Workshop: Paternity and kinship testing including X-chromosomal markers
Cases: Part 2

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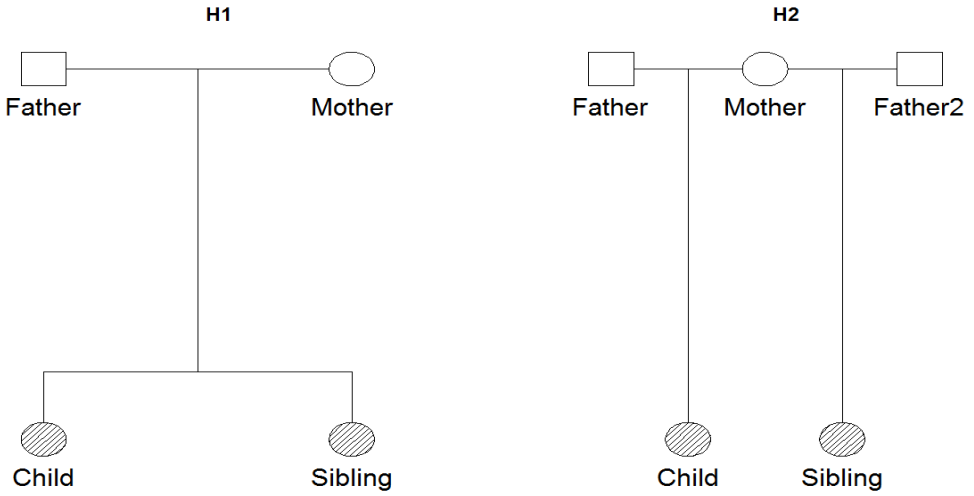
Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

