



# Making Health Economic Models Shiny: Our experience helping companies transition from Excel to R & shiny

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R Consortium 2025 | 18th November 2025

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-  <https://www.linkedin.com/company/dark-peak-analytics>



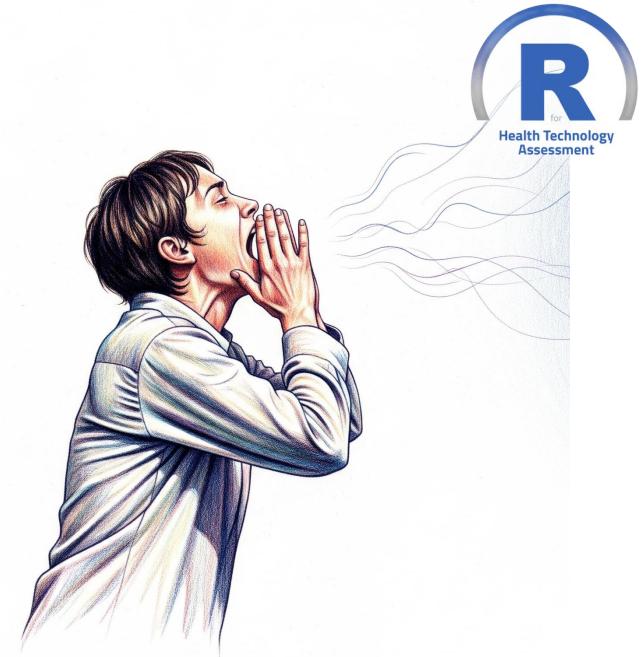
# Introduction



**Dr Robert Smith**

Director, Dark Peak Analytics

PhD Public Health Economics & Decision Science  
UKHSA during pandemic (2020 - 2022)  
Director of R-4-HTA consortium



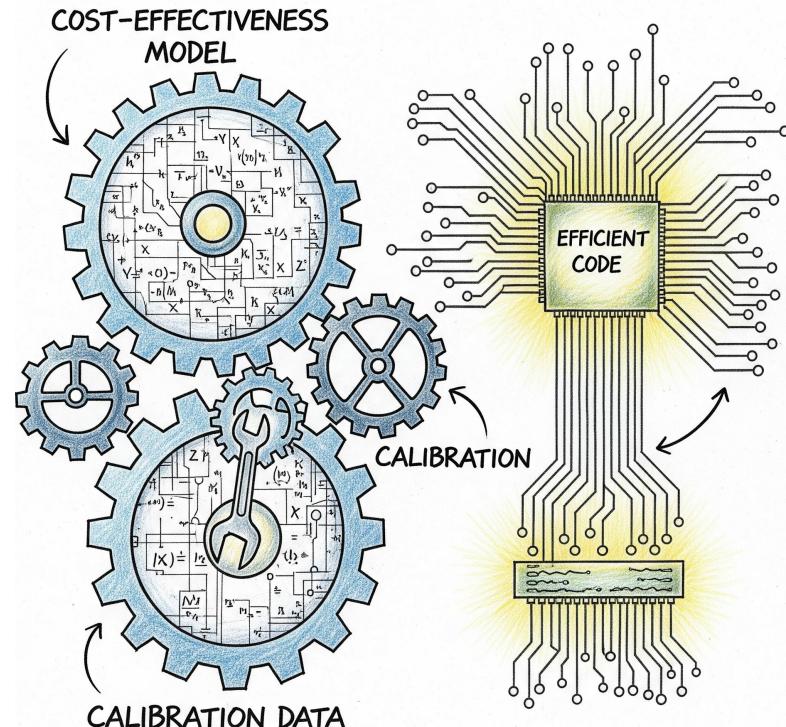
# Introduction



**Dr Wael Mohammed**

Principal Health Economist, Dark Peak Analytics

PhD Public Health Economics & Decision Science  
University of Sheffield (2025)  
University of Newcastle (2019)



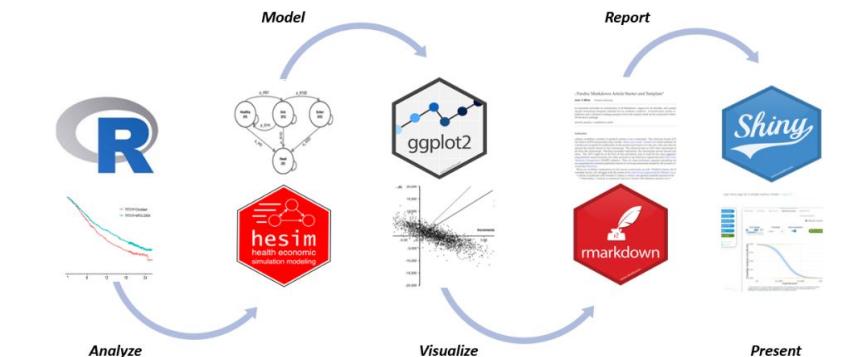
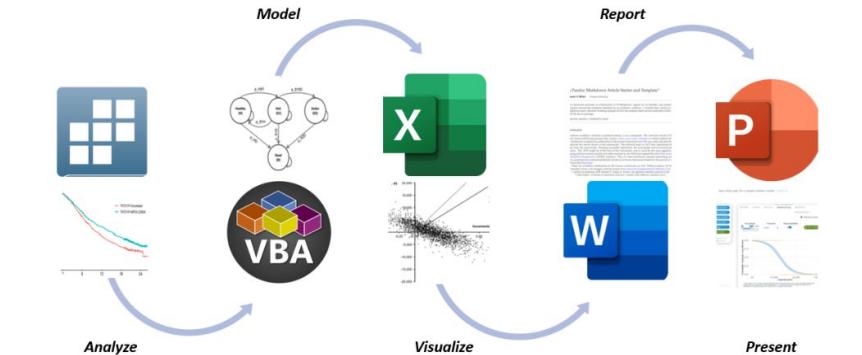


# Background



# Overarching aim

*Shift the health economic modelling pipeline from spreadsheet software (e.g. MS Excel) to script based programming languages (e.g R).*





# Spreadsheets vs R (python / others)

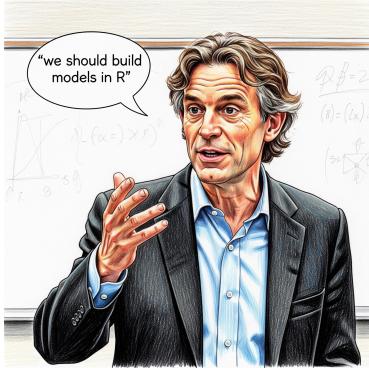
				Comments
1	Capabilities	●●	●●●●●	R is more flexible
2	Engagement & Visualisation	●●●	●●●●	... looks better
3	Computational Speed	●	●●●●	... faster
4	Development & Iteration speed	●●	●●●●	... easier to scale
5	Transparency	●●	●●●●●	... more transparent
6	Familiarity Barriers to entry	●●●●	●	But coding in R is hard

*An entirely personal, and very biased set of estimates!*

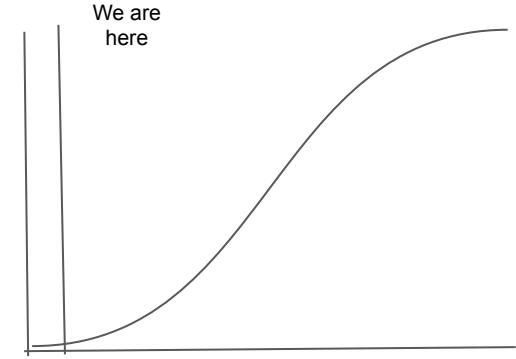
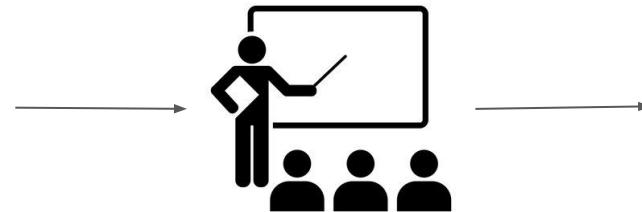


# History





# pre-2020



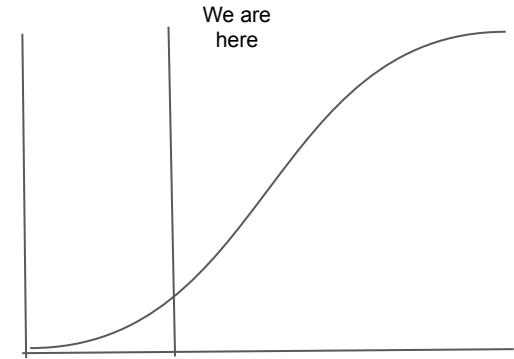
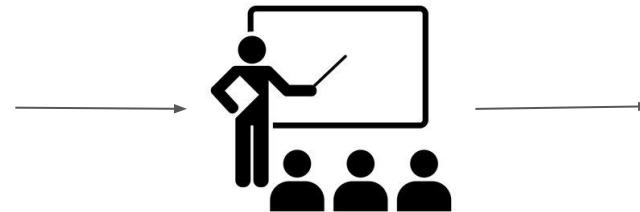
**Publications**

**Training**

**Adoption**



# 2020-2023



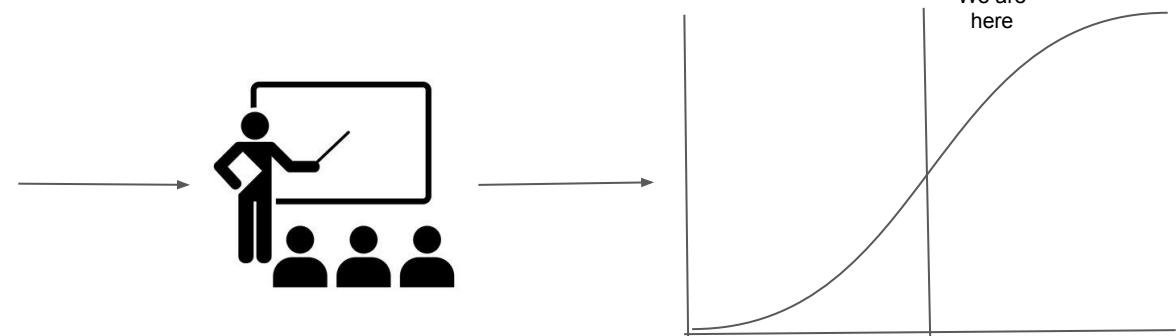
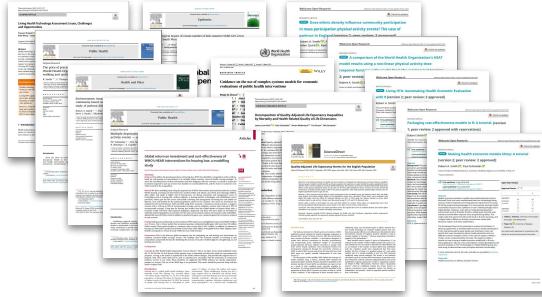
Publications

