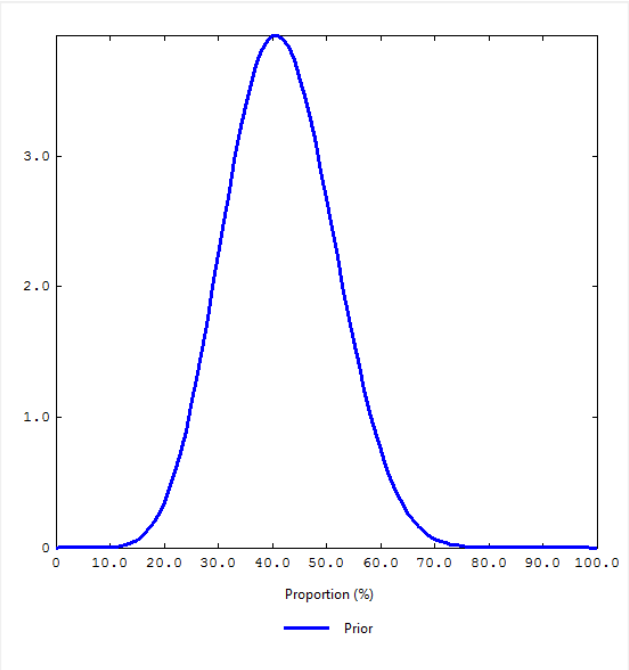


How do we construct a prior?


Admissions:
•Overall Number
•Trend over Time
•Trend vs. Health Calendar
•By origin
Cultural Barriers
Involvement of key community figures
Volunteer presence/ performance
Distance
Health Seeking Behaviour
Non-Responders
Inter- village conflict
Image of HC
Financial Costs
Stigma
Carer Referrals
Perceived Coverage
Recognition of Malnutrition
Plumpydoz
Referrals
Awareness
Protection
Rations
3.0
2.5
2.0
1.5
1.0
0.5
0
0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
Proportion (%)
Prior

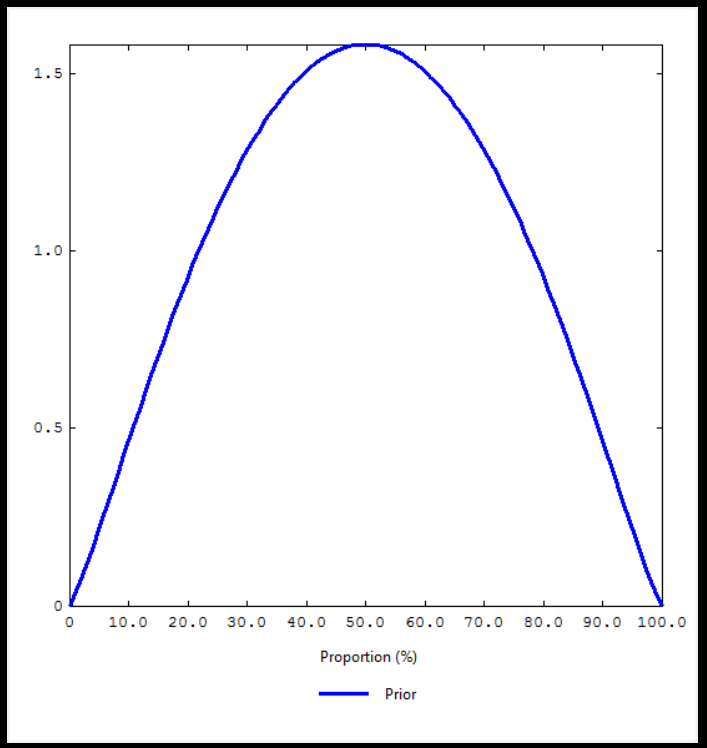
Positive Factors	Value		Negative Factors
Admissions (over time)	5	5	Linkages with other Health Facilities
Exits (incl. Cure/Defaulter/Death/N-Responders)	5	5	Opportunity Costs
Programme Long-Term Presence	3	5	Impact of Stockouts
		3	Health Seeking Behaviour
		3	Late Presentation
		3	Awareness about the Programme
		3	Admission Schedule
		1	Attitude of Health Centre Staff
		1	Stigma/Shame (about Malnutrition)
		1	Admissions (vs. Needs)
	13	30	
Added to Minimum Coverage (0%)	13	70	Subtracted from Maximum Coverage (100%)
	41.5		

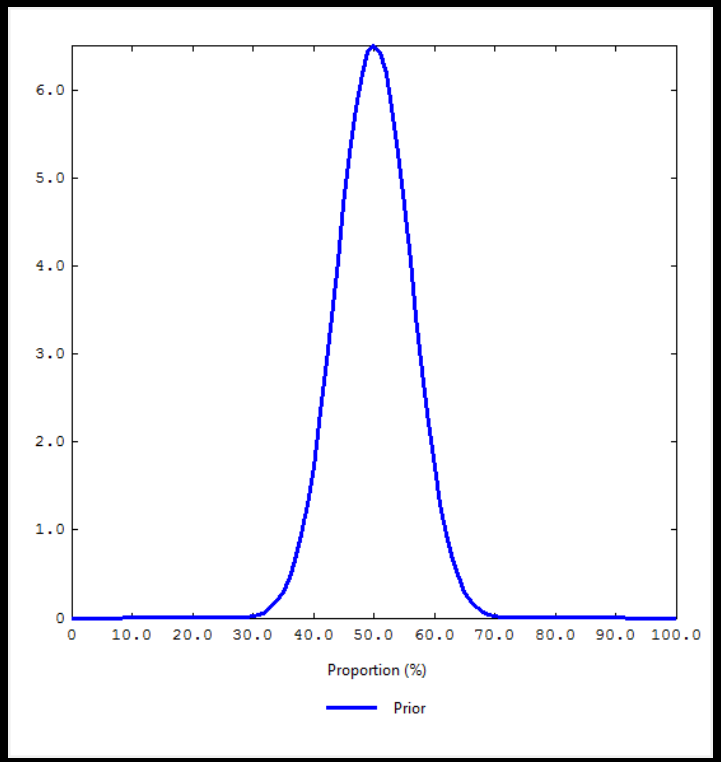
Alpha value	9.9	14	**Beta Value**

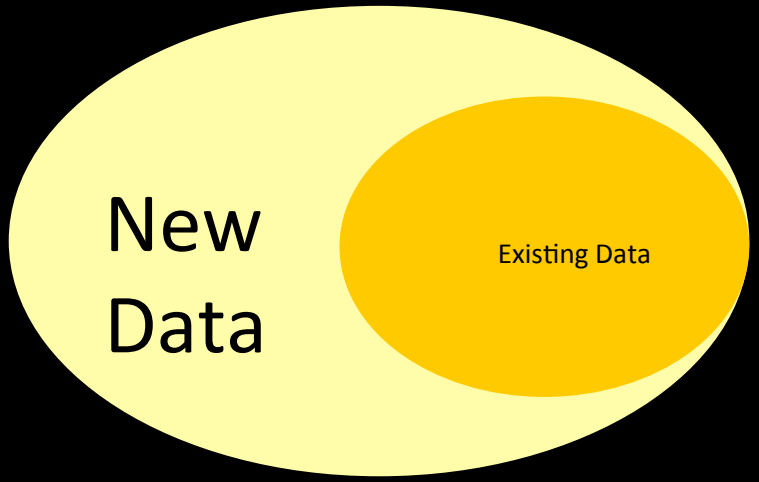


The most important thing is not for the prior to be build following specific steps, but for the final curve to accurately reflect your belief about programme coverage

One way to think about this is....


1.5
1.0
0.5
0
0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0
Proportion (%)
Prior


6.0
5.0
4.0
3.0
2.0
1.0
0
0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0
Proportion (%)
Prior


New Data
Existing Data


New Data
Existing Data

Be cautious: a narrow Prior suggests a degree of certainty about coverage that can only be achieved with sufficient evidence (or after repeated coverage assessments)

In the end, however , an investigation can only tell you so much, so SQUEAC has set some parameters for developing Priors

Values of Alpha and Beta >35 are normally inappropriately high

To complement existing data, we need to collect new statistical data on coverage

And that's where wide-area surveys come in

Before we can do that, we need to determine the minimum **number of children** to sample to achieve the desired confidence, and the **number of villages** to sample