a) Case 1

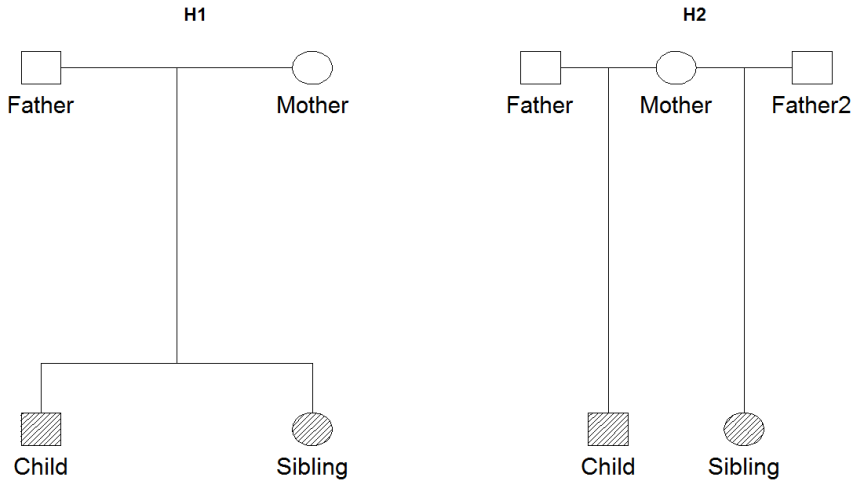


Yes!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

b) Case 2

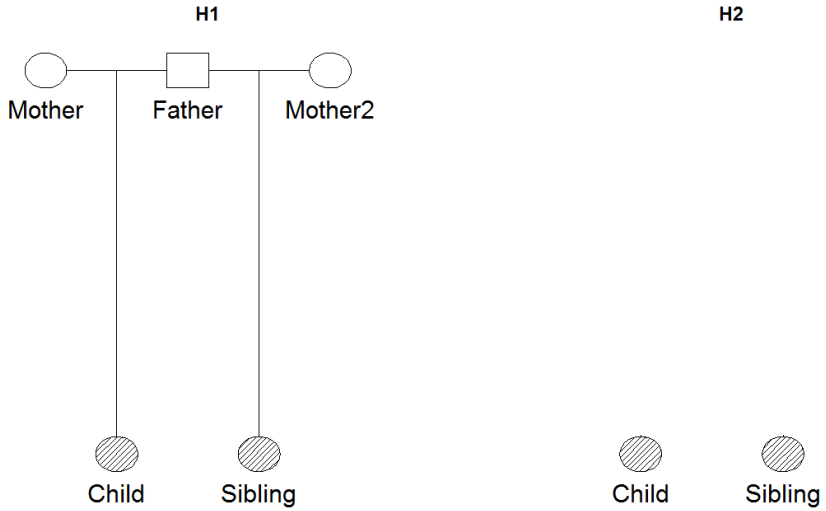


Yes!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

c) Case 3

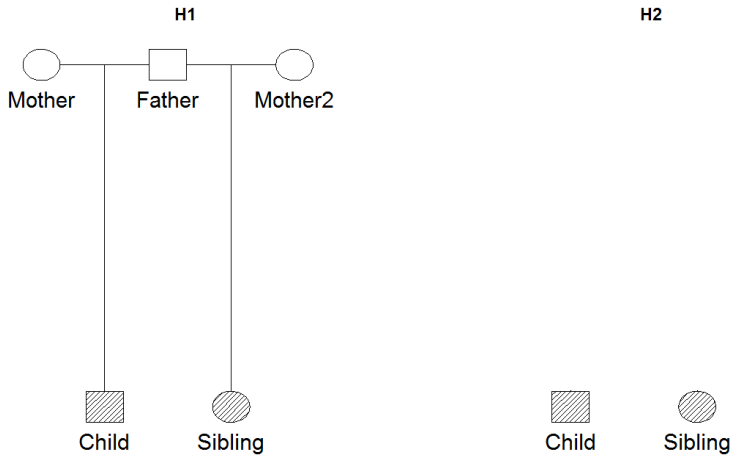


Yes!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

d) Case 4

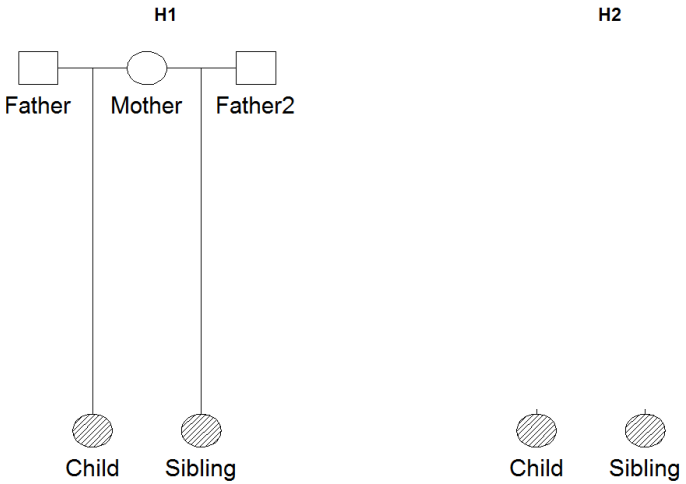


No!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

e) Case 5

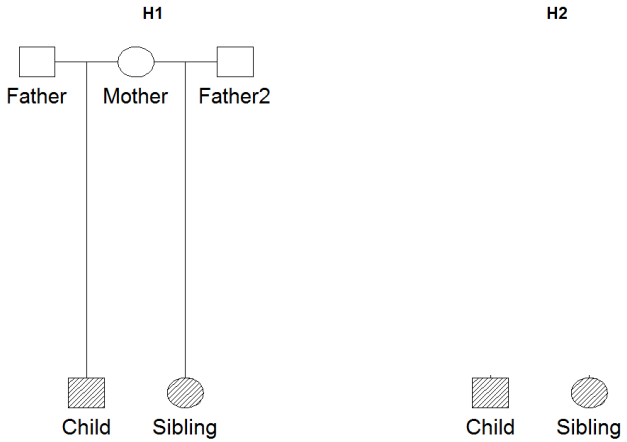