Training

Adoption



# 2024-2025

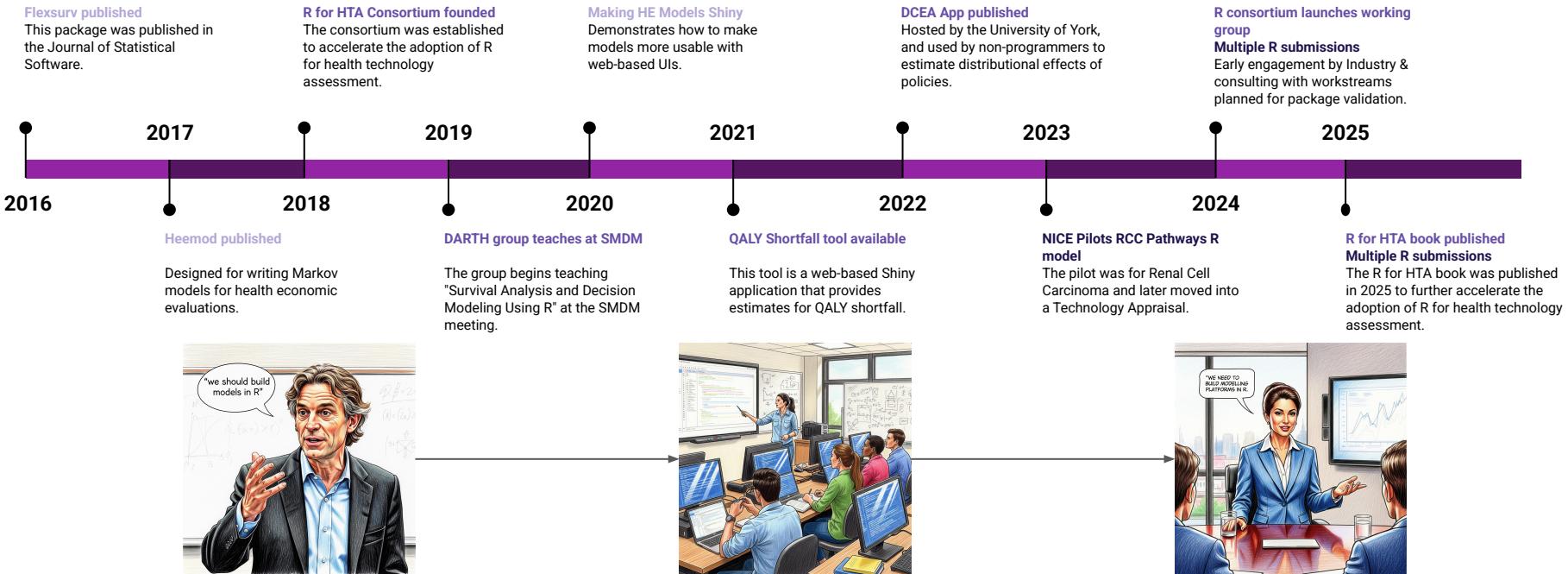


Publications

Training

Adoption

# Timeline





# Timeline - our small role.

Now an unpopular course



2021

2022

2023

2024

2025

Now on CRAN



## Making Health Economic Models Shiny: A tutorial

**Smith & Schneider.** Making health economic models Shiny: A tutorial. *Wellcome Open Res* 2020, 5:69 (<https://doi.org/10.2688/wellcomeopenres.15807.2>)

## Living HTA: Automating Health Economic Evaluation with R

**Smith, Schneider and Mohammed.** Living HTA: Automating Health Economic Evaluation with R. *Wellcome Open Res* 2022, 7:194 (<https://doi.org/10.2688/wellcomeopenresearch.org/articles/17933.2>)

## R Packages for health economic evaluation: A tutorial

**Smith RA, Mohammed W and Schneider PP.** R Packages for health economic evaluation: A tutorial. 2023. (<https://wellcomeopenresearch.org/articles/8-419>)

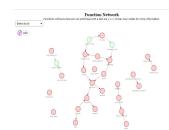
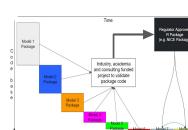
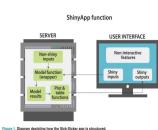
## assertHE: an R package to improve quality assurance of health economic models

**Smith, Samyshkin, Mohammed et al.** assertHE: an R package to improve quality assurance of health economic models. 2024. (<https://wellcomeopenresearch.org/articles/9-701>)

## Automating Health Economic Evaluation with R (+genAI)

**Smith, Lamrock, Dolin, Lewis, McQueen.** R we almost there? Applying the advantages of modern software tools to the ICER Severe Asthma Model. In progress

Now a popular short course



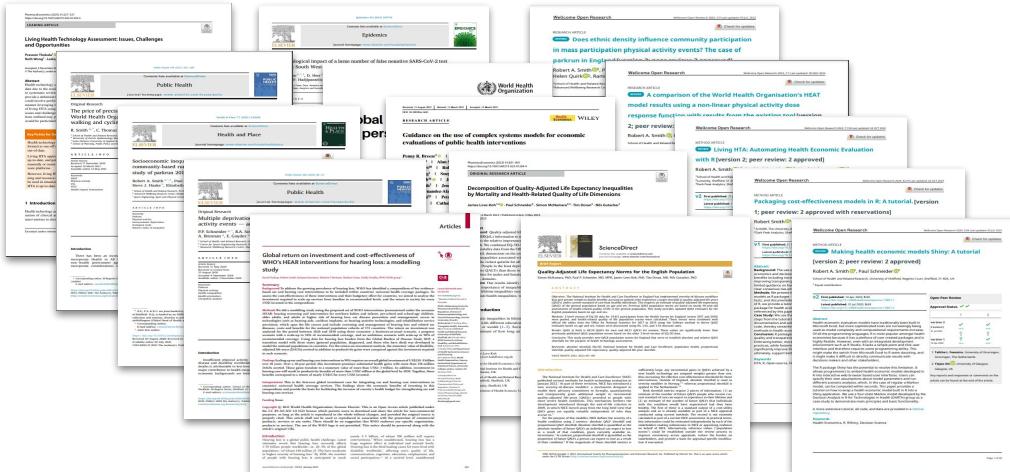
**Bibby**  
Open Source on GitHub



# Tutorial Papers



# Early Publications



# Our Tutorial Papers (and related courses)

**Wellcome Open Research** Wellcome Open Research 2020, 5:59 Last updated: 05 JUL 2022

**METHOD ARTICLE**

**REVIEW** Making health economic models Shiny: A tutorial [version 2; peer review: 2 approved]

Robert A. Smith , Paul Schneider 

School of Health and Related Research, University of Sheffield, Regents Court, Sheffield, S1 4DA, UK

\* Equal contributors.

**V2** First published: 14 Apr 2020, 8:59  
<https://doi.org/10.12688/wellcomeresources.15807.1>

Latest published: 31 Jul 2020, 5:59  
<https://doi.org/10.12688/wellcomeresources.15807.2>

**Abstract**  
 Health economic evaluation models have traditionally been built in Microsoft Excel, but more sophisticated tools are increasingly being used to support the development of these models. Of all the programming languages, R is most popular amongst health economists because it has a plethora of user created packages and is highly flexible. However, even with an integrated development environment such as R Studio, R remains a single point and click user interface and can be less intuitive than Microsoft Excel. This might make the switch from Microsoft Excel to R seem daunting, and it might make it difficult to directly communicate results with decision makers and other stakeholders.

The R package Shiny has the potential to resolve this limitation. It allows programmers to embed health economic models developed in R into an interactive web browser based user interfaces. Users can open the interface in their web browser and run different scenario analyses, which, in the case of regular Markov model, can be computed within seconds. This paper provides a tutorial on how to wrap a health economic model built in R into a Shiny application. We use a four-state Markov model developed in Decision Analysts in R for Technologies in Health (DARTH) case study to demonstrate main principles and basic functionality.

A more extensive tutorial, all code, and data are provided [here](#).

**Keywords**  
 Health Economics, R, RShiny, Decision Science

**Open Peer Review**

**Approval Status** ✓ ✓

version 2	✓ (revision) 21 Jul 2020
version 1	?
	?

**1. Talitha L. Feenstra**, University of Groningen, Groningen, The Netherlands

**2. Yiqian Xin**, University of Glasgow, Glasgow, UK

Any reports and responses or comments on the article can be found at the end of the article.



**Making Health Economic Models Shiny**

A Dark Peak Analytics Short Course



Course

This course teaches delegates to create interactive web applications for health economic models. Based on peer reviewed literature, it shows how...

**Wellcome Open Research** Wellcome Open Research 2022, 7:194 Last updated: 24 OCT 2022

**METHOD ARTICLE**

**REVIEW** Living HTA: Automating Health Economic Evaluation with R [version 2; peer review: 2 approved]

Robert A. Smith , Paul P. Schneider , Wael Mohammed 

<sup>1</sup>School of Health and Related Research, University of Sheffield, Sheffield, S1 4DA, UK  
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<sup>3</sup>Dark Peak Analytics, Sheffield, S11 7BA, UK

**V2** First published: 21 Jul 2022, 7:194  
<https://doi.org/10.12688/wellcomeresources.17933.1>

Latest published: 11 Oct 2022, 8:19  
<https://doi.org/10.12688/wellcomeresources.17933.2>

**Abstract**  
 Background: Requiring access to sensitive data can be a significant obstacle for the development of health models in the Health Economics & Outcomes Research (HEOR) setting. We demonstrate how health economic evaluation can be conducted with minimal transfer of data between parties, while automating reporting as new information becomes available.

**Methods:** We developed an automated analysis and reporting pipeline for health economic modeling and made the code open-source on a GitHub repository. The pipeline consists of three parts: An economic model is constructed by the consultant using pseudo data. On the data-owner side, an application programming interface (API) is hosted on a server. This API hosts all sensitive data so that it does not have to be provided to the consultant. An automated workflow is created, which calls the API, retrieves results, and generates a report.

**Results:** The application of this data science tool and practice allows analysis of data without the need to directly access the need to transfer sensitive data. In addition, the analysis can be largely automated: the analysis can be scheduled to time points (e.g. monthly), or when triggered by an event update to the data. During the trial or validation, results generated automatically can be exported into a 'Documents' no longer need to be revised manually.

**Conclusions:** This example demonstrates that it is possible to separate the health economic model and automate the main steps of the analysis pipeline.

**Keywords**  
 HEOR, HTA, APIs, R, plumber

**Open Peer Review**

**Approval Status** ✓ ✓

version 2	✓ (revision) 11 Oct 2022
version 1	?
	?

**1. Mohsen Sadatnasavadi**, University of British Columbia, Vancouver, Canada

**2. Devin Inzeroli**, Entelity Inc., Princeton, USA

Any reports and responses or comments on the article can be found at the end of the article.



**Automating Health Economic Evaluation with R**

Pre-order available now!

A Dark Peak Analytics Short Course



Course

Automating Health Economic Evaluation with R

This course covers the skills necessary to create automated health economic evaluation reports which always reflect th...

**Wellcome Open Research** Wellcome Open Research 2023, 8:419 Last updated: 24 OCT 2023

**METHOD ARTICLE**

**REVIEW** Packaging cost-effectiveness models in R: A tutorial [version 1; peer review: 2 approved with reservations]

Robert Smith , Wael Mohammed , Paul Schneider 

<sup>1</sup>SCHAR, The University of Sheffield, Sheffield, England, S1 4DA, UK  
<sup>2</sup>Dark Peak Analytics, Sheffield, UK

**V1** First published: 21 Sep 2023, 8:419  
<https://doi.org/10.12688/wellcomeresources.19656.1>

Latest published: 21 Sep 2023, 8:419  
<https://doi.org/10.12688/wellcomeresources.19656.1>

**Abstract**  
 Background: The use of programming languages such as R in health economics and decision science is increasing, and brings numerous benefits including increasing model development efficiency, improving transparency, and reducing human error. However, there is little guidance on how to best develop models using R. So far, no clear consensus has emerged on how to do this.

**Methods:** We present the advantages of creating health economic models as R packages - structured collections of functions, data sets, tests, and documentation. Assuming an intermediate understanding of R, we provide a comprehensive how-to guide on how to create R packages for health economic evaluation. All source code used in or referenced by this paper is available under an open-source licence.

**Case Study:** We use the Sick Sicker Model as a case study applying the principles described in this paper to demonstrate how to develop documentation and aid review. This can improve the distribution of code, thereby streamlining model development, and improving methods in health economic evaluation.

**Conclusion:** R packages offer a valuable framework for efficient and transparent model development in health economic evaluation. Embracing better, more standardised software development practices, while fostering a collaborative culture, has the potential to significantly improve the quality of health economic models and ultimately, support better decision making in healthcare.

**Keywords**  
 HTA, R, Open-source, Health Economics

**Open Peer Review**

**Approval Status** ? ?

version 1	?
	?

**1. Isaac Corro Ramos**, Erasmus University Rotterdam, Rotterdam, The Netherlands

**2. Joe Moss**, York Health Economics Consortium, York, UK

Any reports and responses or comments on the article can be found at the end of the article.