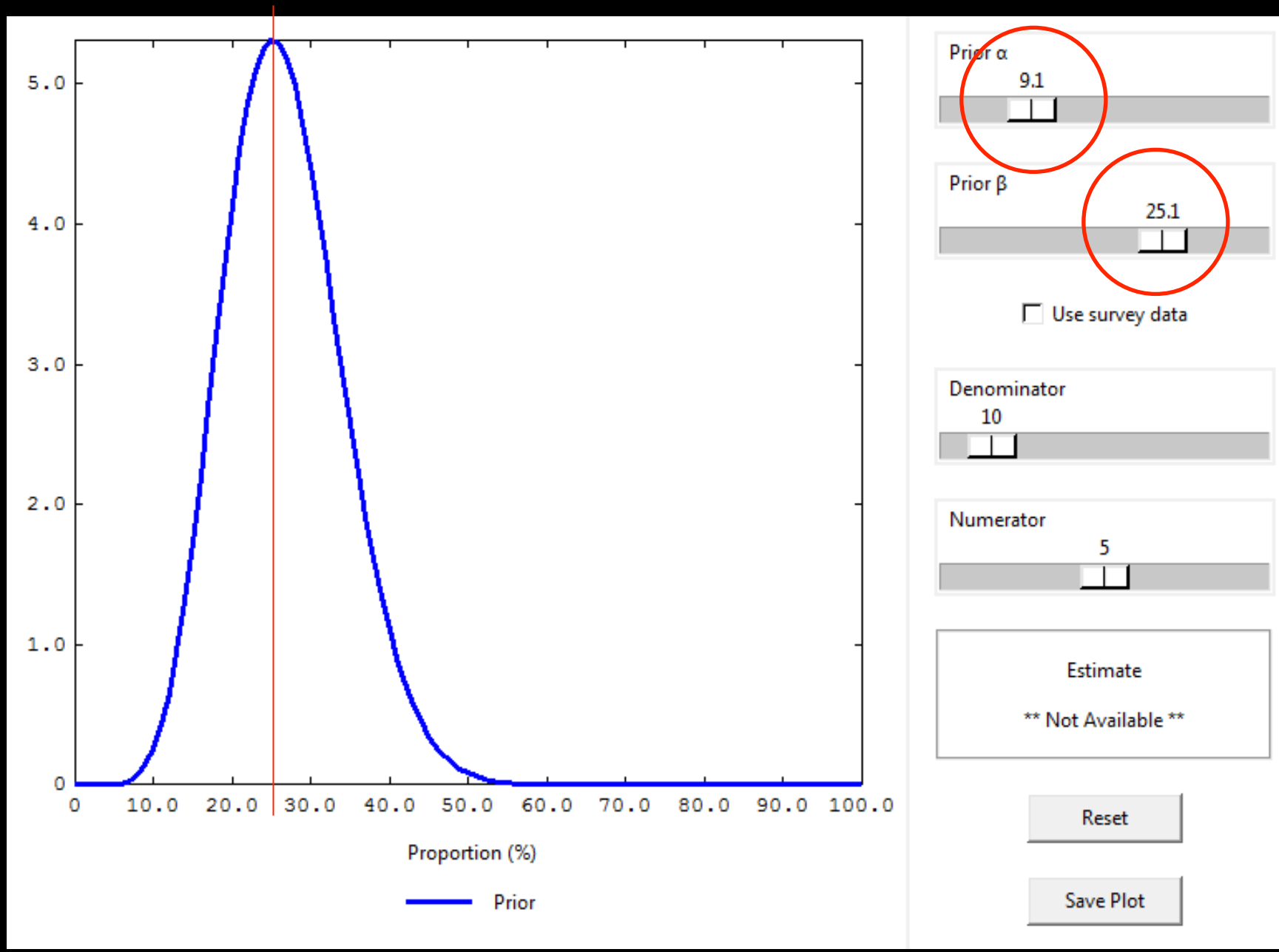
Minimum Sample Size

We can use the following formula

$$n = \left\lceil \frac{mode \cdot (1 - mode)}{(precision \div 1.96)^2} - (\alpha + \beta - 2) \right\rceil$$

Using your α and β values from our Prior

An example…


5.0
4.0
3.0
2.0
1.0
0
0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
Proportion (%)
Prior
Prior α
9.1
Prior β
25.1
Use survey data
Denominator
10
Numerator
5
Estimate
** Not Available **
Reset
Save Plot

$$n = \left\lceil \frac{mode \cdot (1 - mode)}{(precision \div 1.96)^2} - (\alpha + \beta - 2) \right\rceil$$

$$n = \left\lceil \frac{0.25 \cdot (1 - 0.25)}{(0.1 \div 1.96)^2} - (9.1 + 25.1 - 2) \right\rceil$$

$$n = \left\lceil \frac{(0.25 \times 1 - 0.25 \times 0.25)}{(0.002603)} - (32.2) \right\rceil$$

$$n = \left\lceil \frac{(0.1875)}{(0.002603)} - (32.2) \right\rceil$$

$$n = \left\lceil \frac{(0.1875)}{(0.002603)} - (32.2) \right\rceil$$

$$n = \left\lceil 72.03227 - (32.2) \right\rceil$$

$$n = \left\lceil 39.83227 \right\rceil \longrightarrow n = 40$$

In order to achieve a confidence (+/- 10%), and based on your prior, you would need to identify a minimum of 40 cases in Stage 3 survey.

The question is, **where should we sample to achieve the minimum sample size**?

To determine the minimum number of villages to sample, we use the following formula

$$n_{villages} = \left\lceil \frac{n}{\text{average village population}_{\text{all ages}} \times \frac{\text{percentage of population}_{\text{6-59 months}}}{100} \times \frac{\text{prevalence}}{100}} \right\rceil$$

Lets take the following values as an example:

Target Sample Size:	**40 (based on previous)**
Average village population (all ages):	**600**
Prevalence of SAM:	**1%**
% Children aged 6-59 months:	**20%**

$$n_{villages} = \left\lceil \frac{n}{\text{average village population}_{\text{all ages}} \times \frac{\text{percentage of population}_{\text{6-59 months}}}{100} \times \frac{\text{prevalence}}{100}} \right\rceil$$

$$n_{villages} = \left\lceil \frac{40}{600 \times \frac{20}{100} \times \frac{1}{100}} \right\rceil = n_{villages} = \lceil 33.3 \rceil = n_{villages} = 33$$

In order to achieve to provide spatial representation, you will need to sample in 33 villages

The obvious question:
how do we select them?

We use CSAS and other spatially stratified sampling methods.

This is done to ensure a sample that covers the entire programme area

More on this later...

Once the villages to be sampled are identified, we move on to a within community sampling method

Active and Adaptive Case Finding, the same method using for small-area surveys, is used once more

Two types of coverage calculations

Point Coverage

Period Coverage

Type of data to be collected during the survey

Type of Cases	Number of Cases
Number of current (SAM) cases	X
Number of current (SAM) cases attending the programme	Y
Number of current (SAM) cases not attending the programme	Z
Number of recovering cases attending the programme	W

What type of coverage should we measure?

SQUEAC discourages the presentation of both point AND period coverage

Programmes using SQUEAC will need to decide – as SPHERE does not specify which one should be used

How should programmes make this decision?

There is no simple/single answer

“If the program has good case-finding and recruitment and short lengths of stay then the period coverage estimator is likely to be appropriate”

Number of Active Cases	2
Number of active cases in the programme	0
Number of recovering cases in the programme	34

Point coverage returns (0.0%) but period coverage returns (92.4%). Point coverage would penalise good performance

“if the programme has poor case-finding and recruitment and long lengths of stay due to late presentation and/or late admission then the point coverage estimator is likely to be appropriate”

Number of Active Cases	12
Number of active cases in the programme	3
Number of recovering cases in the programme	22

Point coverage returns (25.0%) but period coverage returns (73.5%).

You will need to make a decision based on this and report accordingly

Back to the calculations....

Point Coverage

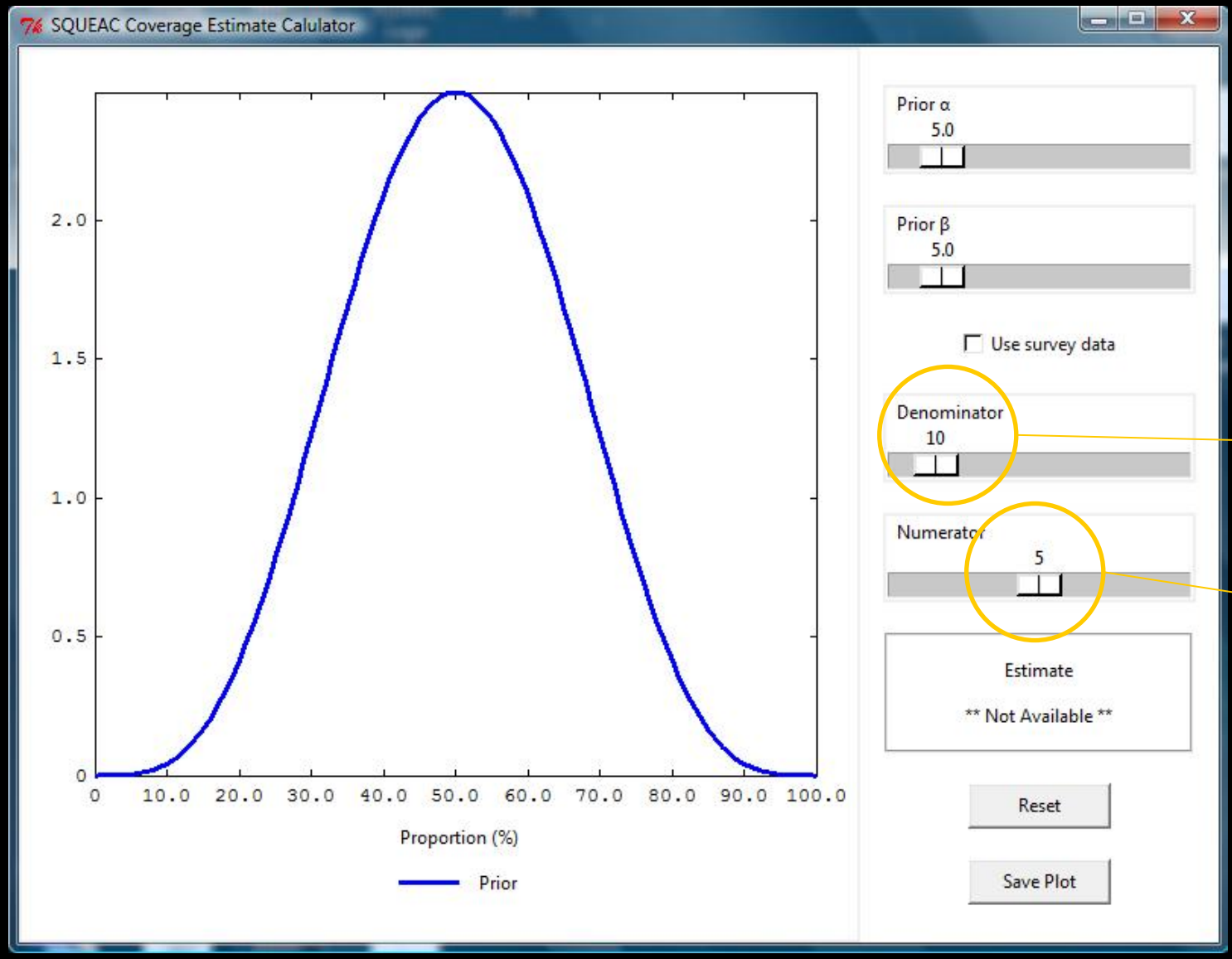
$$\text{Point Coverage} = \frac{\text{Number of current (SAM) cases attending the programme}}{\text{Number of current (SAM) cases}}$$

Type of Cases	Number of Cases
Number of current (SAM) cases	X
Number of current (SAM) cases attending the programme	Y
Number of current (SAM) cases not attending the programme	Z
Number of recovering cases attending the programme	W