Yes!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

f) Case 6

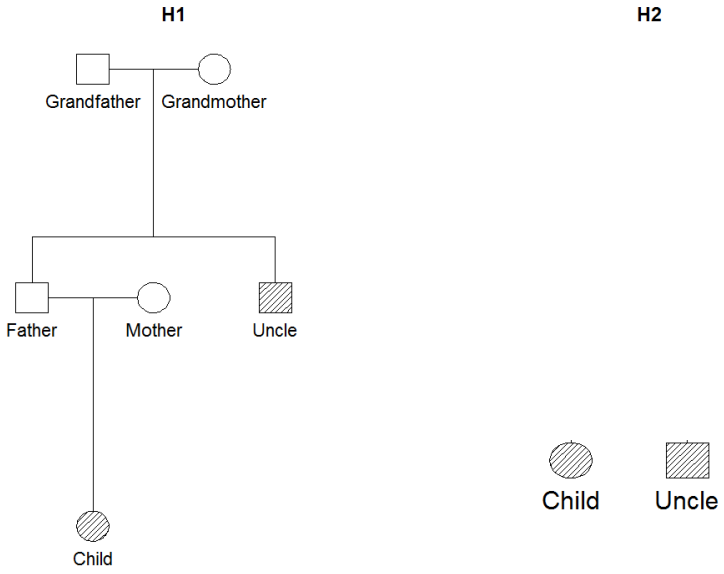


Yes!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

g) Case 7

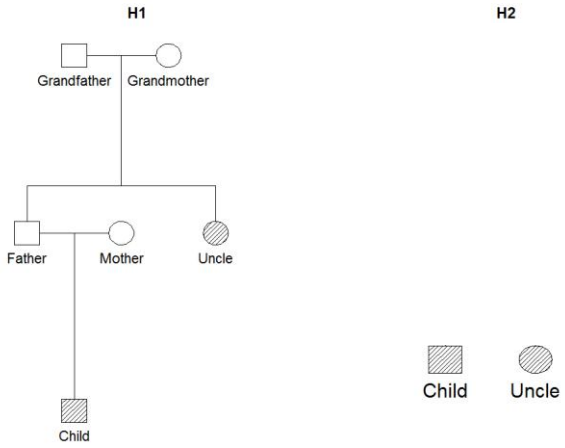


Yes!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

h) Case 8 - No

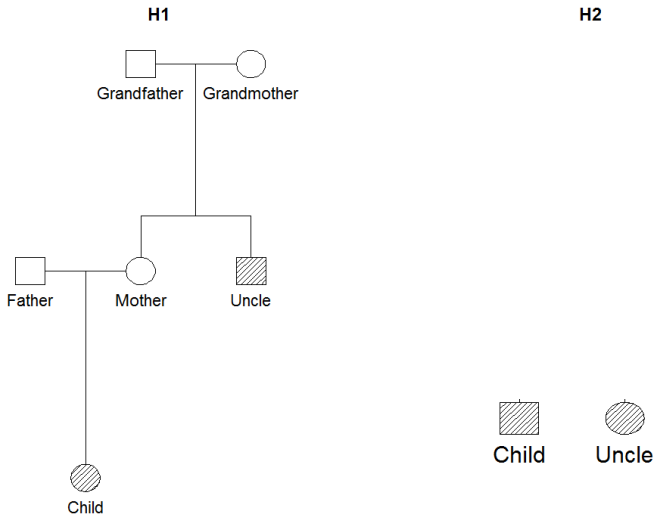


No!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

i) Case 9

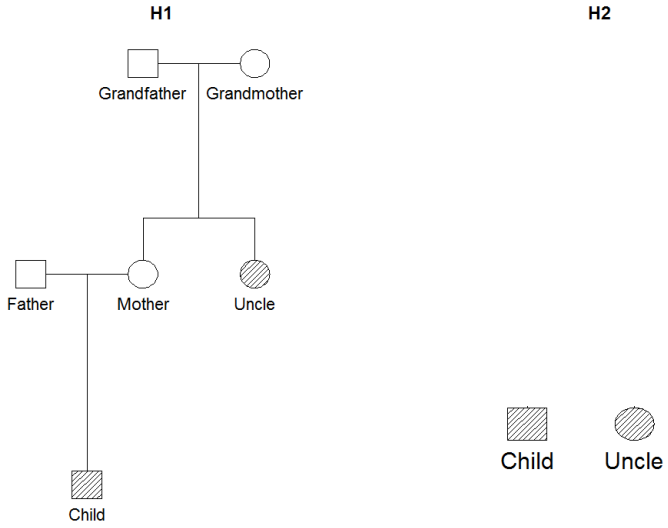


Yes!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

j) Case 10