**Packaging Cost-effectiveness Models in R**

A Dark Peak Analytics Short Course



Course

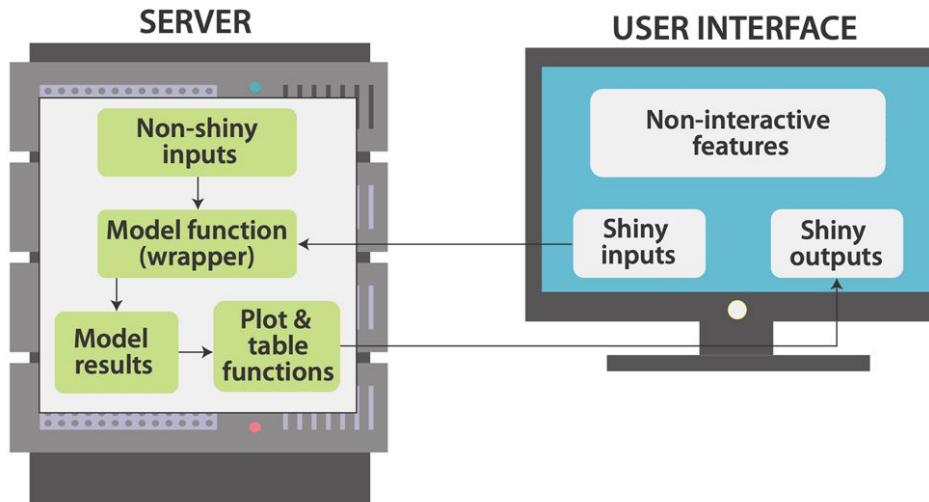
Packaging Cost-effectiveness Models in R

This course covers the skills necessary to build health economic evaluation models into R packages. Following our peer reviewed paper of...

# Tutorial Papers: *Smith and Schneider (2020)*

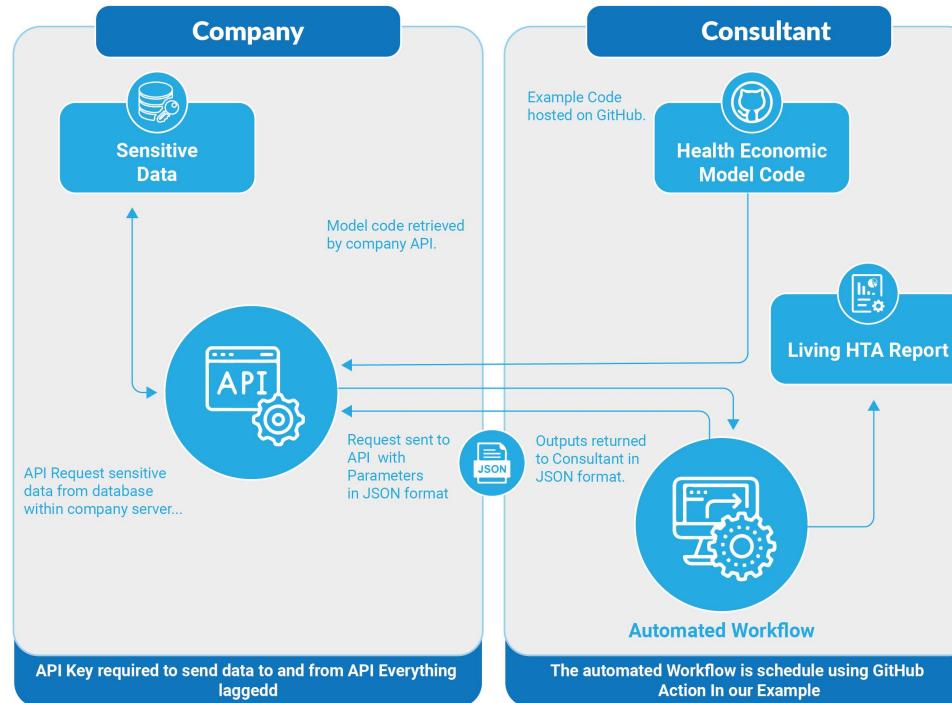
Making health economic models Shiny: A tutorial

## ShinyApp function



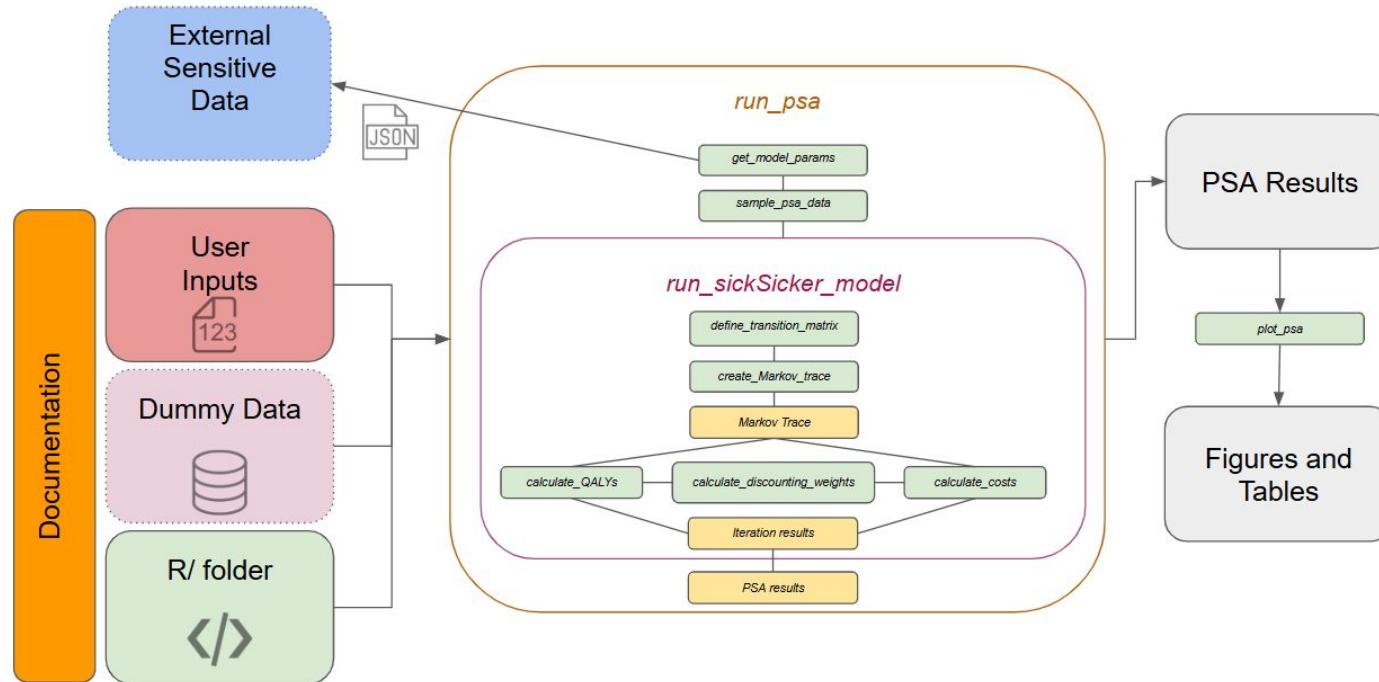
# Tutorial Papers: *Smith et. al (2022)*