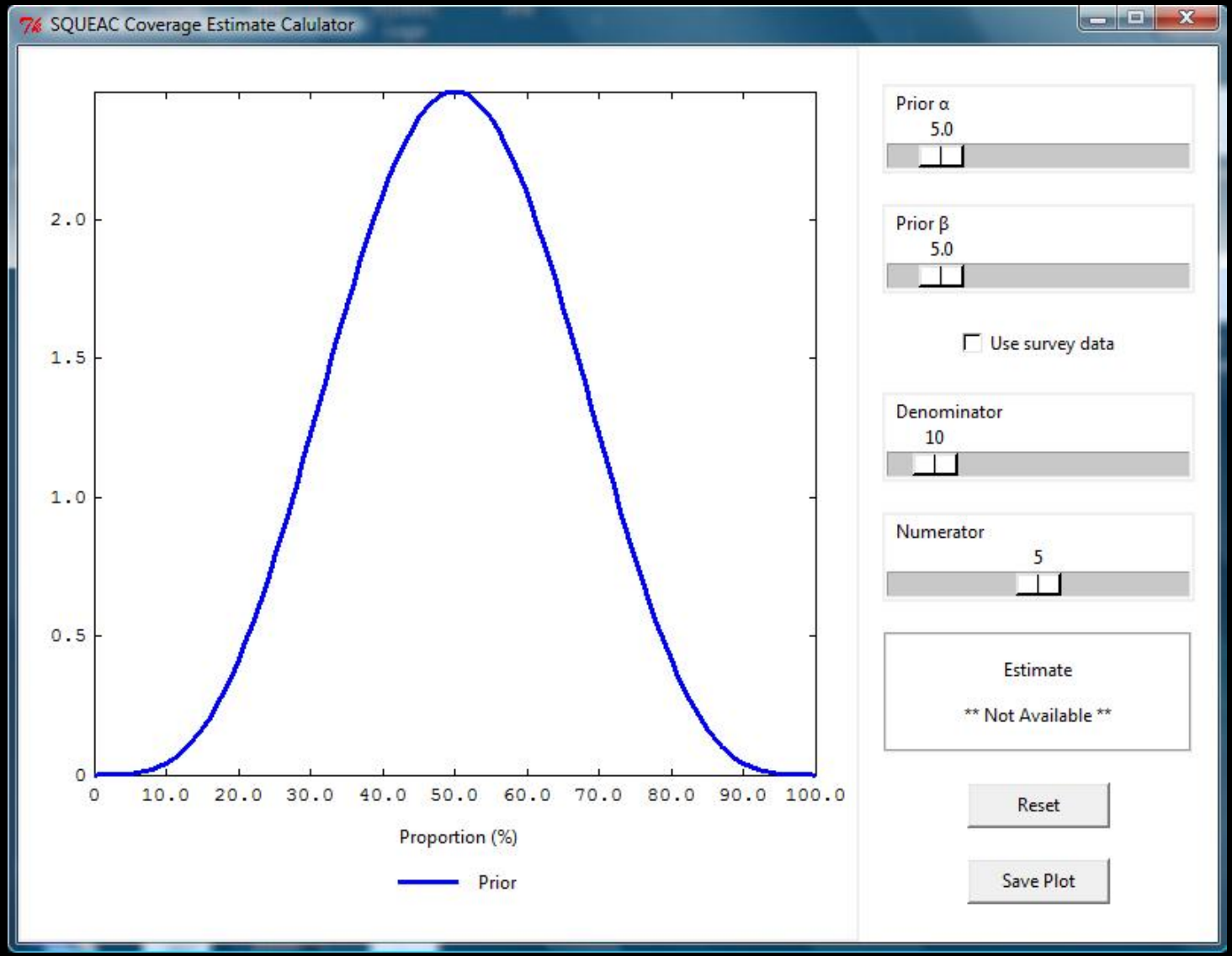
Point Coverage

$$\text{Point Coverage} = \frac{Y}{X}$$

Type of Cases	Number of Cases
Number of current (SAM) cases	**X**
Number of current (SAM) cases attending the programme	**Y**
Number of current (SAM) cases not attending the programme	**Z**
Number of recovering cases attending the programme	**W**


SQUEAC Coverage Estimate Calulator
2.0
1.5
1.0
0.5
0
0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
Proportion (%)
Prior
Prior α
5.0
Prior β
5.0
Use survey data
Denominator
10
Numerator
5
Estimate
** Not Available **
Reset
Save Plot
X
Y

SQUEACBayes Calculator



Period Coverage

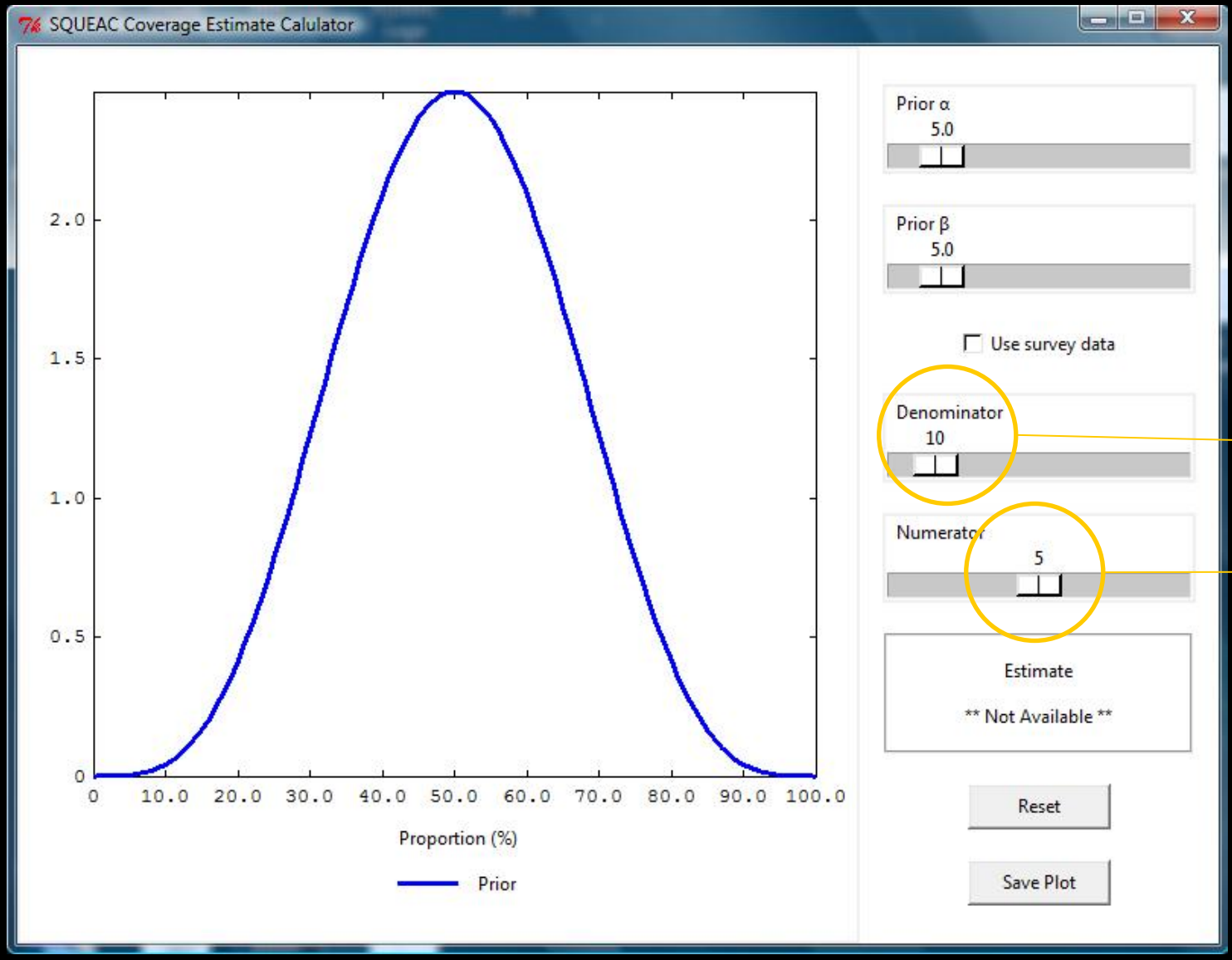
$$\text{Period Coverage} = \frac{\text{Number of current (SAM) cases and recovering cases attending the programme}}{\text{Number of current (SAM) and recovering cases attending the programme} + \text{Number of current (SAM) cases not attending the programme}}$$

Type of Cases	Number of Cases
Number of current (SAM) cases	X
Number of current (SAM) cases attending the programme	Y
Number of current (SAM) cases not attending the programme	Z
Number of recovering cases attending the programme	W

Period Coverage

$$\textbf{Period Coverage} = \frac{X + W}{X + W + Z}$$

Type of Cases	Number of Cases
Number of current (SAM) cases	**X**
Number of current (SAM) cases attending the programme	**Y**
Number of current (SAM) cases not attending the programme	**Z**
Number of recovering cases attending the programme	**W**


SQUEAC Coverage Estimate Calulator
2.0
1.5
1.0
0.5
0
0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
Proportion (%)
Prior
Prior α
5.0
Prior β
5.0
Use survey data
Denominator
10
Numerator
5
Estimate
** Not Available **
Reset
Save Plot