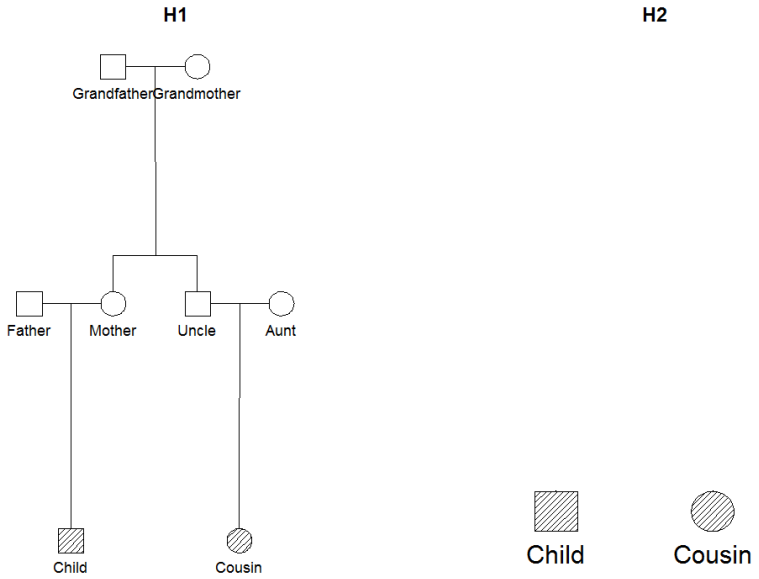


Yes!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

k) Case 11

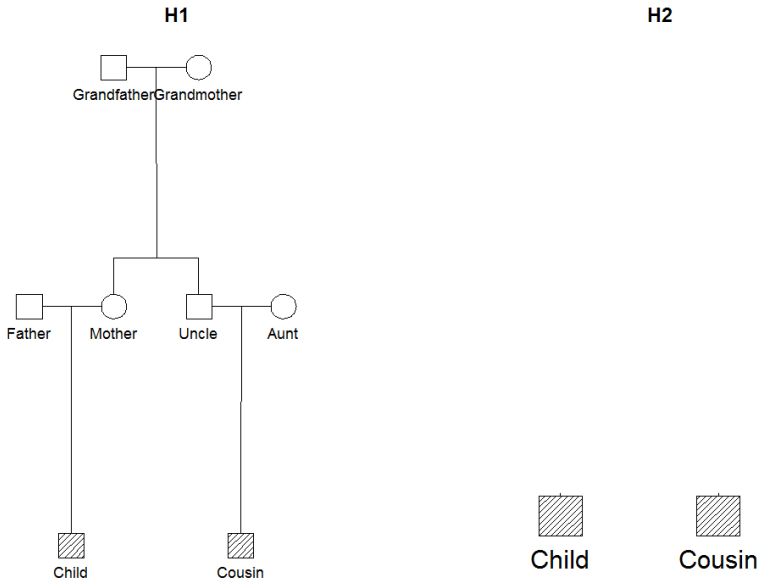


Yes!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

l) Case 1

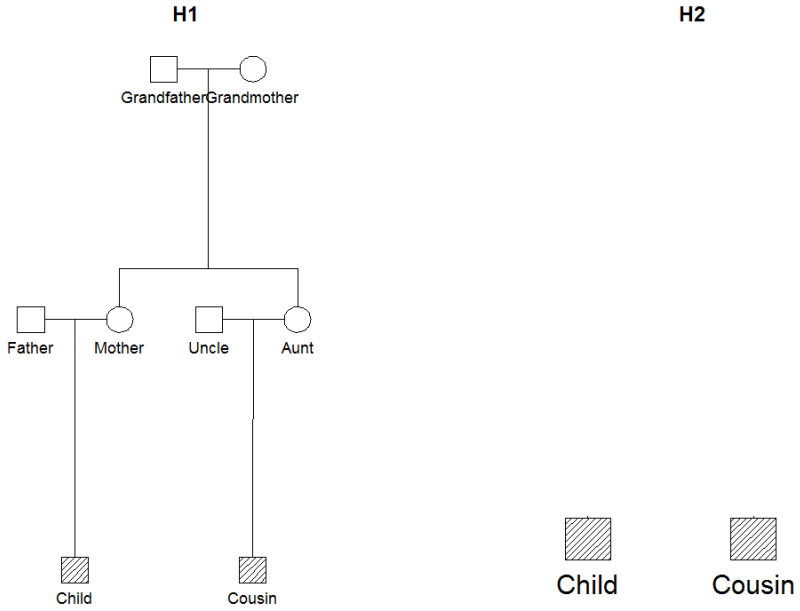


No!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

m) Case 13

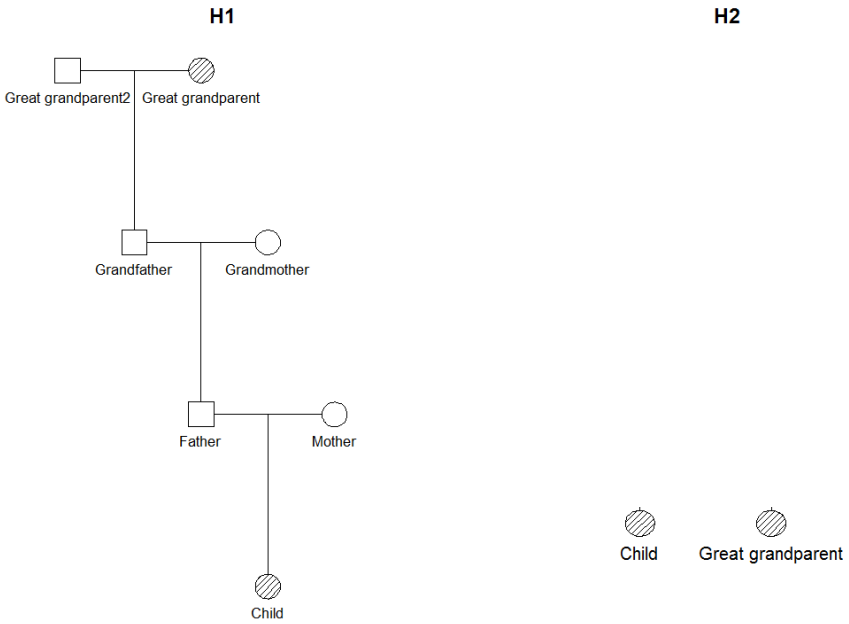


Yes!

Exercise 3

Use your knowledge about inheritance patterns to decide if X-chromosomal markers are relevant in the following scenarios.

n) Case 14



No!