## Living HTA: Automating Health Economic Evaluation with R



# Tutorial Papers: Smith et al. (2023)

## Packaging cost-effectiveness models in R: A tutorial

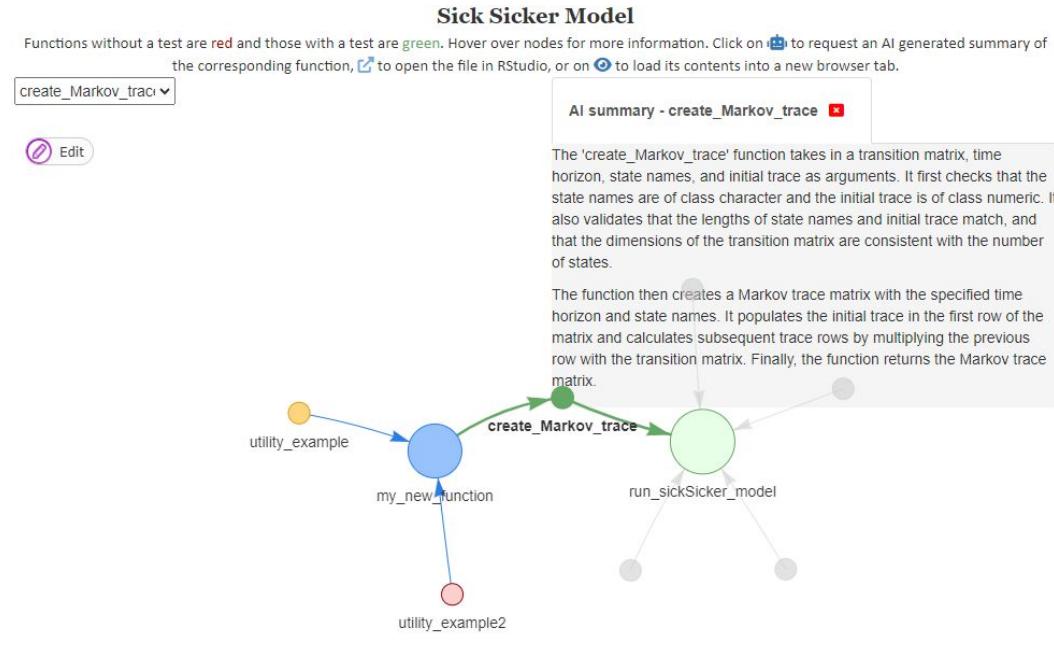


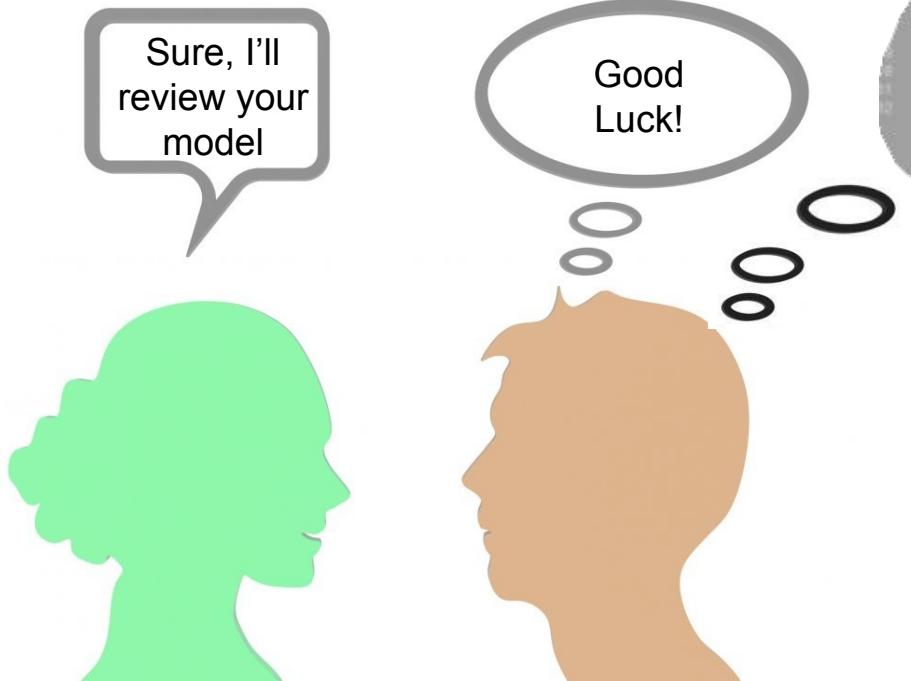


# Software

# Tutorial Papers: Smith et. al. (2024)

## assertHE: an R package to improve quality assurance of HTA models

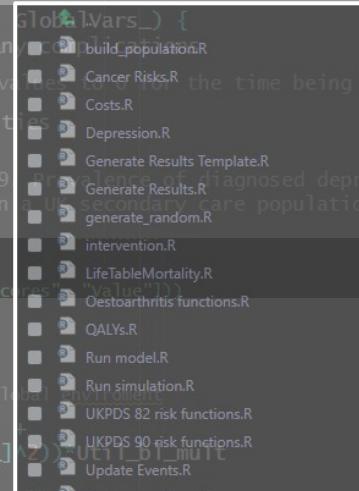




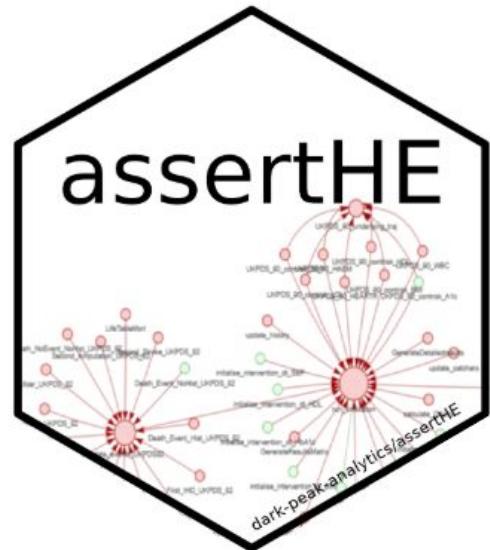
```
def PRINT_HEAD
printf( " %s(%s) ", __charU( __func__ ) );
#endif
// D-Scene(C, scene) // 頂点配列をクリア
(MoMvBspareG( o )) // PTMoYparePbG( MoBspareG( o )); // return;
// G=G-G=0;
(K->type == OB_ARMATURE)
{ // V生配V2 - LIB::resize(20);
bArmature *arm = (bArmature *)o->data; int i=0;
Object *o_ = edGet("o_"); C; oG=o_>ObjectToM=obC("oY", C); ObjectToB=oG->obC(L"oY", C);
EDB2O<Object>(L"oY", C);
//PoseChannel *pcA=CTX_data_active_pose_bone(C), *pC=NULL, *pB=NULL;
if (pcA&&pcA->parent&&pcA->parent->parent)
{
ObjectToTarget=oG->C("oTarget", O); if (VectorT目标>IsNull(oTarget->obmat))
if ((TypeOfIK, "PoseBone", pcA)!=1) return;
//MoMvBspareG( o );
}
```



```
55 year <- 0
56
57 #initialise the results matrix
58 results <- GenerateResultsMatrix(GlobalVars_, endtime_)
59 #initialise a PSA results matrix, if it is a PSA
60 if(GlobalVars_["run_psa", "Value"]==T){
61 psaresults <- matrix(data=NA, nrow = as.numeric(GlobalVars_["psa_count", "Value"]),
62 colnames(psaresults) <- c("Life_Years_per_Patient", "Undiscounted_Costs_per_Patient", "QALYs_per_Patient", "Undiscounted_Costs_per_Patient", "GlobalVars_", "treatment", "attend_se")
63 #Record the BMI of the population
64 population[, "BMI"] <- diag_diab_population[, "BMI"]
65 #This has been kept the same as in the SPHR diabetes model
66 #Record the BMI of the population
67 psa_count[, "value"] <- diag_diab_population[, "BMI"]
68 #Discounted Costs per Patient"
69 population[, "DMCOST"] [alive_] <- population[, "MET"] * alive_ * parameters[, "COST_MET"]
70 population[, "MET2"] [alive_] * parameters[, "COST_MET2"]
71 population[, "HDL"] <- diag_diab_population[, "HDL"]
72 #run population [, "INSU"] [alive_] * parameters[, "COST_INSU"]
73 while (year < endtime_ &
74 sum(is.na(population[, "F_ALLCAUSE"])) == 1) {
75 #population vector CVDGOST[, alive_] are alive, use
76 #in population[, "HDL_F"] [alive_] * parameters[, "COST_HDL"] +
77 alive_population[, "HDL_F"] [alive_] * parameters[, "COST_HDL"]
78 #create population[, "MID_E"] [alive_] * parameters[, "COST_MID_E"]
79 dead_population[, "MID_H"] [alive_] * parameters[, "COST_MID_H"]
80 #dead mean BMI, age and proportion female from Hayes et al
81 dead_population[, "MID_E"] [alive_] * parameters[, "COST_MID_E"]
82 dead_population[, "MID_H"] [alive_] * parameters[, "COST_MID_H"]
83 #Mean_BMI_Hayes <- 28.4 #Mean BMI in the source of our baseline utilities
84 #Estimate diabetes related complications and all cause mortality
85 population[, "STRO2_E"] [alive_] * parameters[, "COST_STRO2_E"]
86 population[, "STRO2_H"] [alive_] * parameters[, "COST_STRO2_H"]
87 population[, "STRO2_E"] [alive_] * (parameters[, "COST_STRO2_E"] *
88 #only add on the additional costs of a 2nd stroke, and the cost of
89 population[, "CHE_E"] [alive_] * parameters[, "COST_CHE_E"]
90 ## '@param random_nums_ It's the array of a common set of random numbers'
91 ## '@return pBC is the vector of the probabilities of breast cancer
92 population[, "ATFIB_H"] [alive_] * 0# note no cost was assigned
93 Breast_cancer <- function(population_, parameters_){
94 #Calculate the fitted value
95 FV <- parameter[, "CANB_mu"] + they have an event
96 parameter[, "CANB_bta_MEN"] * population[, "MEN"] [alive_] +
97 parameter[, "CANB_bta_BMI"] * population[, "BMI"] [alive_] +
98 parameter[, "CANB_bta_BMIMEN"] * (population[, "MEN"] [alive_] * apply the BMI decrements to this)
99 #convert to probabilities
100 pBC <- 1-exp(-exp(FV))
101 #set breast cancer risk to 0 for men
102 pBC <- ifelse(population[, "FEMALE"]==0,0,pBC)
103 #remove temporary variables generated in the function
104 rm(FV)
105 #return the probabilities
106 return(pBC)
107 }
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# Publication

Wellcome Open Research

Welcome Open Research 2024, 9:701 Last updated: 17 JUN 2025

Check for updates

SOFTWARE TOOL ARTICLE

## assertHE: an R package to improve quality assurance of HTA models

(version 1; peer review: 1 approved, 1 approved with reservations)

Robert A. Smith<sup>1,2</sup>, Yevgeniy Samyshkin<sup>3,4</sup>, Wael Mohammed<sup>1,2</sup>, Felicity Lamrock<sup>4</sup>, Tom Ward<sup>1,4</sup>, Jack Smith<sup>1</sup>, Alan Martin<sup>1</sup>, Paul Schneider<sup>1,2</sup>, Dawn Lee<sup>6</sup>, Gianluca Baiò<sup>7</sup>, Howard Thom<sup>8</sup>, Nathan Green<sup>9</sup>, Marina Richardson<sup>10</sup>, Mohammed El Alili<sup>10,11</sup>, Xavier Pouwels<sup>12</sup>, Calum Lewis<sup>12</sup>, Baris Deniz<sup>1,3</sup>

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<sup>3</sup>CSS, London, UK  
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<sup>7</sup>University College London Department of Statistical Science, London, UK  
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<sup>9</sup>Institute for Clinical and Economic Review (ICER), Boston, MA, USA  
<sup>10</sup>Department of Health Sciences, Faculty of Science, Vrije Universiteit Amsterdam, Amsterdam Public Health Research Institute, Amsterdam, The Netherlands  
<sup>11</sup>National Health Care Institute (ZIN), Dieren, The Netherlands  
<sup>12</sup>Section of Health Technology and Services Research, University of Twente, Overijssel, The Netherlands  
<sup>13</sup>Current Affiliation: Alde Solutions LLC, Wilmington, Delaware, USA

First published: 02 Dec 2024, 9:701  
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Latest published: 02 Dec 2024, 9:701  
https://doi.org/10.12688/wellcomeopenres.23180.1

Open Peer Review

Approval Status ? ✓

version 1 ? ✓ view

02 Dec 2024

Background

Health economic models are increasingly used to inform decisions about the allocation of healthcare resources. Ensuring the robustness and reliability of these models is critical. Currently, quality assurance is conducted by both technical and non-technical experts assessing different components of the model manually. This is resource intensive, time-consuming, and testing the different components of the model together is time consuming, and testing every part of the model is sometimes not feasible in the time available. To aid in this, we have developed the assertHE R package.

Page 1 of 18

# CRAN Package

## Package 'assertHE'

April 24, 2025

Title Visualisation and Verification of Health Economic Decision Models

Version 0.0.0

Description assertHE is designed to help health economic modellers when building and reviewing models. The visualisation functions allow users to more easily review the network of functions in a project, and get lay summaries of them. The asserts included are intended to check for common errors, thereby saving up time for modellers to focus on tests specific to the individual model in development or review. For more details see Smith and colleagues (2024)<doi:10.12688/wellcomeopenres.23180.1>.

Licence MIT - 6k LICENSE

Encoding UTF-8

RoslynNote 7.2.2

Suggests testthat (>= 3.0.0), colourpicker, clipr, jsonlite

Config/testthat/validate\_ 3

Depends R (>= 4.1.0)

Imports assertthat, ggplot2, dplyr, utils, visNetwork, covr, htmltools, officer, flextable, knitr, shiny, shinyjs, rstudiosquash, roxygen2, methods, water, graphr, htr

URL <https://dark-peak-analytics.github.io/assertHE/>, <https://github.com/dark-peak-analytics/assertHE>

BugReports <https://github.com/dark-peak-analytics/assertHE/issues>

NeedsCompilation no

Author Robert Smith [aut, cnc, cph] (<<https://orcid.org/0000-0002-0245-3217>>), Wael Mohammed [aut] (<<https://orcid.org/0000-0003-0370-4983>>), Jack Smith [aut], Oliver Smith [aut] (<<https://orcid.org/0000-0003-0766-1277>>), Dark Peak Analytics Ltd [cph, fnd]

Maintainer Robert Smith <[rsmith@darkpeakanalytics.com](mailto:rsmith@darkpeakanalytics.com)>

Repository CRAN

DatePublication 2025-04-24 17:10:02 UTC

1

[packages/assertHE/index.html](https://cran.r-project.org/web/packages/assertHE/index.html)

# GitHub Repo

README Code of conduct License MIT license

## assertHE

DOI: 10.5281/zenodo.1394917 R-CHD-check.yaml passing

This work is now published in Wellcome Open Research, please cite as:

Smith RA, Samyshkin Y, Mohammed W et al. assertHE: an R package to improve quality assurance of HTA models. Wellcome Open Res. 2024, 9:701. <https://doi.org/10.12688/wellcomeopenres.23180.1>

The goal of assertHE is to help modellers build and review health economic models in R. The package provides functions which can be included within models to check that the objects created conform to standard rules (e.g. probabilities between 0 and 1). It also provides functions to review the structure of the model, showing the network of functions color coded by test coverage. Users can click on the nodes to see function and test source code, test coverage and create an AI generated summary of the function.

Rob outlined the package at R-HTA 2024 with a [video](#) and [slides](#) publicly available for those interested in finding out more.

We are continuing to work to improve the package and welcome contributions. To get involved, please see the [Contribution guide](#). For more context about the aims of the wider project please read the [the wild](#).

### Installation

You can install the CRAN version of assertHE from [CRAN](#) with:

```
install.packages("assertHE")  
library(assertHE)
```

Alternatively the development version of assertHE can be installed from [GitHub](#) with:

```
# install.packages("devtools")  
devtools::install_github("dark-peak-analytics/assertHE")  
library(assertHE)
```

### Using the package

#### Reviewing model structure

The below code creates a visual representation of the model structure for a given project. The user must provide a path to the project folder, the location of functions (typically "R") and the location of tests (typically "tests/testthat").

```
visualise_project(  
  project_path = "path_to_project_directory",  
  doc_width = "800px")
```

[dark-peak-analytics.github.io/assertHE/](https://dark-peak-analytics.github.io/assertHE/)

# assertHE R package

## Aim:

Help modellers **build** and **review** health economic models in R.

## Functionality:

**Check that the objects created in models conform to standard rules**  
(e.g. probabilities between 0 and 1).



**Summarise & visualise the structure of a model**

- Plot function network color coded by test coverage.
- Click on the nodes to see function and test source code and test coverage.
- Display a LLM generated summary of any function.

<https://github.com/dark-peak-analytics/assertHE>



# Using the assertHE R package

```
install.packages("assertHE")
```

```
library(assertHE)
```

B: insert checks for common errors into the code

```
check_trans_prob_array(a_P = a_P,
                      stop_if_not = T)
```

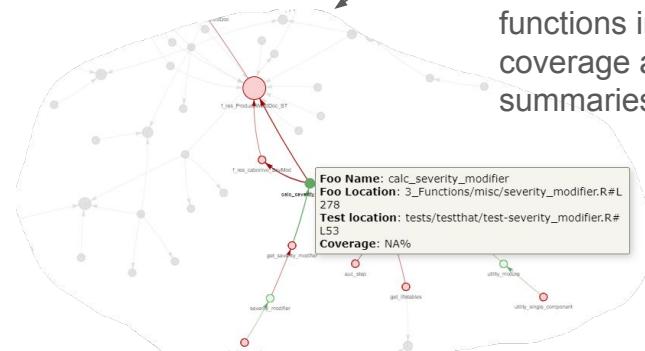
Flags if there are errors or potential problems.