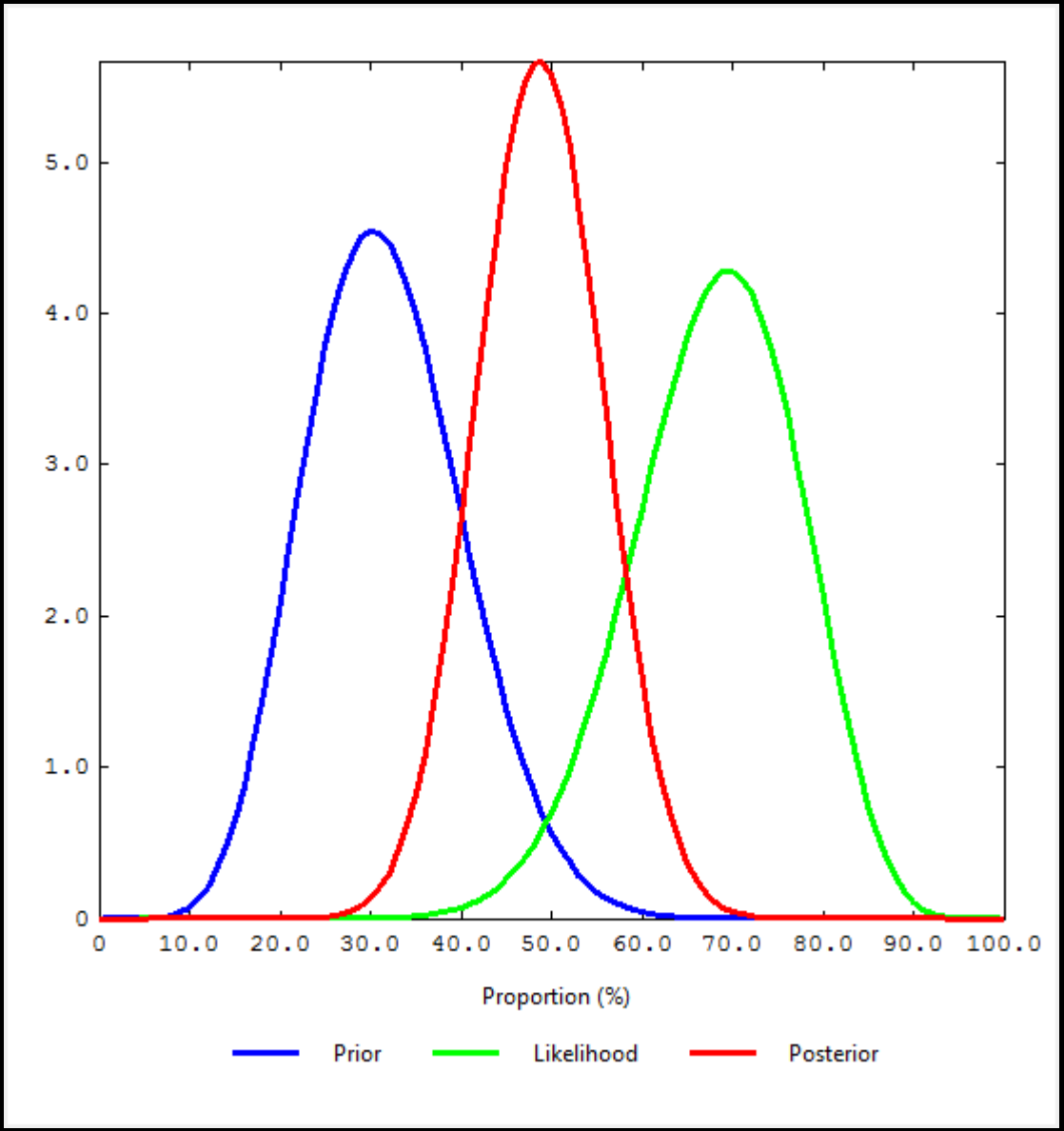
X+W+Z

X +W

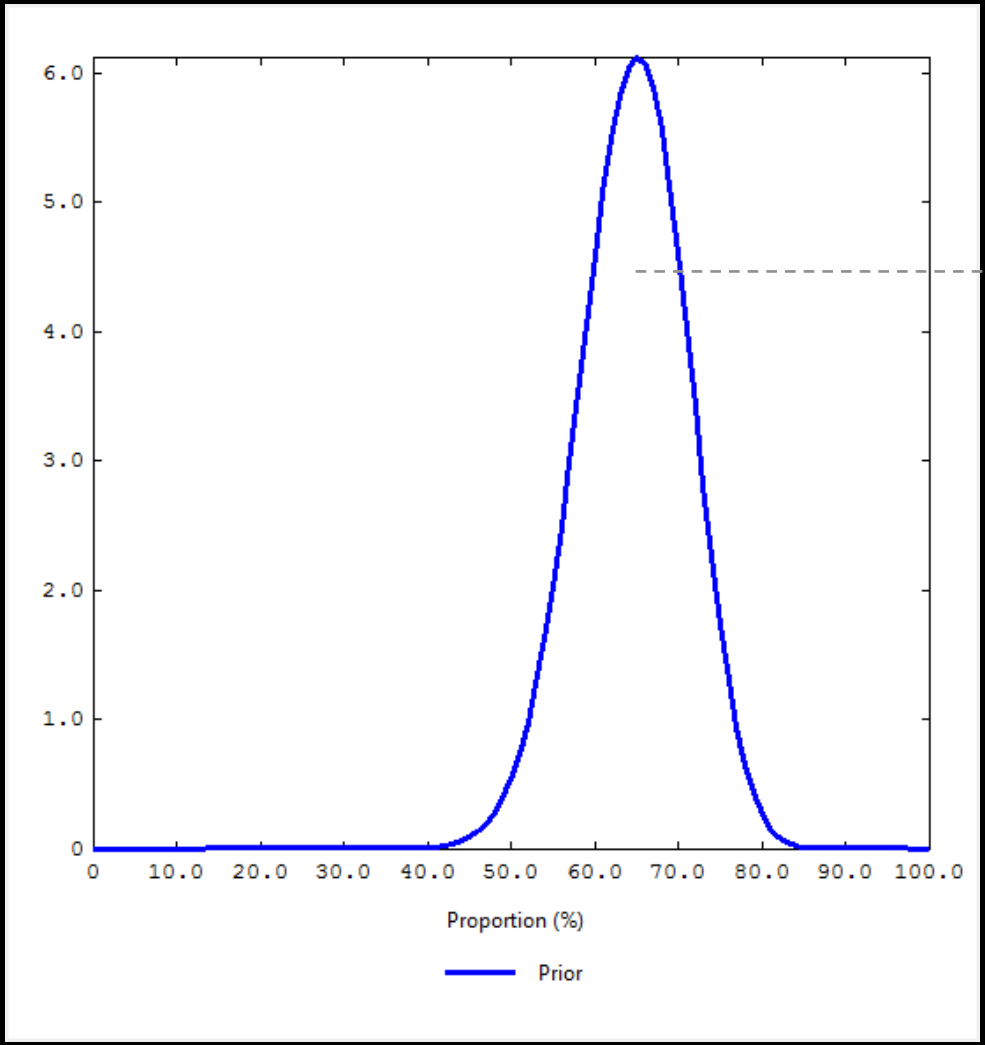
A couple of possible scenarios

Worst Case Scenario

Kenya SQUEAC (this morning)

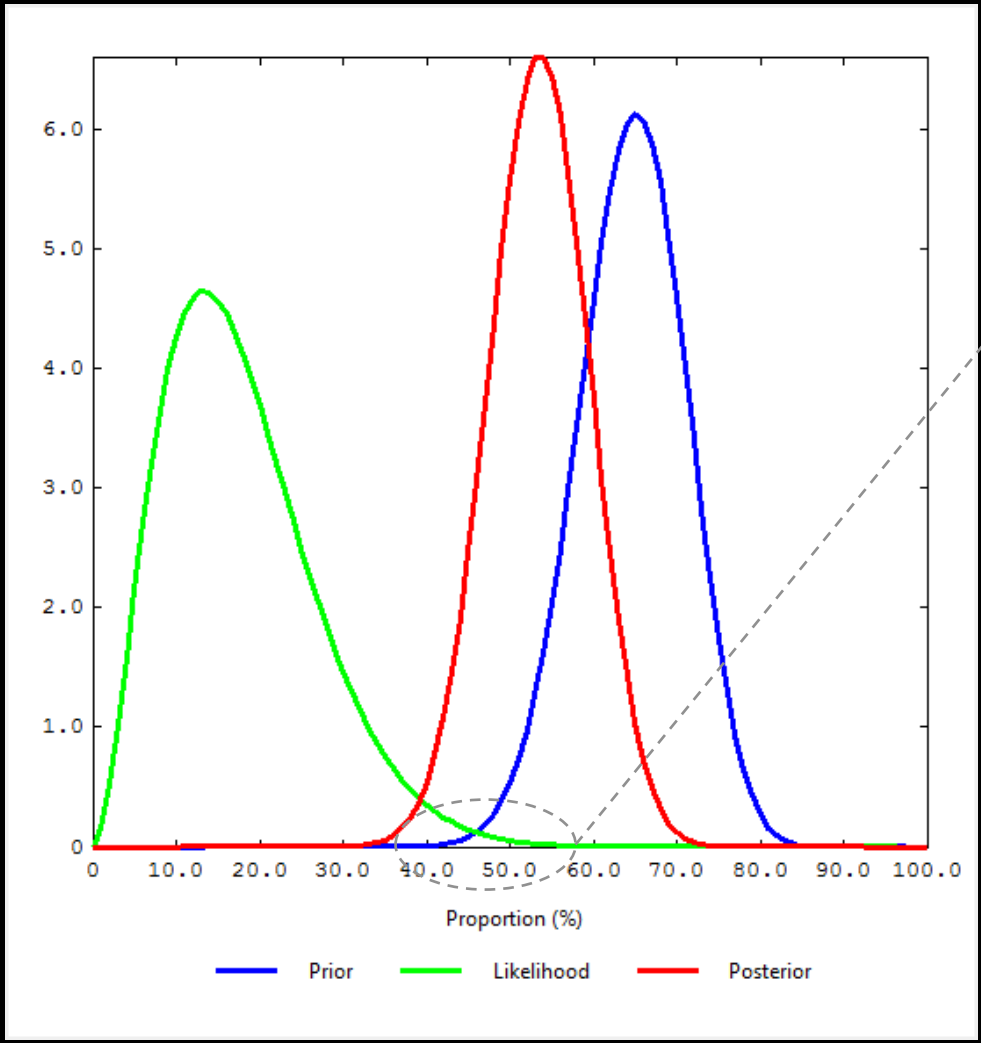


Worst Case Scenario



Prior is strong (narrow) and positive (high coverage)