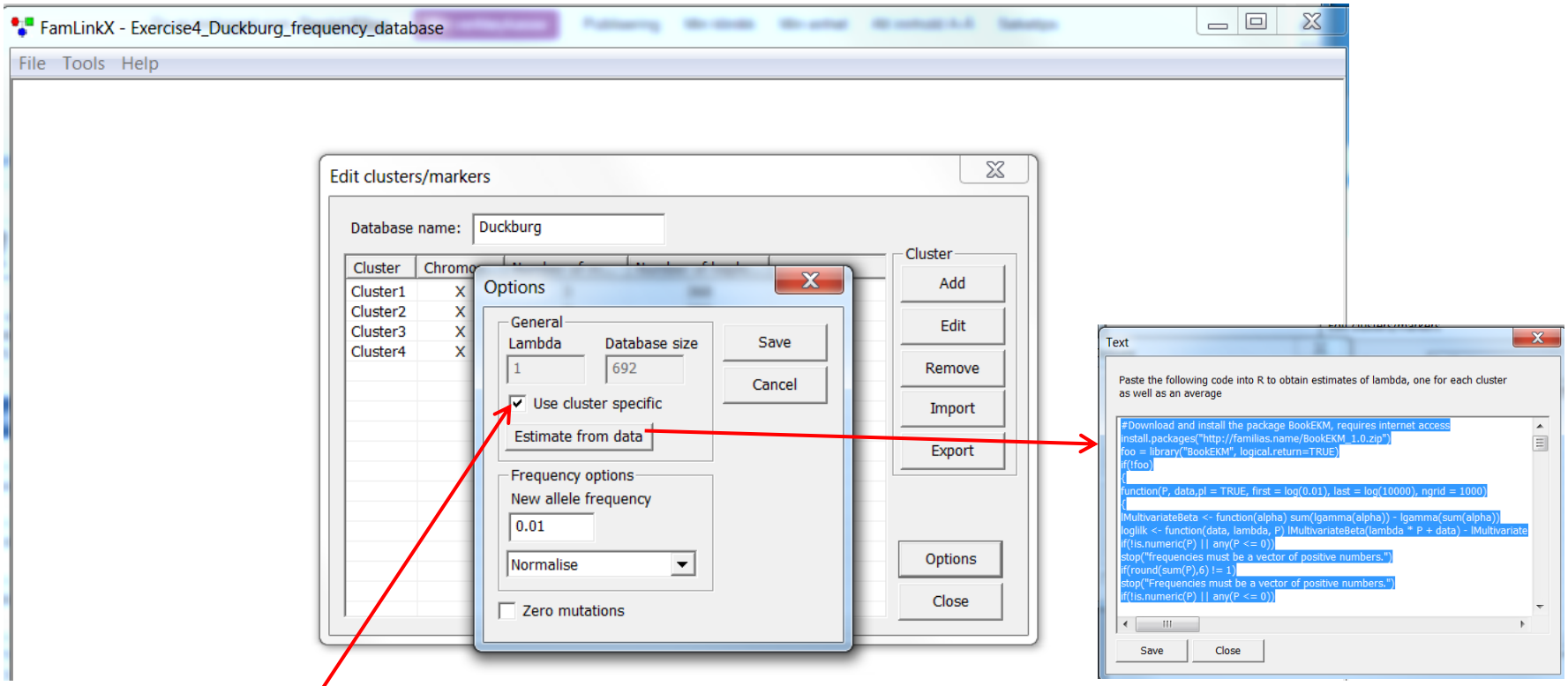
Exercise 4

A woman named Daisy, residing in the city Duckburg, asks for your expertise in a case where she needs to determine the relationship between three girls, April, May and June. She has been able to obtain X-chromosomal profiles for the girls and herself.

a) Import frequency data from a Duckburg population sample and DNA data for the three girls. Mutations are unheard of in Duckburg and all rates are zero to reflect this fact.

    * Estimate the lambas for the clusters defined in the frequency database using the built-in function in FamLinkX and the R software. You may skip this part and use lambas 315, 208, 111 and 200 for the four clusters respectively.