```
# Warning message:
# In check_array_rows_balanced(a_P, stop_if_not = stop_if_not) :
#   Not valid transition probabilities
#   Transition probabilities not valid from Health States:
# 1 H; at cycle 1
# 2 H; at cycle 2
# 3 H; at cycle 3
# 4 H; at cycle 4
# 5 H; at cycle 5
# 6 H; at cycle 6
# 7 H; at cycle 7
# 8 H; at cycle 8
# 9 H; at cycle 9
# 10 H; at cycle 10
```

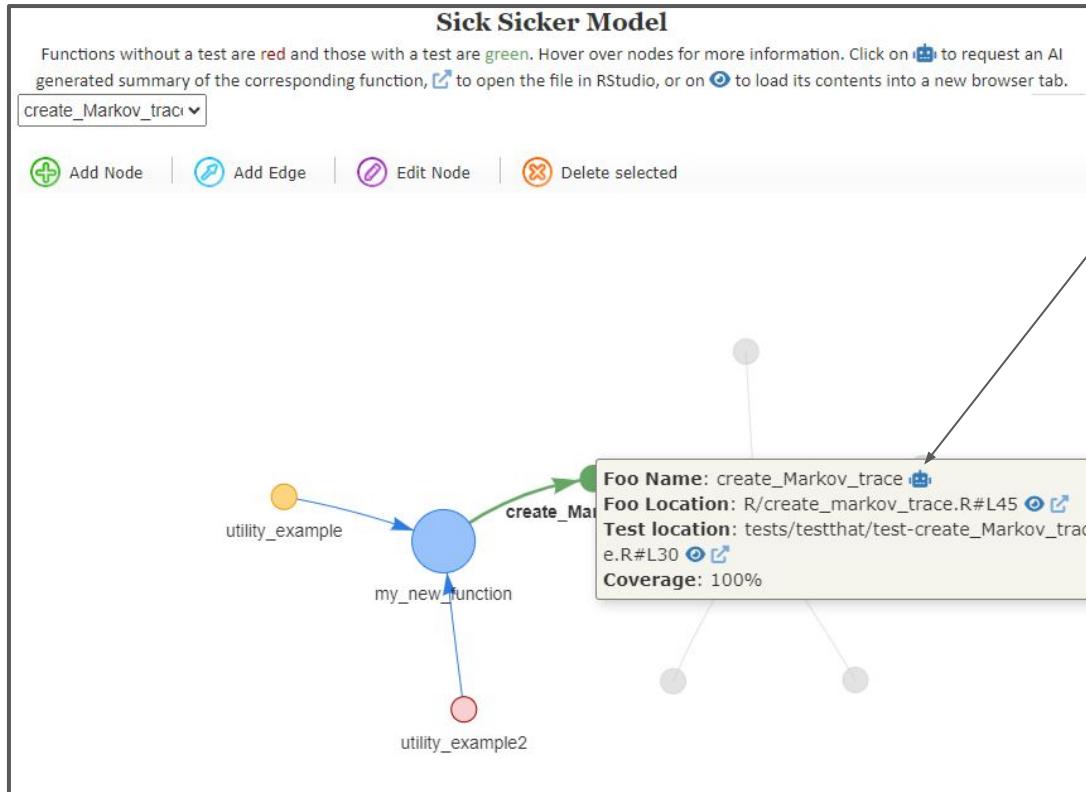
A: visualise network of functions