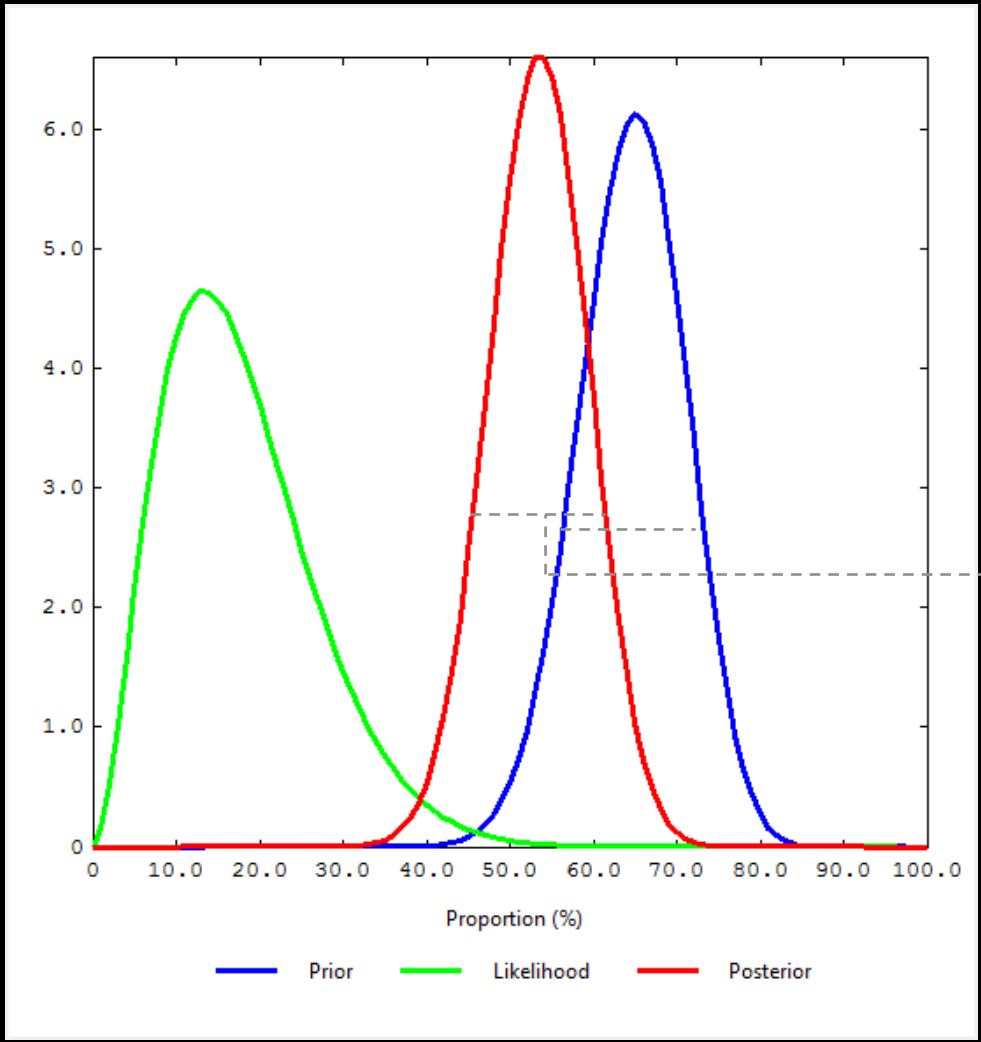
Worst Case Scenario



Very little overlap between prior and likelihood

Prior and Likelihood Conflict

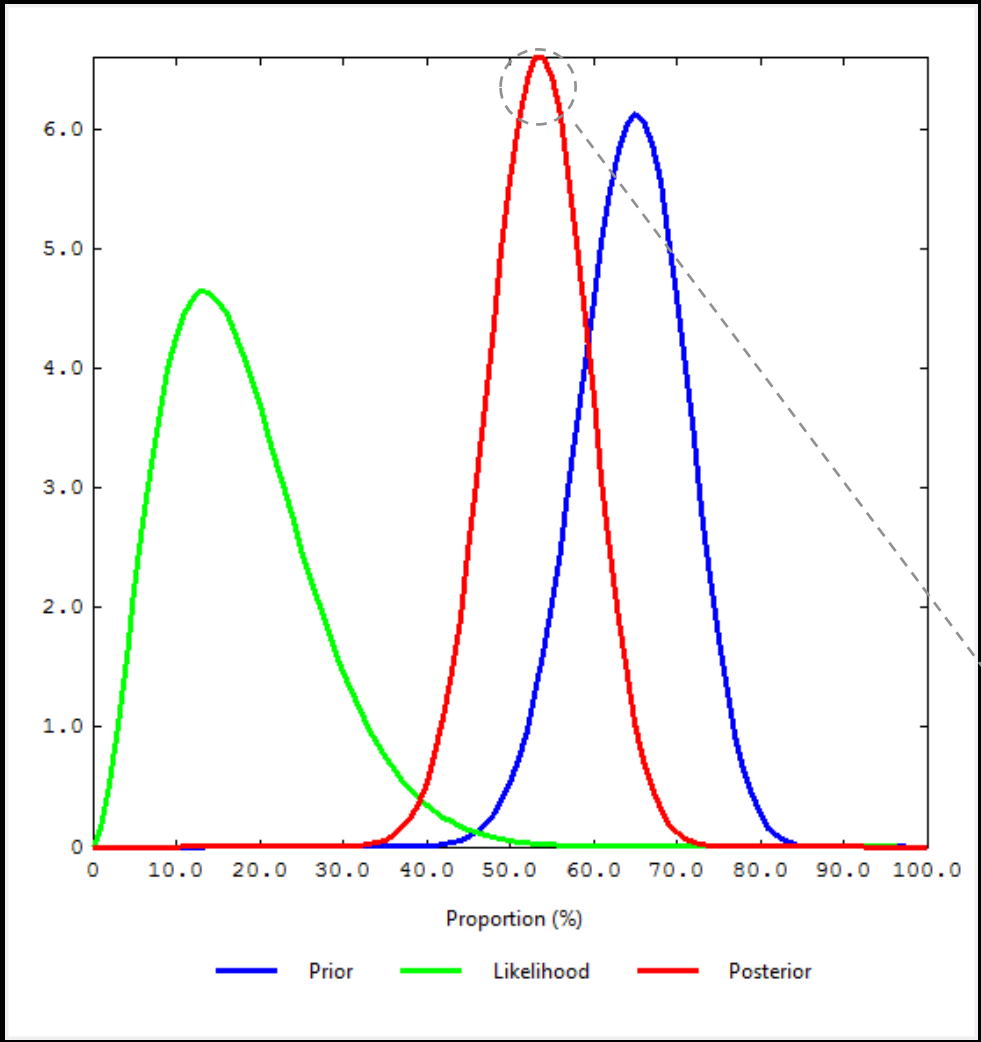
Worst Case Scenario



Very little overlap between prior and likelihood
Prior and Likelihood Conflict

Posterior has similar width to prior. The likelihood survey has not reduced uncertainty

Worst Case Scenario



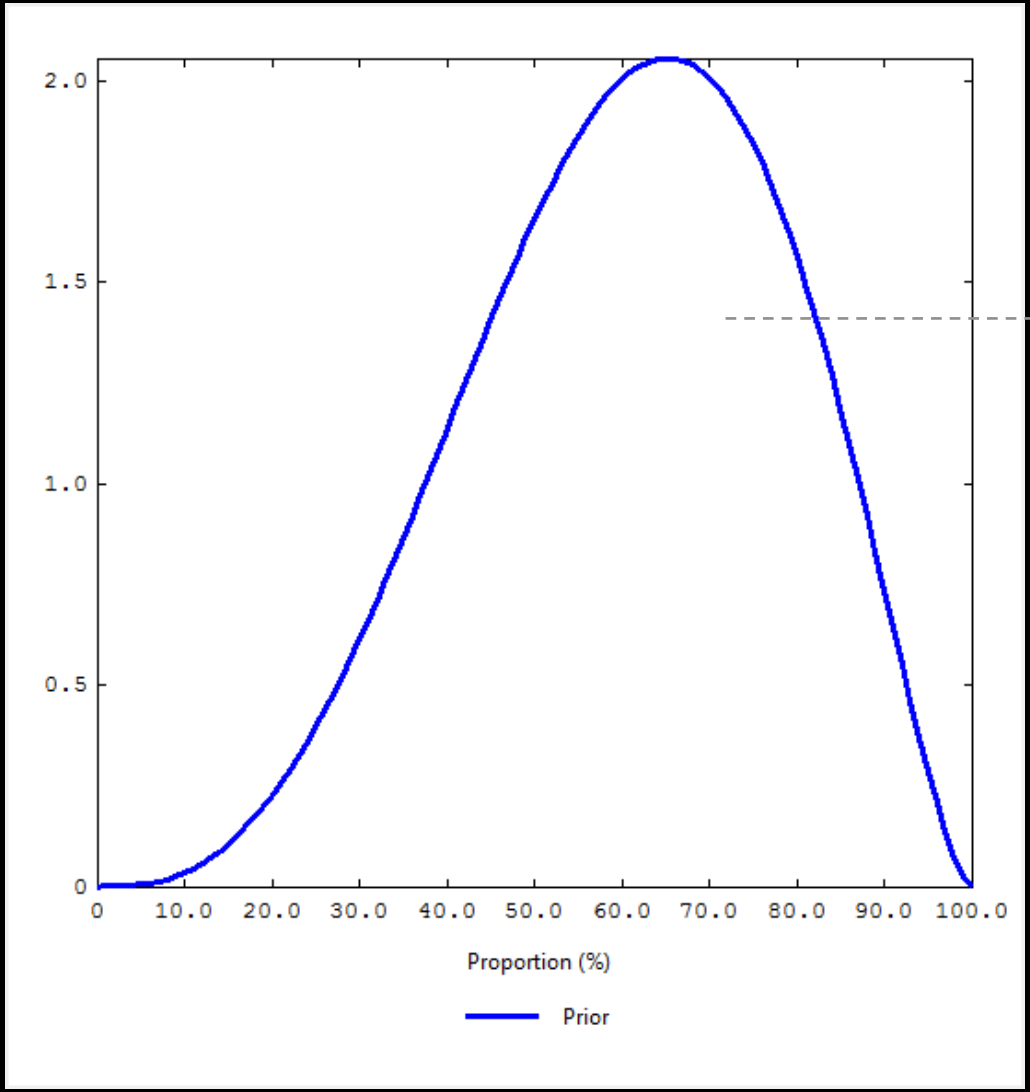
Very little overlap between prior and likelihood
Prior and Likelihood Conflict