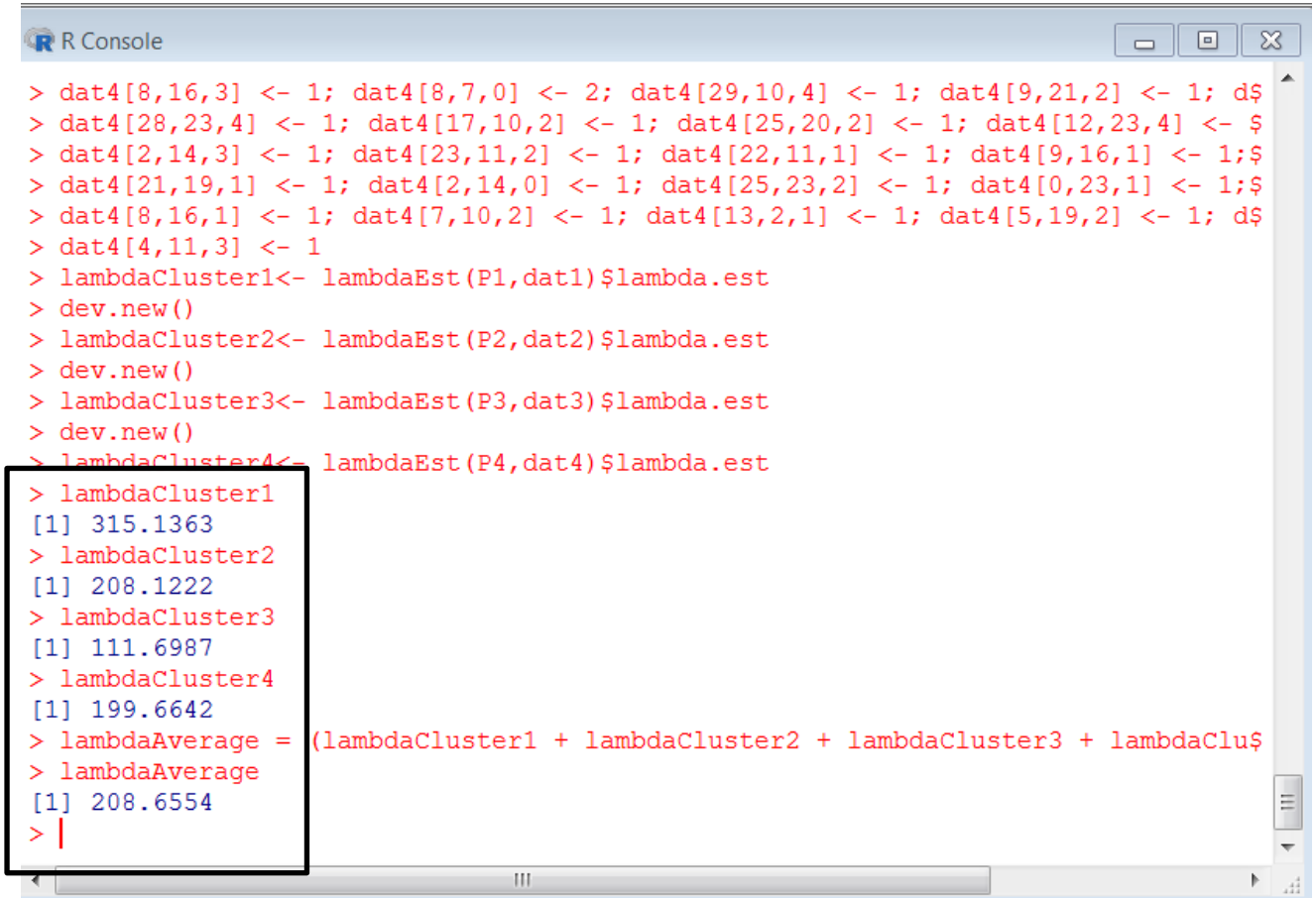
Exercise 4



Activates cluster specific lambdas

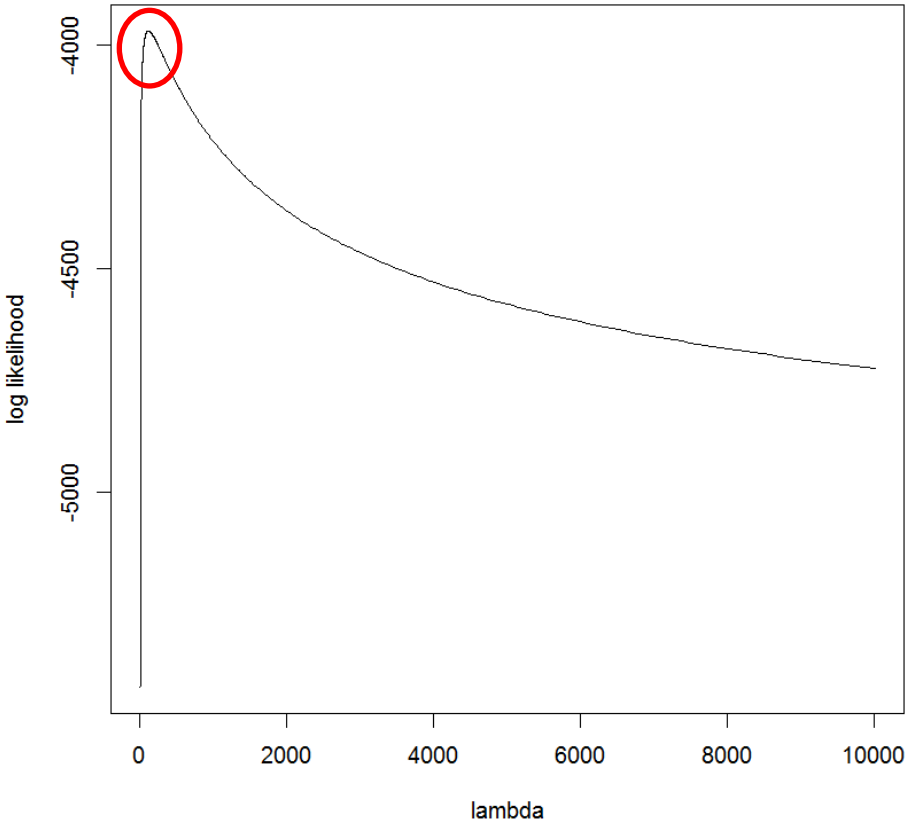
Paste code into R

Exercise 4


R Console
> dat4[8,16,3] <- 1; dat4[8,7,0] <- 2; dat4[29,10,4] <- 1; dat4[9,21,2] <- 1; d$
> dat4[28,23,4] <- 1; dat4[17,10,2] <- 1; dat4[25,20,2] <- 1; dat4[12,23,4] <- $
> dat4[2,14,3] <- 1; dat4[23,11,2] <- 1; dat4[22,11,1] <- 1; dat4[9,16,1] <- 1;$
> dat4[21,19,1] <- 1; dat4[2,14,0] <- 1; dat4[25,23,2] <- 1; dat4[0,23,1] <- 1;$
> dat4[8,16,1] <- 1; dat4[7,10,2] <- 1; dat4[13,2,1] <- 1; dat4[5,19,2] <- 1; d$
> dat4[4,11,3] <- 1
> lambdaCluster1<- lambdaEst(P1,dat1)$lambda.est
> dev.new()
> lambdaCluster2<- lambdaEst(P2,dat2)$lambda.est
> dev.new()
> lambdaCluster3<- lambdaEst(P3,dat3)$lambda.est
> dev.new()
> lambdaCluster4<- lambdaEst(P4,dat4)$lambda.est
> lambdaCluster1
[1] 315.1363
> lambdaCluster2
[1] 208.1222
> lambdaCluster3
[1] 111.6987
> lambdaCluster4
[1] 199.6642
> lambdaAverage = (lambdaCluster1 + lambdaCluster2 + lambdaCluster3 + lambdaClu$
> lambdaAverage
[1] 208.6554
>