```
visualise_project(
  project_path = "path_to_project_directory",
  foo_path = "R",
  test_path = "tests/testthat",
  run_coverage = T)
```

Inspect the network to understand how the model functions interact, their test coverage and get AI function summaries.

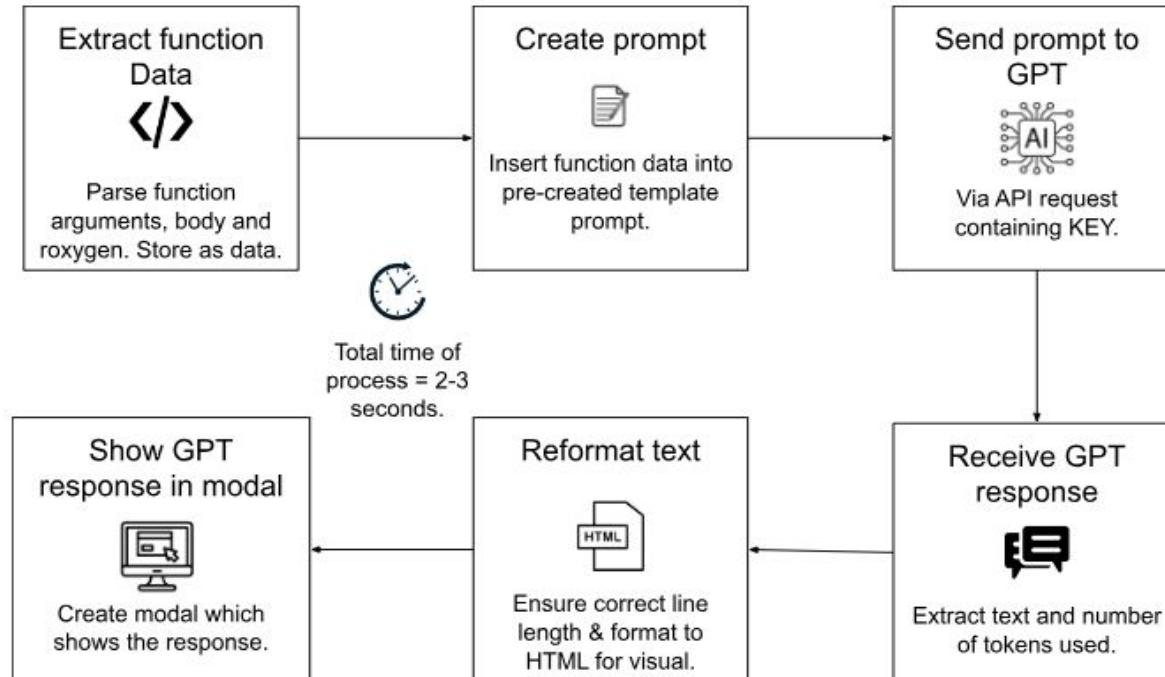


# assertHE model reviewer

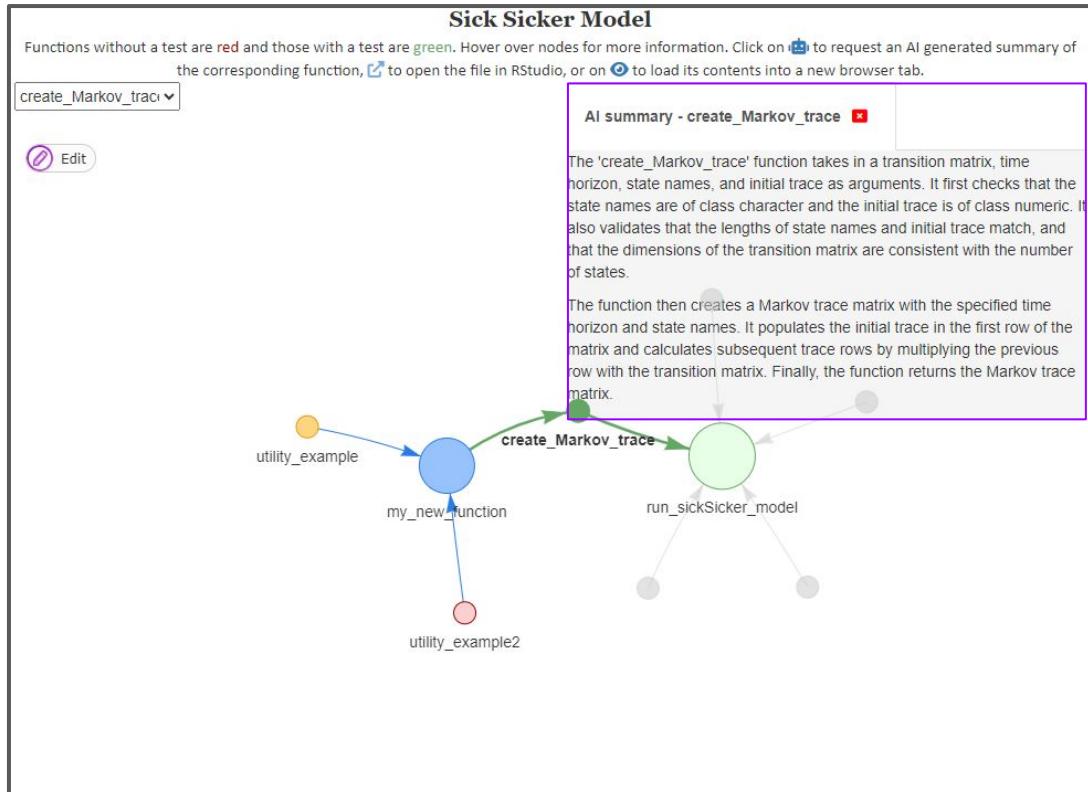


Generate LLM summary of function.

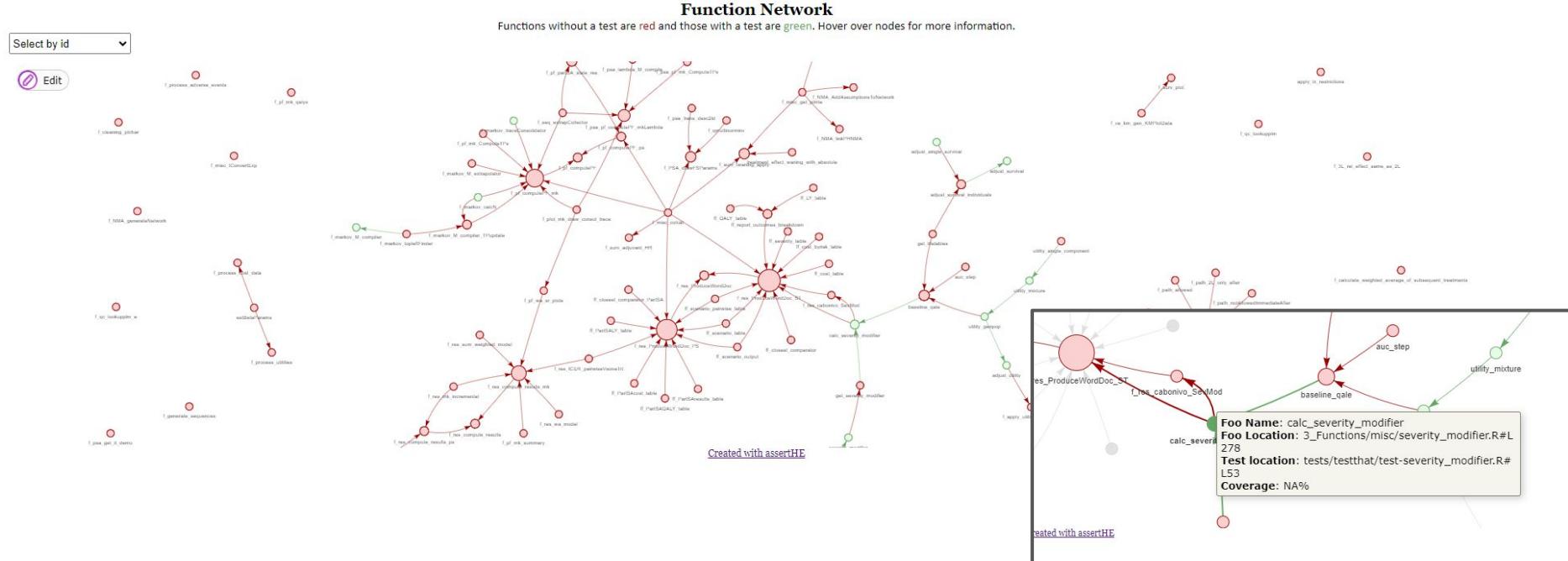
# assertHE model reviewer



# assertHE model reviewer



# Case Study: NICE RCC Pilot





# Training



# Short Courses



**Introduction to R for Health Economic Evaluation**

A Dark Peak Analytics Short Course

[View course details](#)

[View course page](#)

[View course content](#)



**State Transition (Markov) Models in R**

A Dark Peak Analytics Short Course

[View course details](#)

[View course page](#)

[View course content](#)



**Efficient Microsimulation Modelling in R**

A Dark Peak Analytics Short Course

[View course details](#)

[View course page](#)

[View course content](#)



**Partitioned Survival Models in R**

A Dark Peak Analytics Short Course

[View course details](#)

[View course page](#)

[View course content](#)



**Making Health Economic Models Shiny**

A Dark Peak Analytics Short Course

[View course details](#)

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[View course content](#)



**Data Visualisation for Health Economic Evaluation**

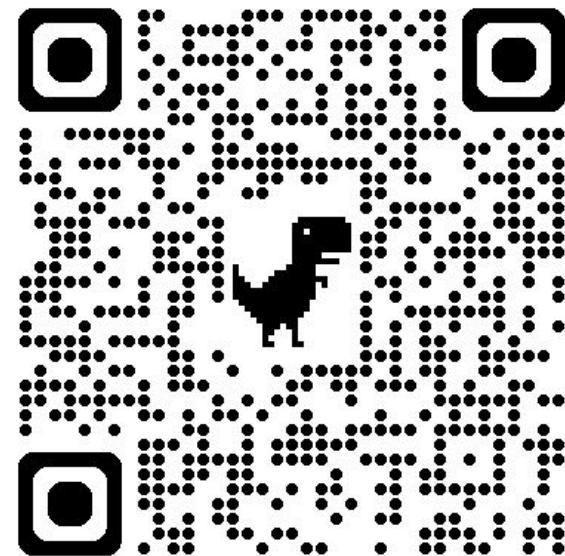
A Dark Peak Analytics Short Course

[View course details](#)

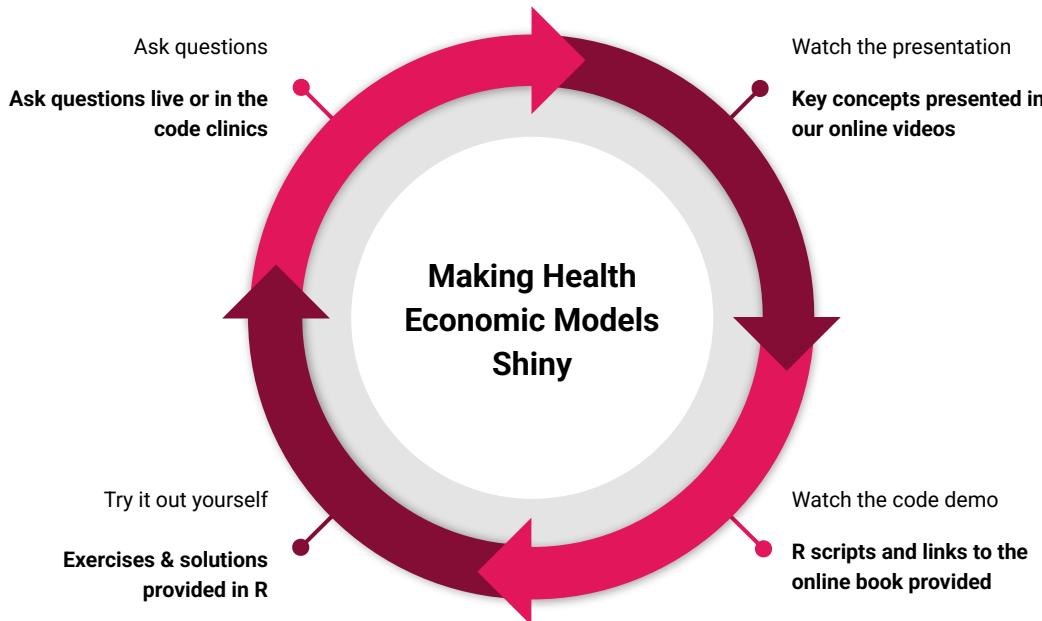
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# Short Courses



# Case Study: Shiny



# Case study - Our course delegates' apps

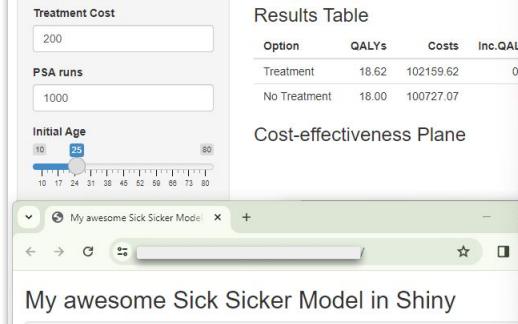
**Sick Sicker Model in Shiny**

Treatment Cost	200
PSA runs	1000
Initial Age	25

**Results Table**

Option	QALYs	Costs	Inc.QALYs	Inc.Costs	ICER
Treatment	18.62	102159.62	0.63	1423.43	2269.89
No Treatment	18.00	100727.07	NA	NA	NA

**Cost-effectiveness Plane**



**Shiny Skiing**

Treatment Cost	200
PSA runs	1000
Initial Age	25

**Results Table**

Option	QALYs	Costs	Inc.QALYs	Inc.Costs	ICER
Treatment	18.59	101130.09	0.62	1418.45	2289.86
No Treatment	17.97	99711.64	NA	NA	NA

**Cost-effectiveness Plane**



**My awesome Sick Sicker Model in Shiny**

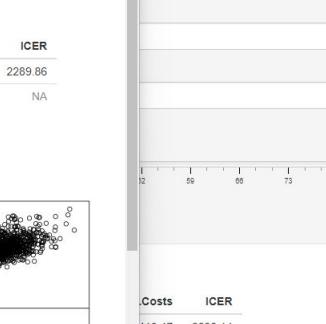
Treatment Cost	200
PSA runs	1000
Initial Age	25

**Run model**

**Results Table**

Option	QALYs	Costs	Inc.QALYs	Inc.Costs	ICER
Treatment	18.58	100648.74	0.62	1409.61	2289.33
No Treatment	17.96	99401.36	NA	NA	NA

**Cost-effectiveness Plane**





# Reading list

Last Updated: 15/04/2025