Posterior has similar width to prior. The likelihood survey has not reduced uncertainty

Posterior estimate is not accurate

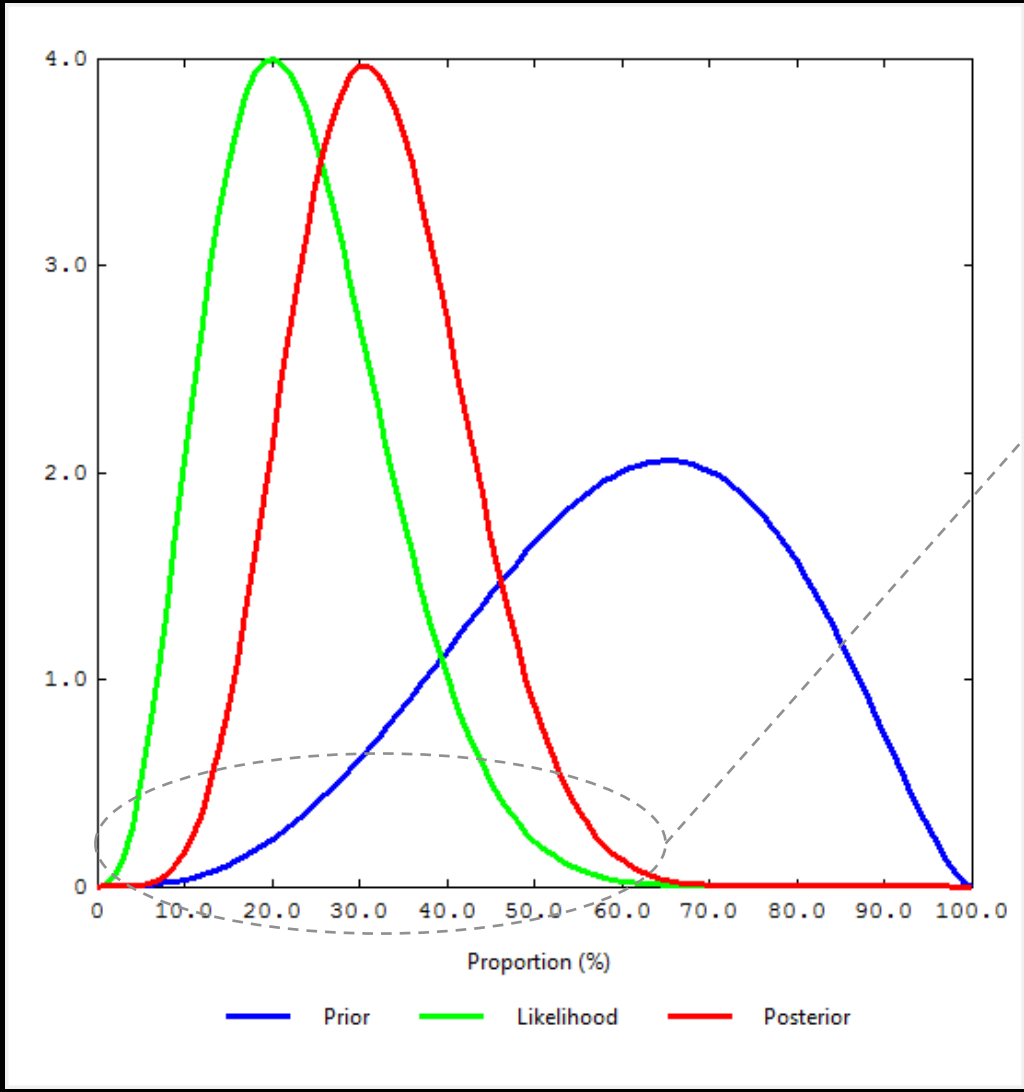
Safe Case Scenario

Safe Case Scenario



Prior is weak (broad) and positive (high coverage)

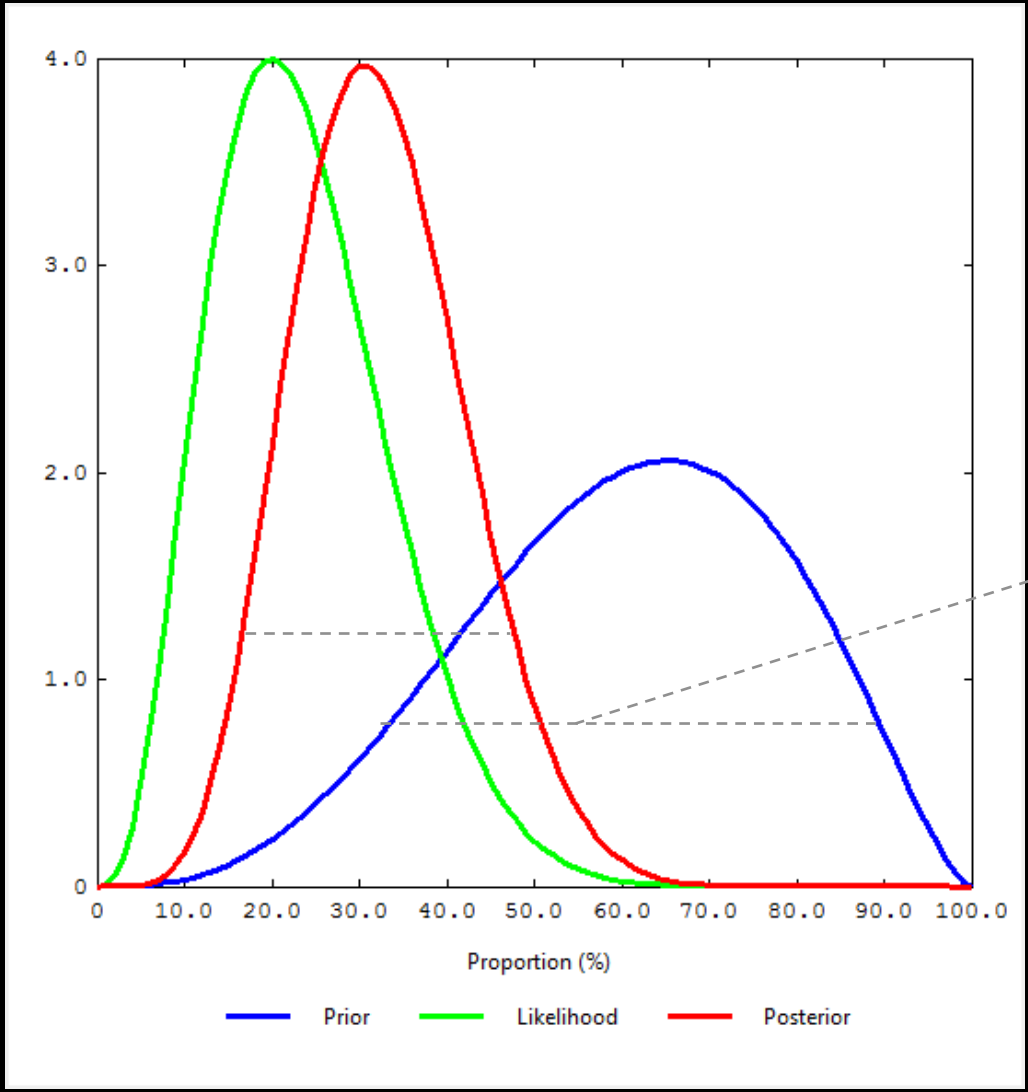
Safe Case Scenario



Considerable overlap between prior and likelihood

Prior and Likelihood Do Not Conflict

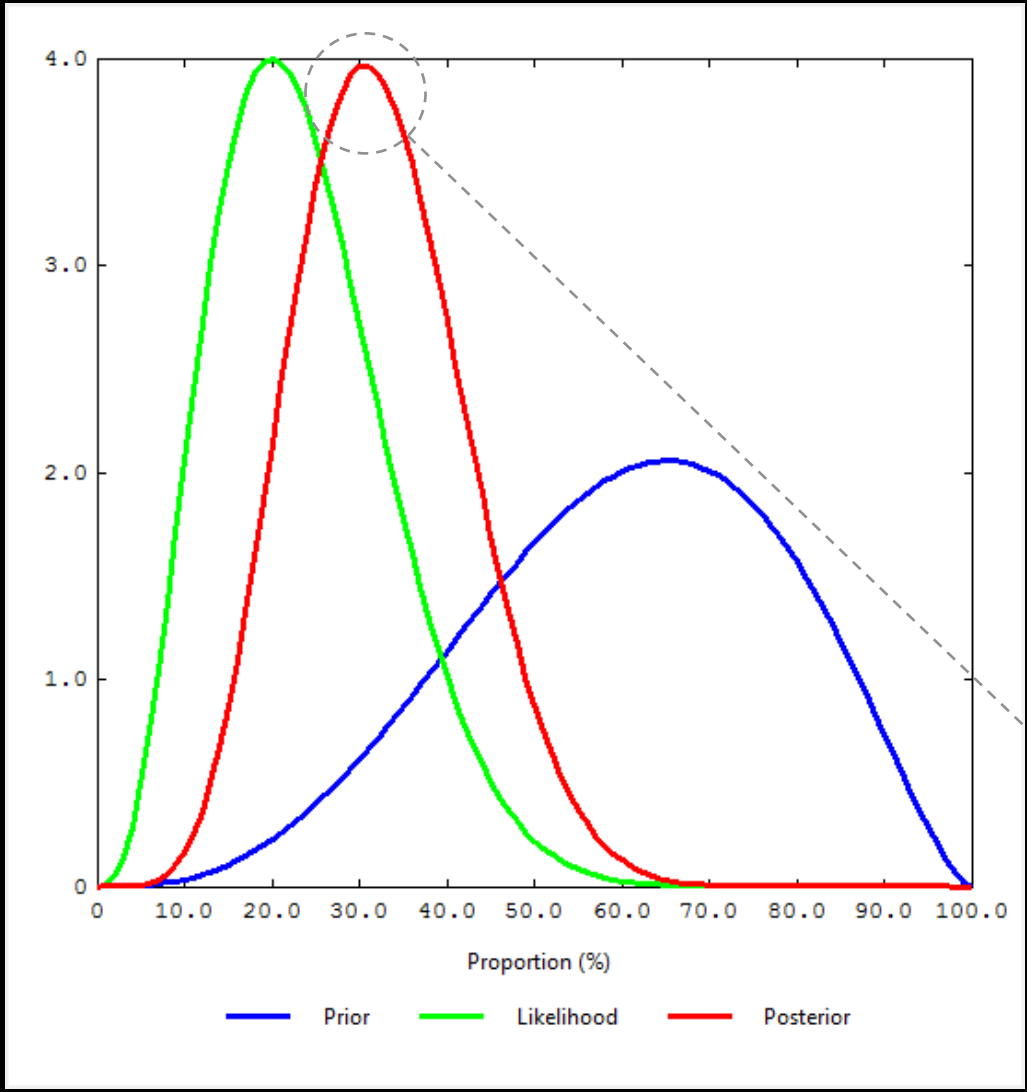
Safe Case Scenario



Considerable overlap between prior and likelihood **Prior and Likelihood Do Not Conflict**