Exercise 4

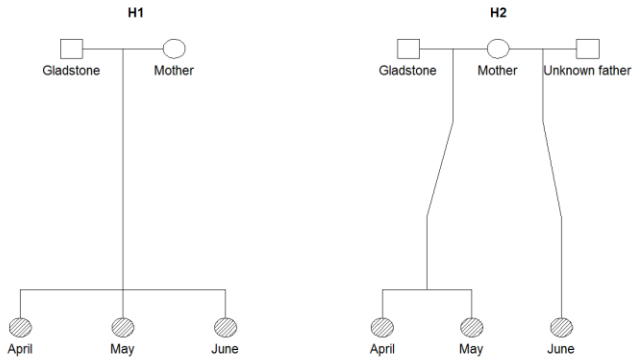
Maximum likelihood estimate for lambda



Exercise 4

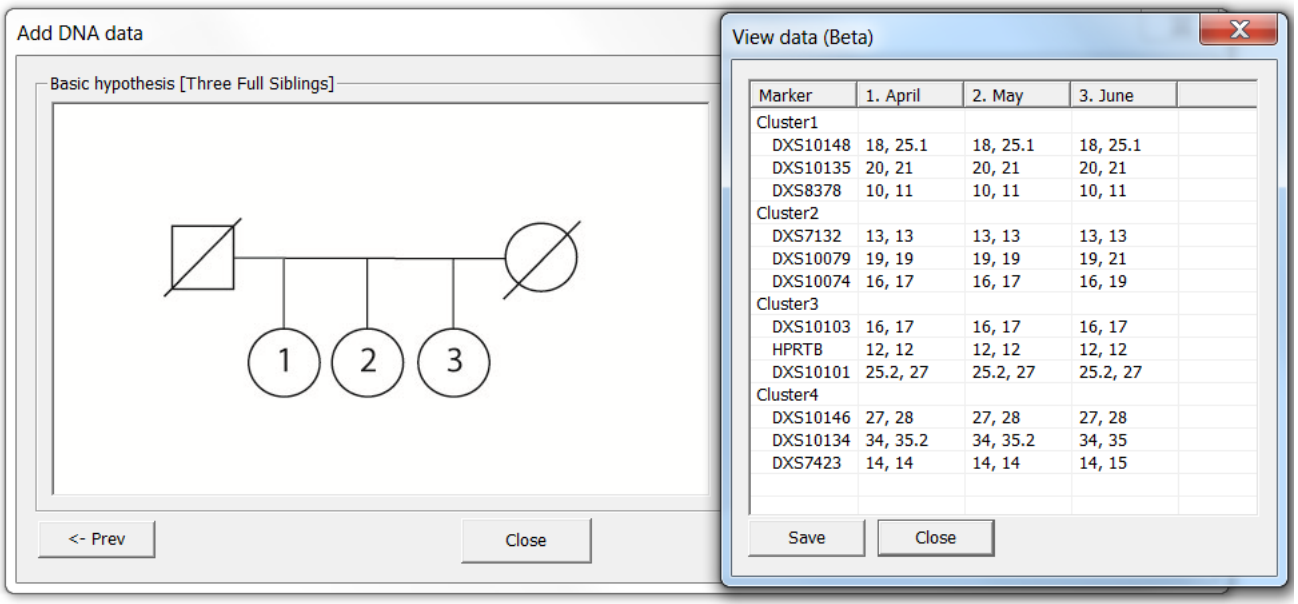
b) Our first task is to decide what hypotheses to test. We have information that they all share the same mother, but whether or not they share the same father is uncertain. In practice we would now need to test all the different combinations where two of the girls are full siblings and the third girl maternal half sibling to those two. However, Daisy further tells us that she is also certain that April and May shares the same father, Gladstone, while she is uncertain if he is also father of June or if another man, is the father (both are unavailable for testing). Compute the LR for the two relevant pedigrees (This part does not involve DNA data from Daisy).

Hypotheses:

