Freedom from disease survey

In this back page lab we are going to do something a little different, using an R package with a graphic user interface (GUI). For the majority of this approach, we do not have to type code into the R console, but can work with a user-friendly "calculator" developed by the authors of the package. The package "FFD" is designed for designing two-stage freedom from disease surveys. In this example, we are going to work with the hypothetical situation that an outbreak of PRRS has occurred in the Western Cape. After controlling the outbreak, we want to make sure that the disease has been eradicated from the province by means of a survey to show freedom from disease in the pig population.

Epi Lab color code

Software/Packages/Add-ins required

Software/Packages/Add-ins recommended

Description text

R code to copy/paste into console

R code to copy/paste into console that needs adjustment to your personal workspace

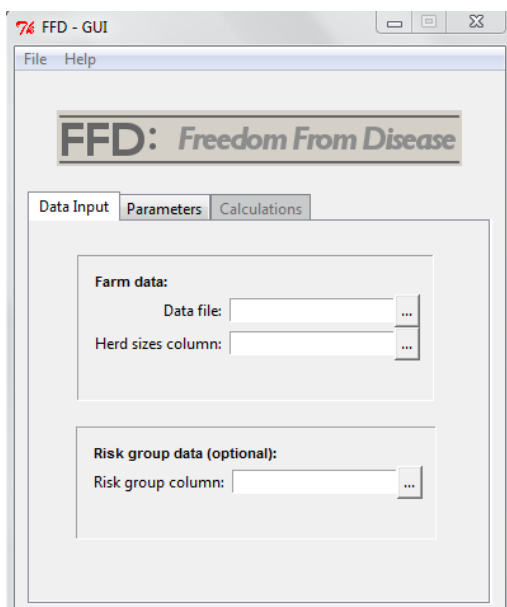Websites where you can download requirements

Lab #3 requirements

- R - http://cran.r-project.org/bin/windows/base/
- R Studio - www.rstudio.com/ide/download/desktop
- FFD R package
- Internet connection

The code

```
#First we need to install the Freedom From Disease package for R
install.packages("FFD", repos="http://R-Forge.R-project.org")
#Load the FFD package
library(FFD)
```



```
#Now we will activate the graphic user interface of the FFD package
FFD_GUI()
```
A new window should appear.
#Using this graphic interface, the parameters for the survey can simply be filled in in the boxes.
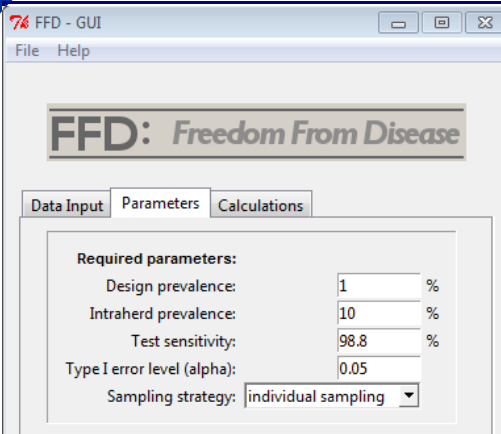#We start by loading the farm data we have for Western Cape pig farms.
#We have put the example file online and you can download it by going to the following URL in your internet browser: http://www.jdata.co.za/backpagelabs/backpagelabs_lvh_ffd.csv
#Save that file where you can find it again and then select it after clicking "…" next to "Data file"
NOTE: Any farm census data may be uploaded into this box, as long as it is in the European .csv (semi-colon delimited) file format. MS Excel files can be saved in this format by doing the following:
1.   In Excel Go to File -> Options -> Advanced -> Editing
2.   Uncheck the "Use system separators" setting and put a comma in the "Decimal Separator" field.
3.   Save the file in the .CSV (comma delimited) format
Then click "…" next to "Herd sizes column" and select the PigPop column, this is the heading of the column which contains the numbers of animals in each herd.