Posterior is narrower than prior. The likelihood survey has reduced uncertainty

Safe Case Scenario



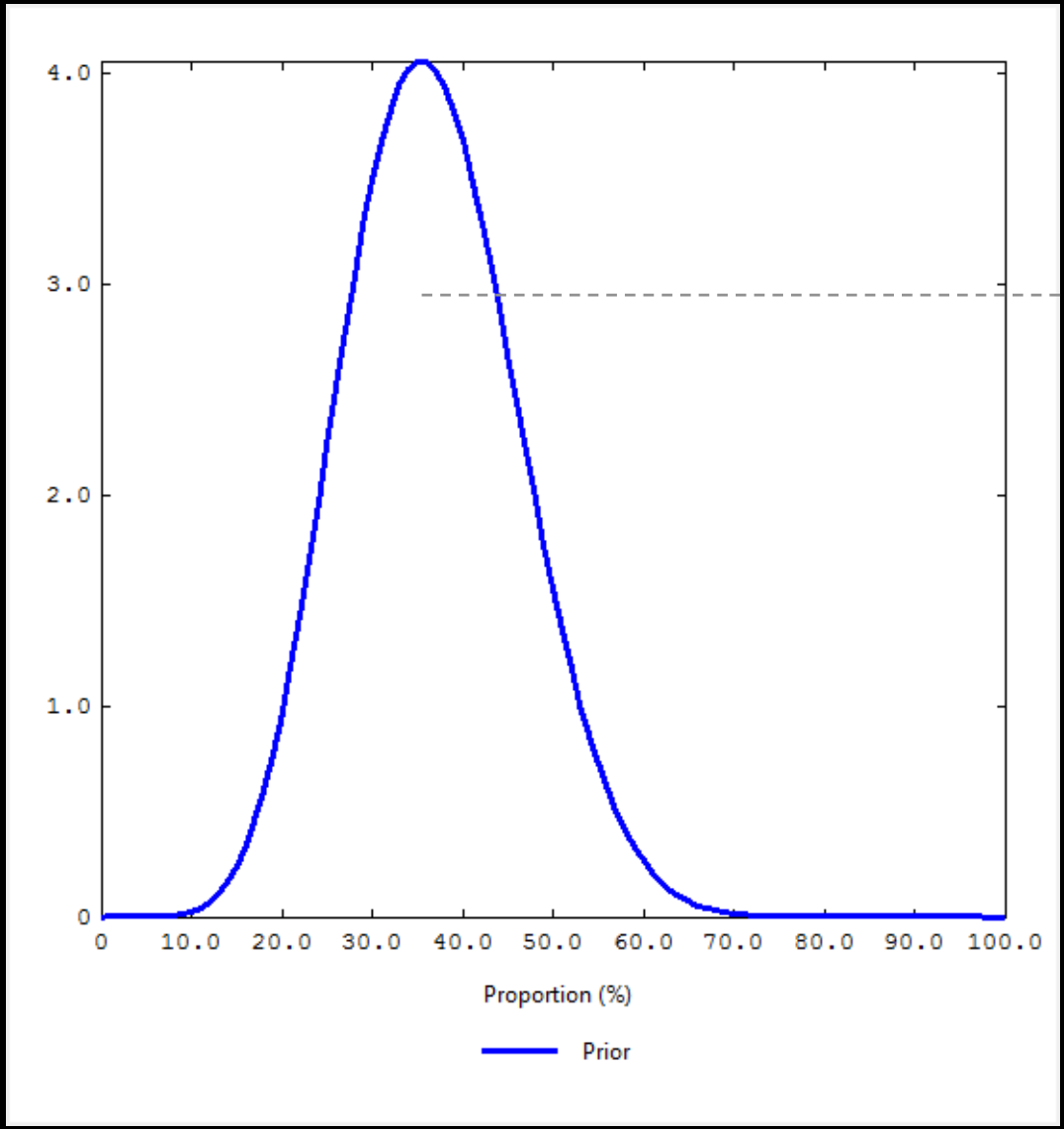
Considerable overlap between prior and likelihood **Prior and Likelihood Do Not Conflict**

Posterior is narrower than prior. The likelihood survey has reduced uncertainty

Posterior estimate is accurate

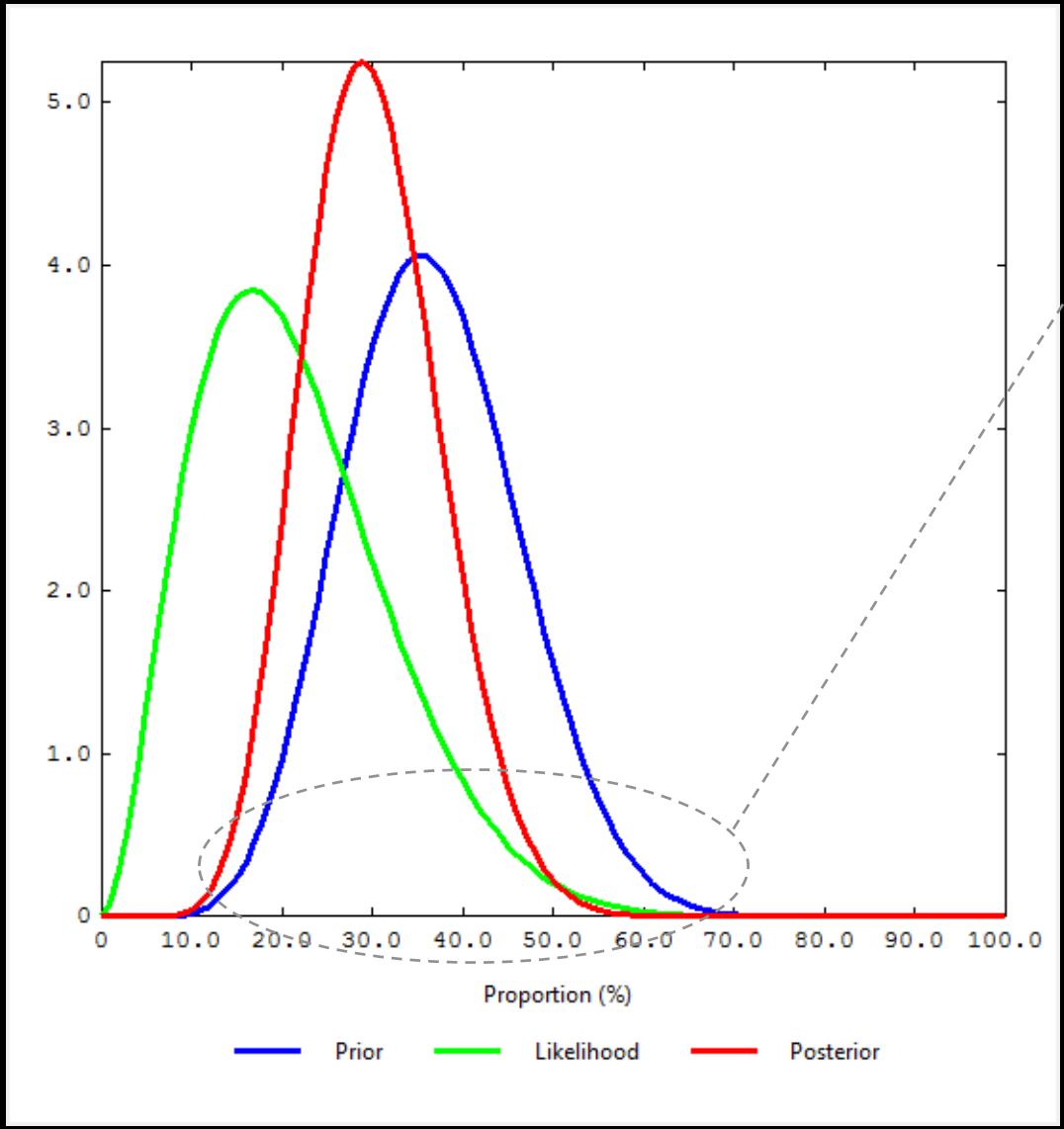
Best Case Scenario

Best Case Scenario



Prior is weak (broad) and positive (high coverage)