## Key publications to learn R for Health Economic Evaluation

The publications below constitute a great starting point when trying to learn R for Health Economic Evaluation. These vary in complexity. Tutorial papers with accompanying code are highlighted in **bold**.

We have denoted any publication that requires an academic account or payment to access with (Paywall) before the publication name.

### Background & Motivation

Bach, G. and Heath, A., 2017. When simple becomes complicated: why Excel should lose its place at the top table. *Global & Regional Health Technology Assessment*, 4(1), pp.grhta-5000247. <https://journals.sagepub.com/doi/10.5301/grhta.5000247>

Ingent, D., Thom, H., Ballo, G. and Jansen, J.F., 2019. **R**, you still using excel? The advantages of modern software tools for health technology assessment. *Value in Health*, 2019 May, 1-2(5), 575-8. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6519058/>

(Paywall) Jasai, H., Pachlivanoglou, P., Krikamp, E., Alzaid-Escudero, F., Ennis, E. and Hunink, M.M., 2017. An overview of R in health decision science. *Medical decision making*, 37(7), pp.735-746. <https://doi.org/10.1177/0272969X1665059>

Xin, Y., Gray, E., Robles-Zurita, J.A., Haghpanahian, H., Hegge, R., Konli-Lynch, C., Briggs, A., McMillan, D.A., Lawson, K.D. and Lewsey, J., 2022. From spreadsheets to script: experiences from converting a Scottish cardiovascular disease policy model into R. *Applied health economics and health policy*, pp.1-10. <https://doi.org/10.1007/s40259-021-00684-y>

Hollman, C., Pachlidanoglou, P. and McCabe, C., 2017. A Comparison of Four Software Programs for Implementing Decision Analytic Cost-Effectiveness Models. *PharmacoEconomics*. Springer International Publishing, 2017, 35(8):17-30. <https://doi.org/10.1007/s40259-017-0619-8>

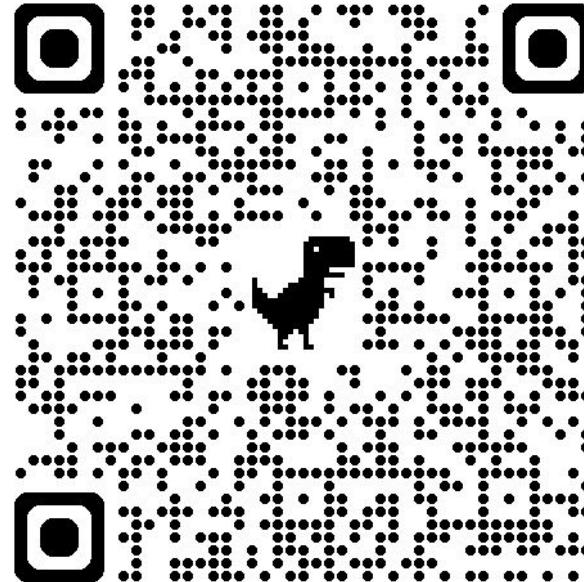
Powell, X.G. and Koffberg, H., 2024. Introducing Open Science in Teaching Health Economic Modeling. *PharmacoEconomics-Open*, 8(3), pp.347-357. <https://doi.org/10.1007/s41699-023-00469-0>

### Coding Frameworks/Structures

(Paywall) Alzaid-Escudero, F., Krikamp, E.M., Pachlivanoglou, P., Jasai, H., Kao, S.Y.Z., Yang, A. and Ennis, E.A., 2019. A need for change! A coding framework for improving transparency in decision modeling. *PharmacoEconomics*, 37(1), pp.1309-1316. <https://doi.org/10.1007/s40259-019-00837-x>

Smith, R., Mohammed, W. and Schmidler, P., 2020. Packaging cost-effectiveness models in R: A tutorial. *Wellcome Open Research*, 5. <https://doi.org/10.12688/wellcomeopenres.18563.1>

Don't see your paper here? Shoot at Rob: [rmth@darkpeakanalytics.com](mailto:rmth@darkpeakanalytics.com)





# Platforms



# Why is shiny so important?

Health economic models play a crucial role in decision making

There is often a trade-off between usability and external validity

Improvements in technology can help mitigate the trade-off