FFD - GUI

File Help

FFD: *Freedom From Disease*

Data Input | Parameters | Calculations

Required parameters:

Design prevalence:	1	%
Intraherd prevalence:	10	%
Test sensitivity:	98.8	%
Type I error level (alpha):	0.05	
Sampling strategy:	individual sampling	

#Now click on the Parameters tab and fill in the following values:

Design prevalence: 1% (aka between-herd prevalence: the minimum expected prevalence of positive herds, as recommended by the OIE for PRRS)

Intraherd prevalence: 10% (aka within herd prevalence: the minimum prevalence of diseased animals we expect to find in a PRRS-positive herd)

Test sensitivity: 98.8% (Using the IDEXX PRRS X3 Ab test)

Type I error level: 0.05 (meaning we are 95% confident that there is freedom from disease if the result of the survey is negative)

Sampling strategy: individual sampling (as opposed to limited sampling where we limit ourselves to a specific number of animals to sample per herd)

Data Input | Parameters | **Calculations**

Compute sample size:

Herd sensitivity: 95 %
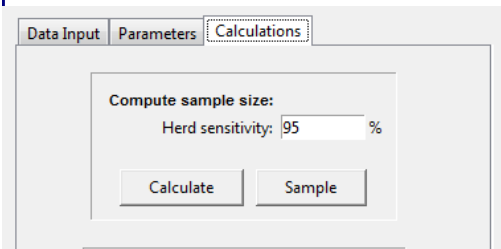
[Calculate] [Sample]

#Now click on the calculations tab and fill in 95% in the "Herd Sensitivity" box under "Compute sample size". We have chosen a high herd sensitivity because the high sensitivity of the diagnostic test implies that there is a low chance that a positive herd will not be detected positive in the survey. That means that for each herd that is being tested we say we have a 95% chance of finding the disease (=confidence level). There are more sophisticated methods of calculating herd sensitivity, but for simplification of this example we are using an estimated value.

#Click Calculate

A new window will appear with your required sampling parameters. At the bottom of the output window, you will find the following result (see left -below):

```
Sampling strategy:
------------------
Herd sensitivity:                        95.00 %
Number of herds to test:                   288
Expected total number of animals to test: 3317.91
No data on expected total costs of the survey.

Lookup table for the number of animals to test per herd:

   Herd size  | No. of animals to test
 ------------------------------------------
   1 - 13     |      entire herd
  14 - 18     |         14
    19        |         15
    20        |         16
  21 - 22     |         17
    23        |         18
    24        |         19
  25 - 32     |         20
    33        |         21
  34 - 42     |         22
  43 - 44     |         23
  45 - 62     |         24
  63 - 73     |         25
  74 - 103    |         26
 104 - 163    |         27
 164 - 344    |         28
 345 - 12050  |         29
```

Here we are given a sampling strategy using the parameters we entered. 288 randomly selected herds in the province should be sampled. Within each herd, the lookup table can be used to determine how many individual samples should be taken from each herd based on herd size.

To get a list of farms to sample that is randomly selected you can click on the "Sample" button. A small box with a sampling strategy of "fixed" or "dynamic" comes up. We want to sample exact number of herds required (288 in this case) so we select fixed and then click on "Sample" (the "Seed" refers to the random number generator - don't worry about it)-

**Draw sample from Population
using Individual Sampling**

Sample size: fixed ▼
Seed: 6389

you are prompted to save your file showing which farms to sample and the number of pigs present on each farm. You can then use the lookup table as discussed above to choose the number of animals to sample per farm.
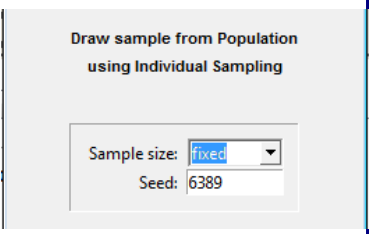
This tool has several other functions available, including risk-based sampling plans and calculations of the cost of the survey. We would like to encourage you to explore these other possibilities using your own data, and let us know how you manage.

References

Bautista, E.M., Morrison, R.B., Goyal, S.M., Collins, J.E.& Annelli, J.F. (1993) Seroprevalnce of PRRS virus in the United States. Swine Health and Production, November and December, 4-8.

Kopacka, I. (2013). FFD: Package to substantiate freedom from disease in R using two-stage sampling. R package version 1.0-2.http://ffd.r-forge.r-project.org/

OIE (2008) Report of the OIE ad hoc group on porcine reproductive respiratory syndrome (Appendices IV and V). http://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/PRRS_guide_web_bulletin.pdf

R Core Team (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/