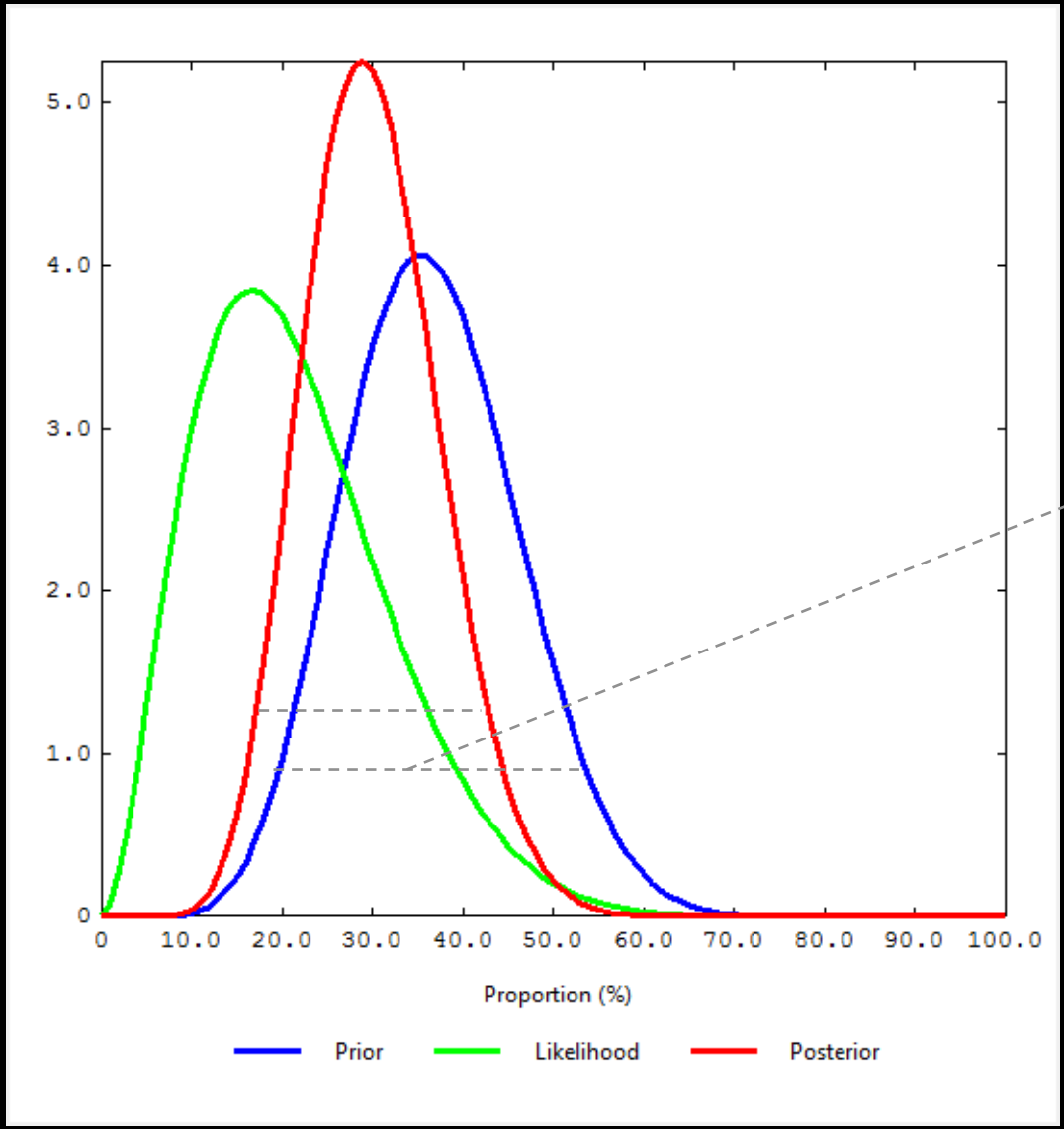
Best Case Scenario



Considerable overlap between prior and likelihood

Prior and Likelihood Do Not Conflict

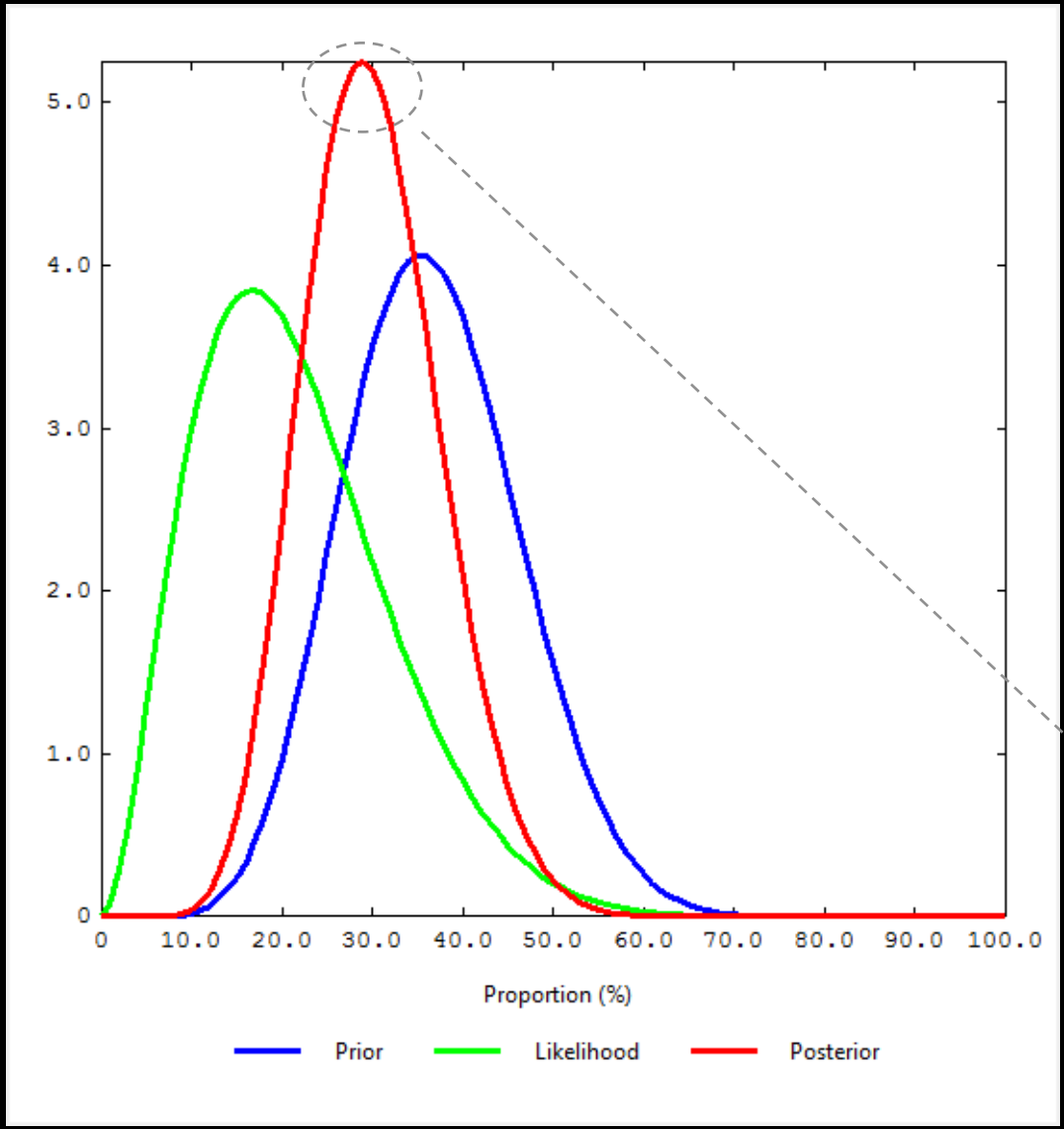
Best Case Scenario



Considerable overlap between prior and likelihood **Prior and Likelihood Do Not Conflict**

Posterior is narrower than prior. The likelihood survey has reduced uncertainty

Best Case Scenario



Considerable overlap between prior and likelihood **Prior and Likelihood Do Not Conflict**

Posterior is narrower than prior. The likelihood survey has reduced uncertainty

Posterior estimate is accurate

If there is a significant conflict between Prior and Posterior, there is nothing you can do other than report the conflict or start the exercise from scratch

It is therefore better to ensure that you are scrupulous when developing your prior

What do we need practically for Stage 3?

SQUEAC Practical Needs

Stage	Pre-Existing Information	Staff Profile	Staff Number	Additional Resources	Estimated Number of Working Days
1	Programme data (e.g. admissions and exits by month, seasonal calendar, full list of community volunteers and villages covered, programme reports, etc) Up to date list of all villages/ settlements by catchment area Accurate geographical map of size A1/A0 with scale close to 1:50,000	Local language speakers •Lead (e.g. Programme Coordinator, Programme Manager, M&E/Surveillance Officer) •Programme staff (e.g. OTP support staff, Community Mobilisation Officers, etc.) •Partners (e.g. Nutrition Focal Point from district MoH)	2-6	Vehicle (ad hoc to collect information) Drivers with local knowledge	7-10 (will be shorter for subsequent SQUEACs)
2	None	• Core team • (Enumerators)	4-8	Vehicle (full time)	2-3

SQUEAC Practical Needs

Stage	Pre-Existing Information	Staff Profile	Staff Number	Additional Resources	Estimated Number of Working Days
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2	None	• Core team • (Enumerators)	4-8	Vehicle (full time)	2-3
3	**Accurate map with all villages** **List of villages by catchment area / relevant administrative division** **Population data (total and by catchment area)**	• **Core team** • **Team Supervisors** • **Enumerators**	**6-10**	**Vehicle (full time)**	**5-7**
				Total	**14-20**

SQUEAC Practical Needs

Stage	Pre-Existing Information	Staff Profile	Staff Number	Additional Resources	Estimated Number of Working Days
1	Programme data (e.g. admissions and exits by month, seasonal calendar, full list of community volunteers and villages covered, programme reports, etc) Up to date list of all villages/ settlements by catchment area Accurate geographical map of size A1/A0 with scale close to 1:50,000	Local language speakers •Lead (e.g. Programme Coordinator, Programme Manager, M&E/Surveillance Officer) •Programme staff (e.g. OTP support staff, Community Mobilisation Officers, etc.) •Partners (e.g. Nutrition Focal Point from district MoH)	2-6	Vehicle (ad hoc to collect information) Drivers with local knowledge	7-10
2	None	• Core team • (Enumerators)	4-8	Vehicle (full time)	2-3
3	Accurate map with all villages List of villages by catchment area / relevant administrative division Population data (total and by catchment area)	• Core team • Team Supervisors • Enumerators	6-10	Vehicle (full time)	5-7
				Total	14-20

Question & Answers

(20 minutes)

End of Session
(17:30)