---

*“Authors of modelling papers can do things to make their work substantially more useful for policy. The best is to provide an interactive interface, where if the policymaker does not agree with the starting assumptions of the model, they can change them.” (Whitty, 2015)*



Prof Sir Chris Whitty

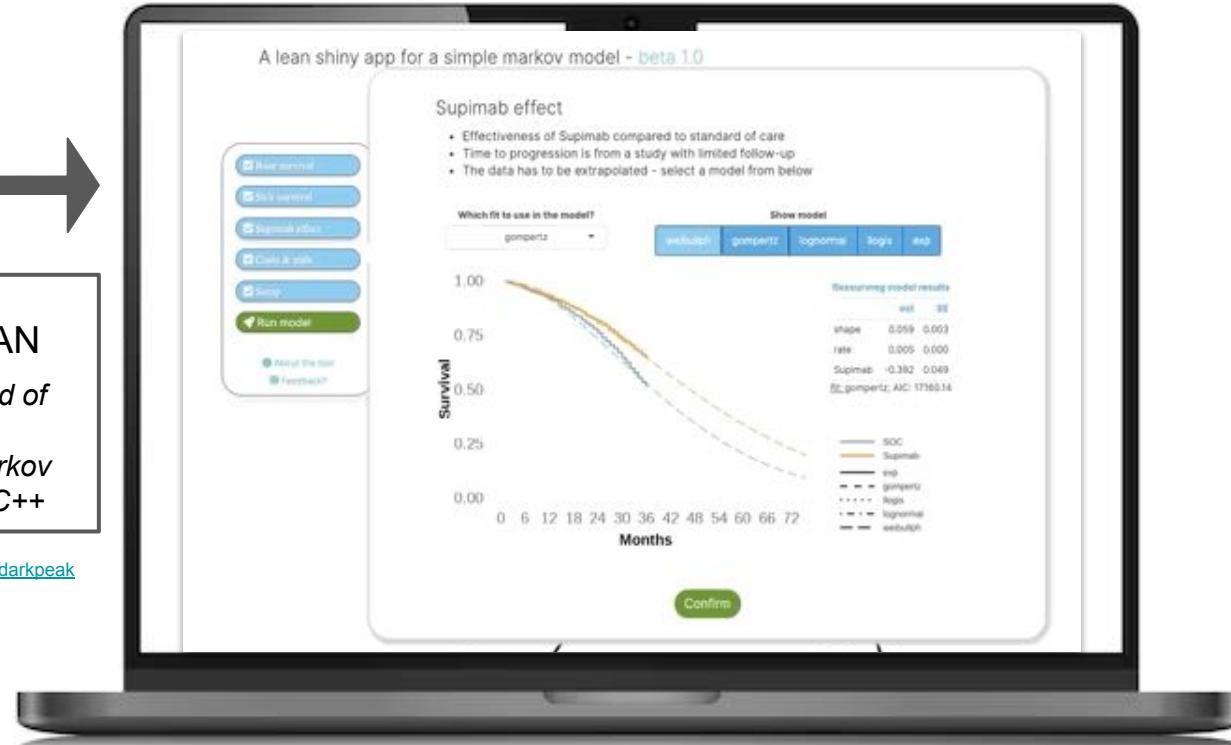
# Open-source model



## GitHub/CRAN

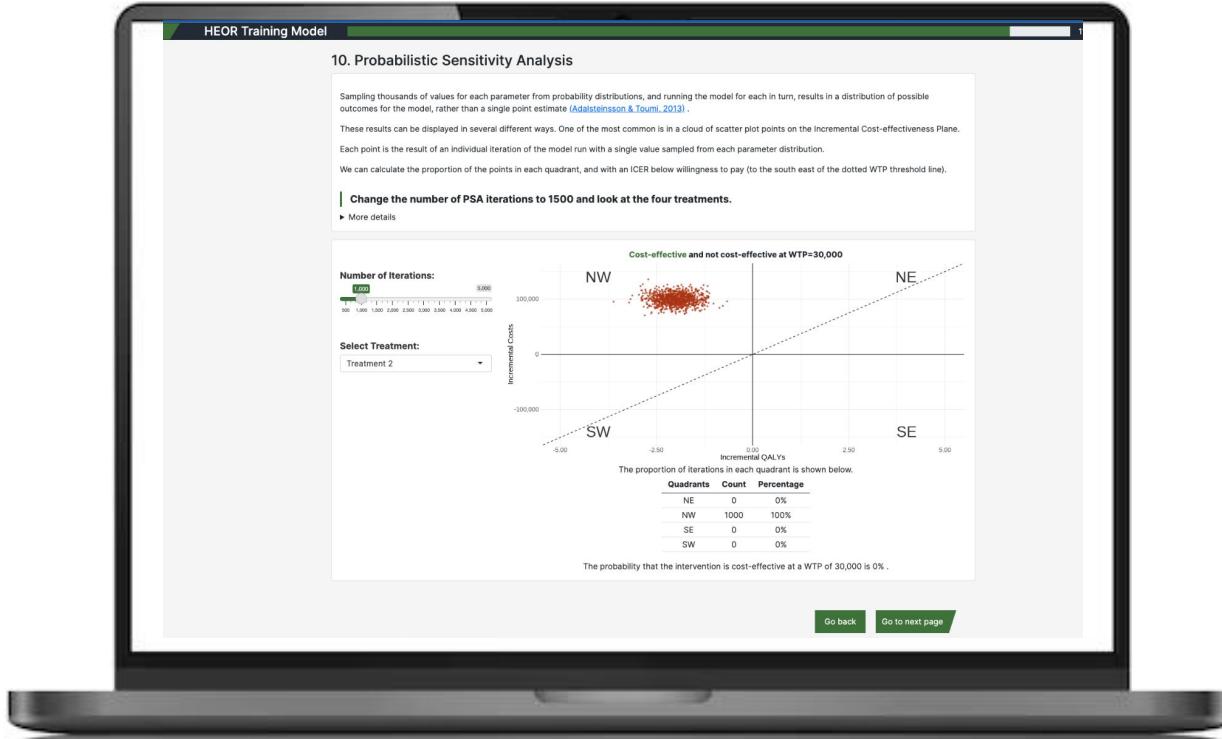
A faster method of  
running time  
dependent markov  
models using C++

<https://github.com/dark-peak-analytics/darkpeak>



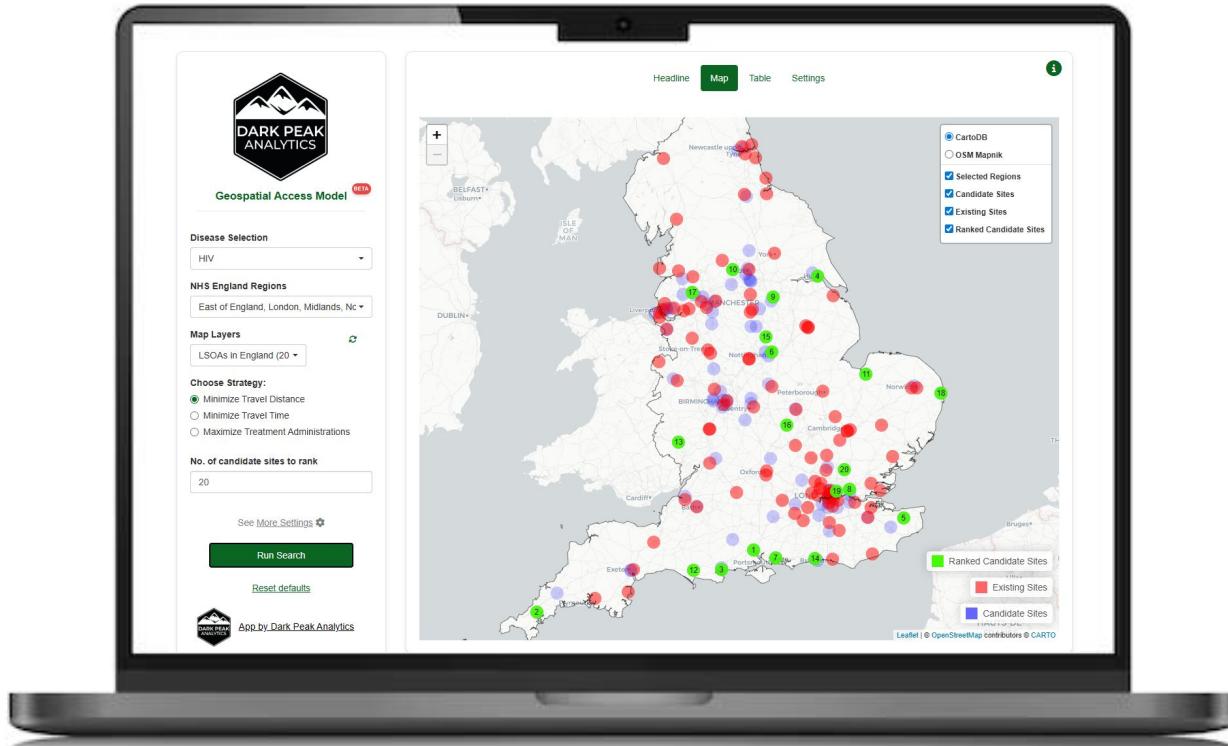
<https://darkpeakanalytics.shinyapps.io/sadm-mk2/>

# Case study - Health Economic Training Tool



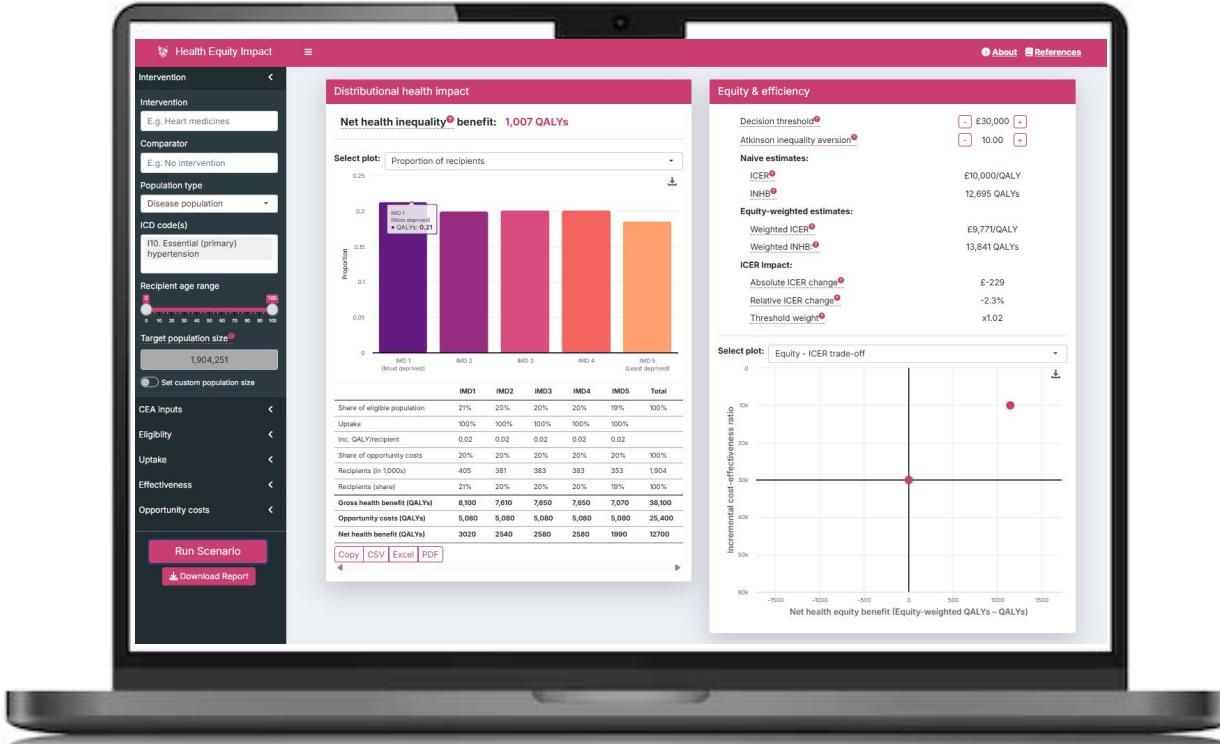
*Case Study: Training tool to introduce stakeholders new to health economic modelling through the components of a model*

# Case study - Geospatial Health Economic Model



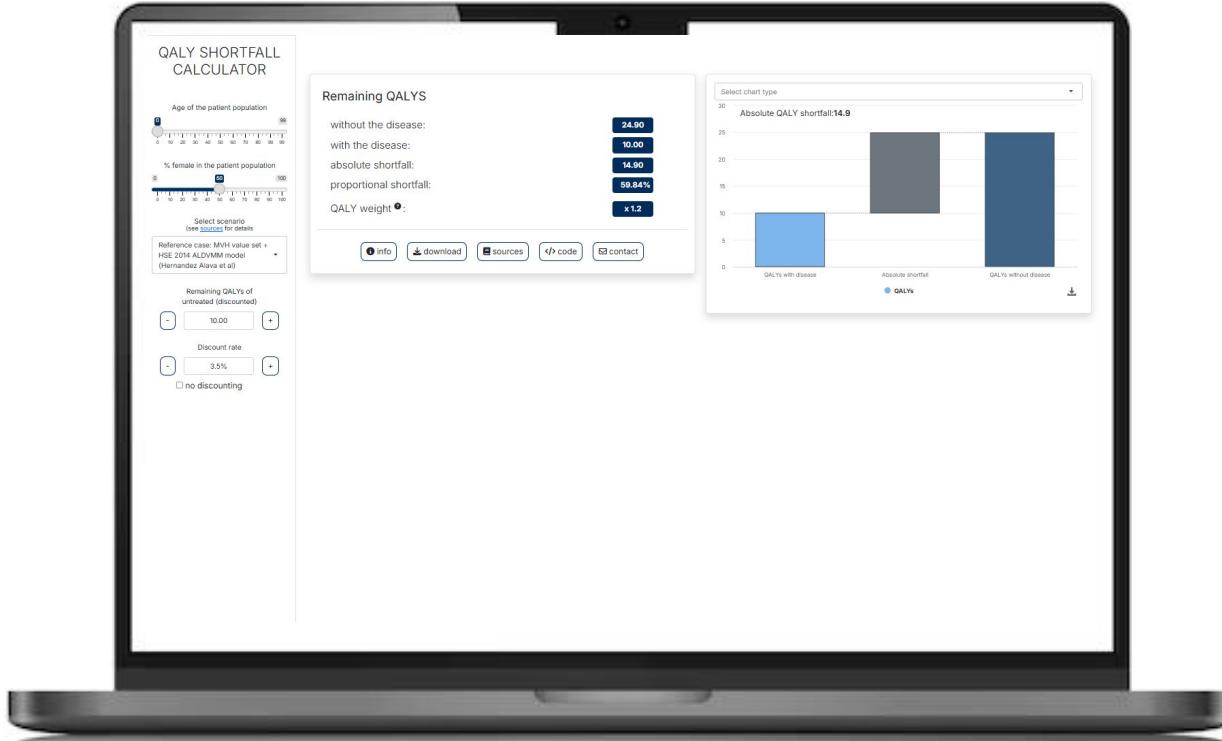
*Case Study: Geospatial health economic model used to identify optimal healthcare sites for HCP administered medicines.*

# Case study - DCEA tool



*Case Study: Geospatial health economic model used to identify optimal healthcare sites for HCP administered medicines.*

# Case study - Shortfall tool



<https://shiny.york.ac.uk/shortfall/>



# Case study - Structured Expert Elicitation Tool

The image shows a laptop screen displaying a structured expert elicitation tool. The interface includes a navigation bar with a dropdown menu showing '3 Roulette/Chips...', a 'READ-ONLY' lock icon, and a 'PICOT Information' section. The main content area displays a question about patient survival probability and a 'Task 2' section with a roulette wheel and a grid for placing chips. A URL at the bottom provides access to the tool.

What proportion of patients will be both alive and progression free at 3 years for the advanced RCC patient population in England if they received cabozantinib plus nivolumab at 1st line in the int/poor risk group and had not had previous treatment with adjuvant pembrolizumab?

Show PICOT Information

Task 2

Place 20 chips on the grid. The number of chips in each bin shows how likely you think the value is to be in that range.

Chips: 0 / 20

Reset

Percentage (%)

Percentage Range (%)	Chips Placed
5.0 - 9.5	1
14.0 - 18.5	2
18.5 - 23.0	5
23.0 - 27.5	7
27.5 - 32.0	5
32.0 - 36.5	2
36.5 - 41.0	1
41.0 - 45.5	0
45.5 - 50.0	0

<https://see.darkpeakanalytics.com>

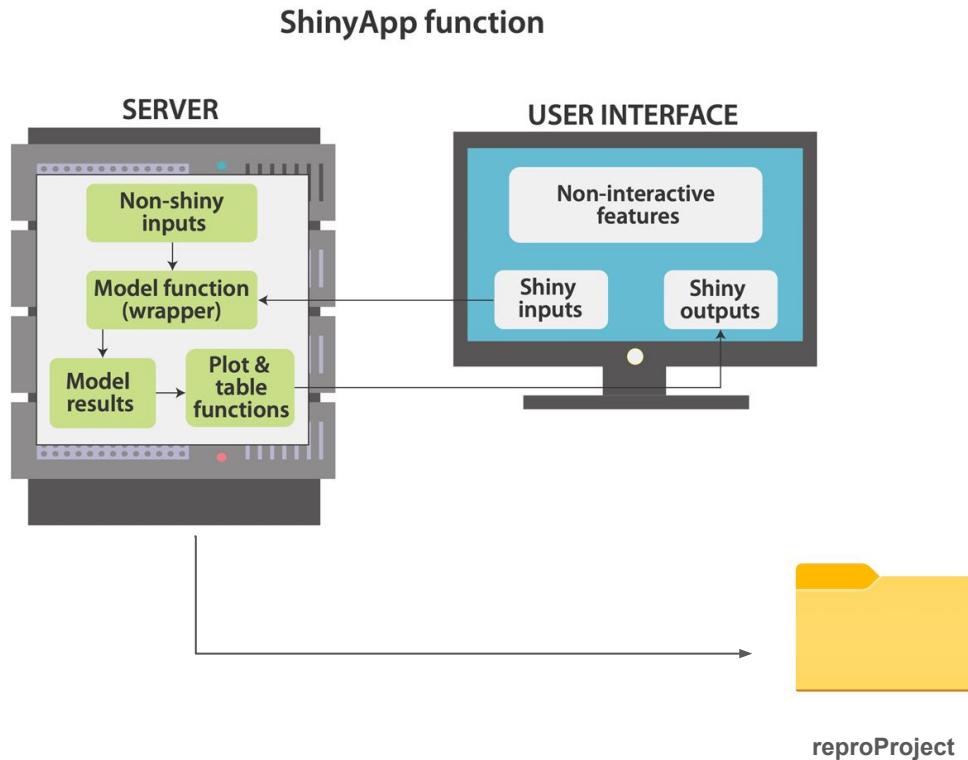
# genAI for HEOR - not designed for Excel



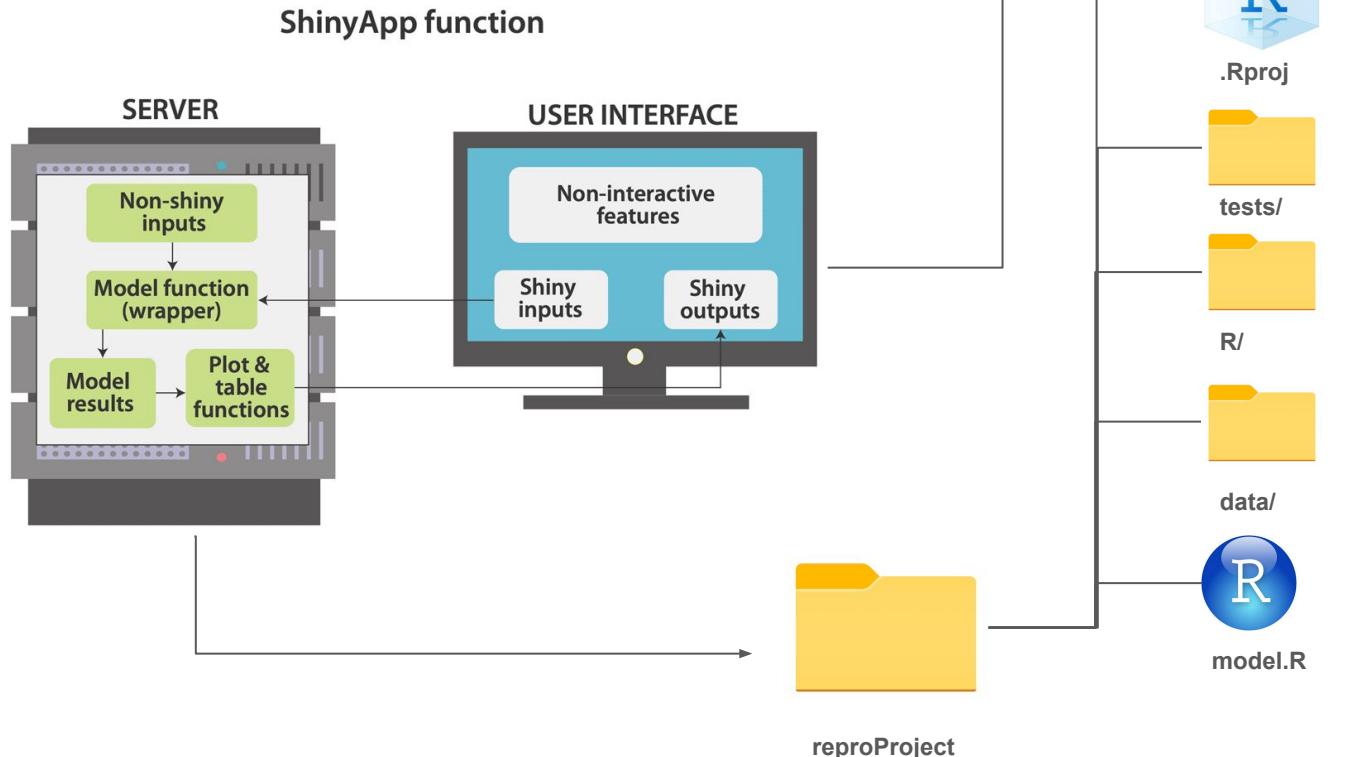


# New developments

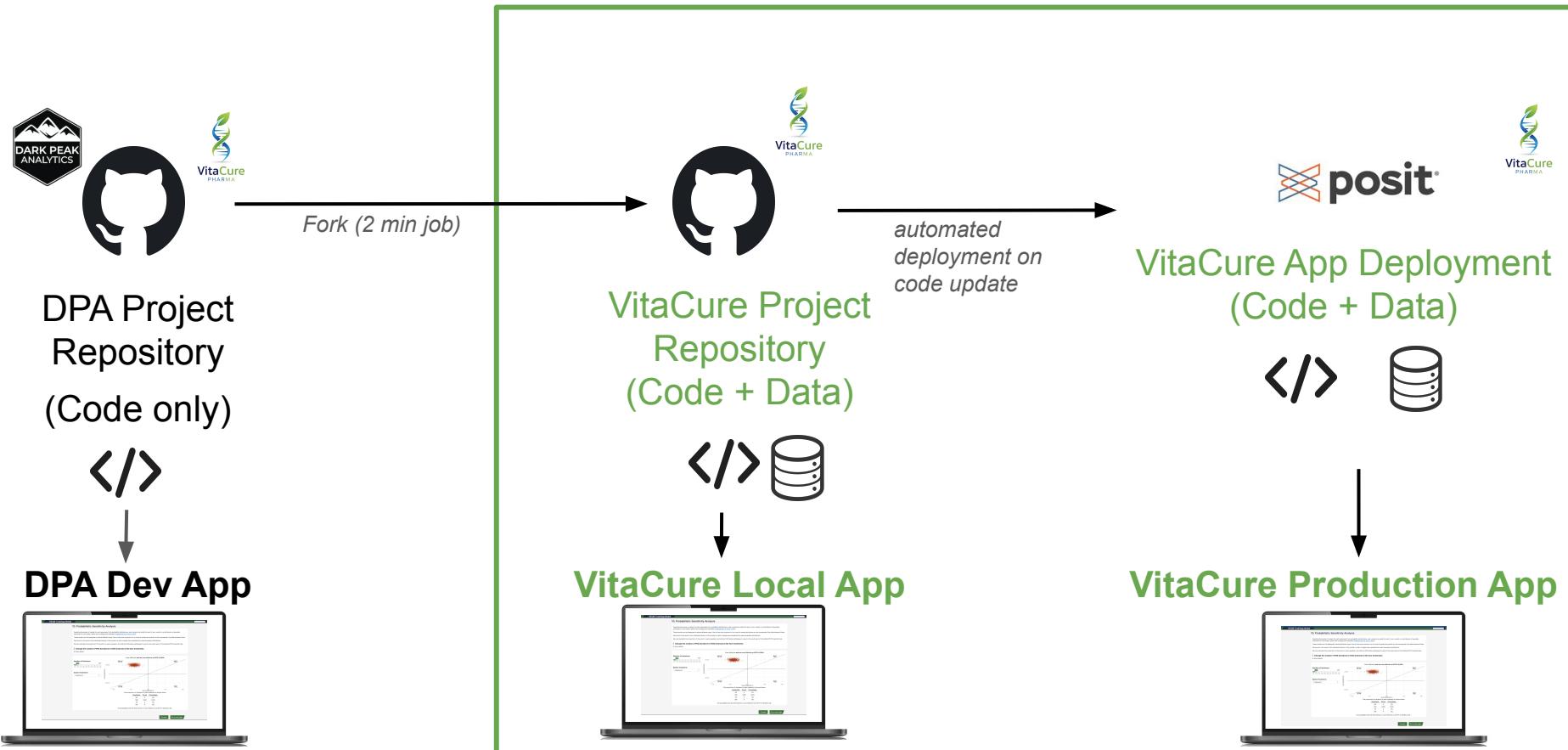
# Reproducible outputs



# Country Model Adaptations



# Deploying shiny apps within a company (VitaCure)





# Conclusions