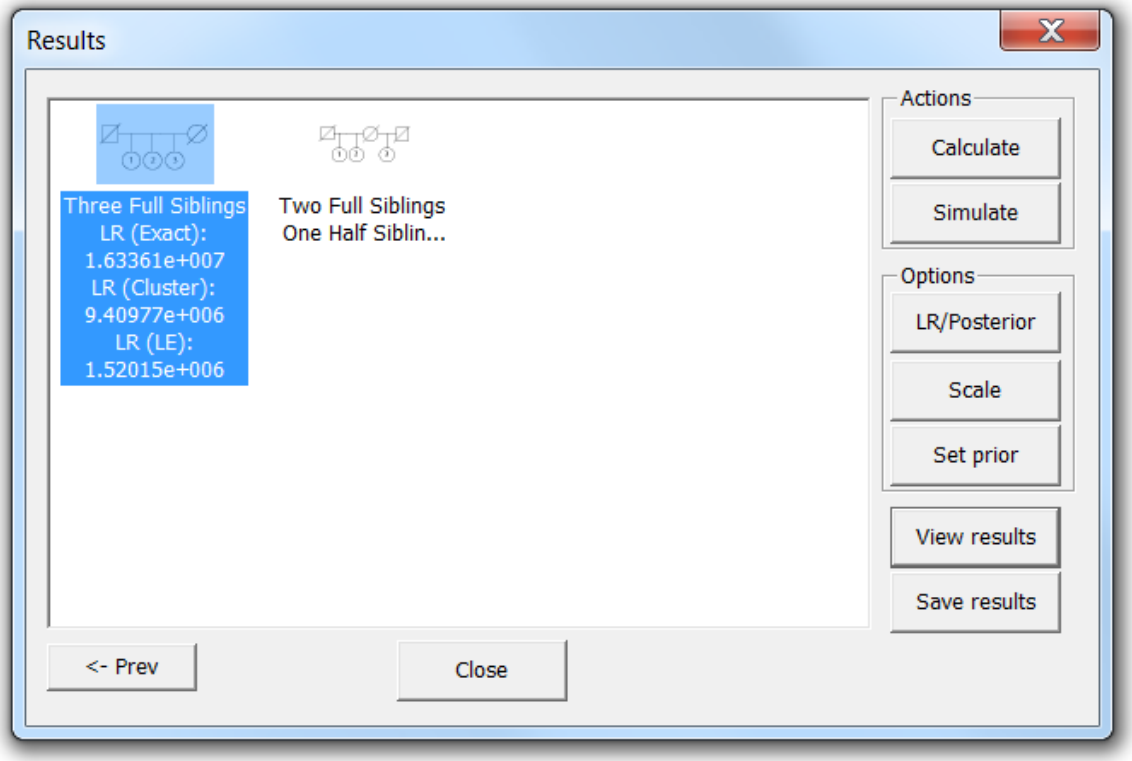


They both exist in FamLinkX!

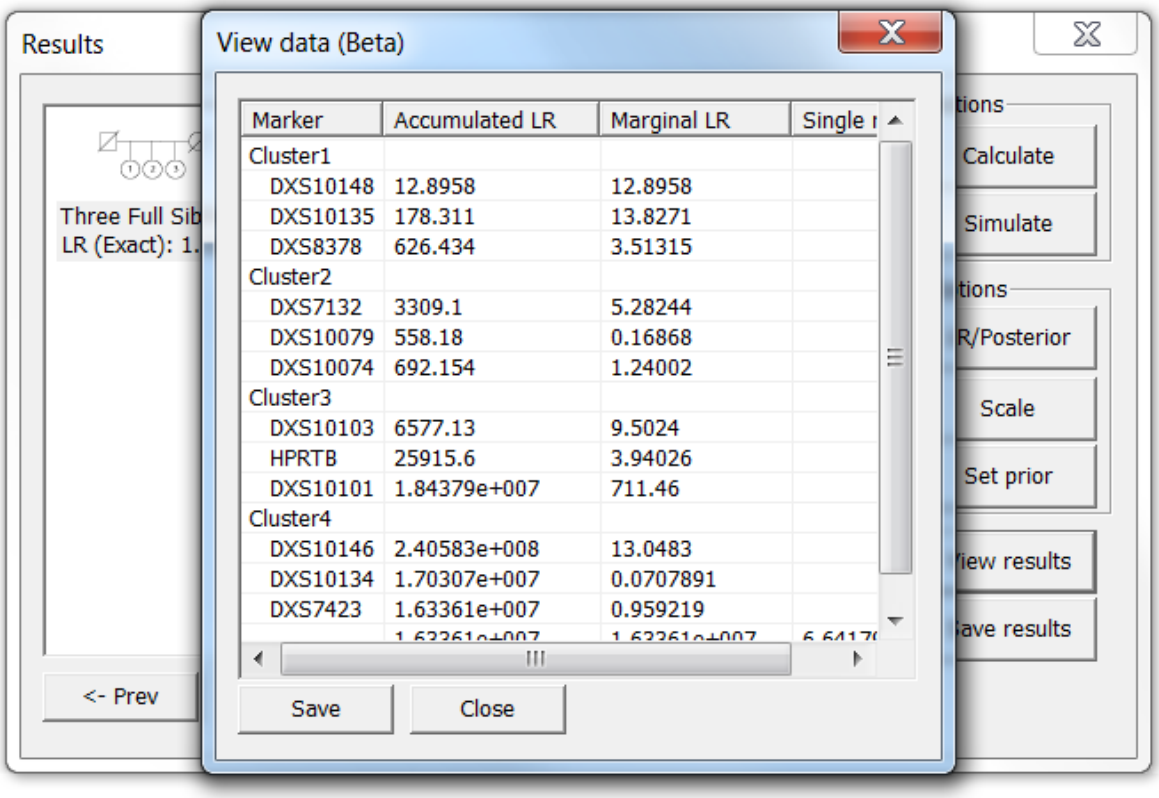
Exercise 4


Add DNA data
Basic hypothesis [Three Full Siblings]
1
2
3
<- Prev
Close
View data (Beta)
Marker | 1. April | 2. May | 3. June
Cluster1
DXS10148 | 18, 25.1 | 18, 25.1 | 18, 25.1
DXS10135 | 20, 21 | 20, 21 | 20, 21
DXS8378 | 10, 11 | 10, 11 | 10, 11
Cluster2
DXS7132 | 13, 13 | 13, 13 | 13, 13
DXS10079 | 19, 19 | 19, 19 | 19, 21
DXS10074 | 16, 17 | 16, 17 | 16, 19
Cluster3
DXS10103 | 16, 17 | 16, 17 | 16, 17
HPRTB | 12, 12 | 12, 12 | 12, 12
DXS10101 | 25.2, 27 | 25.2, 27 | 25.2, 27
Cluster4
DXS10146 | 27, 28 | 27, 28 | 27, 28
DXS10134 | 34, 35.2 | 34, 35.2 | 34, 35
DXS7423 | 14, 14 | 14, 14 | 14, 15
Save
Close

Exercise 4


Results
Three Full Siblings
LR (Exact):
1.63361e+007
LR (Cluster):
9.40977e+006
LR (LE):
1.52015e+006
Two Full Siblings
One Half Siblin...
Actions
Calculate
Simulate
Options
LR/Posterior
Scale
Set prior
View results
Save results
<- Prev
Close

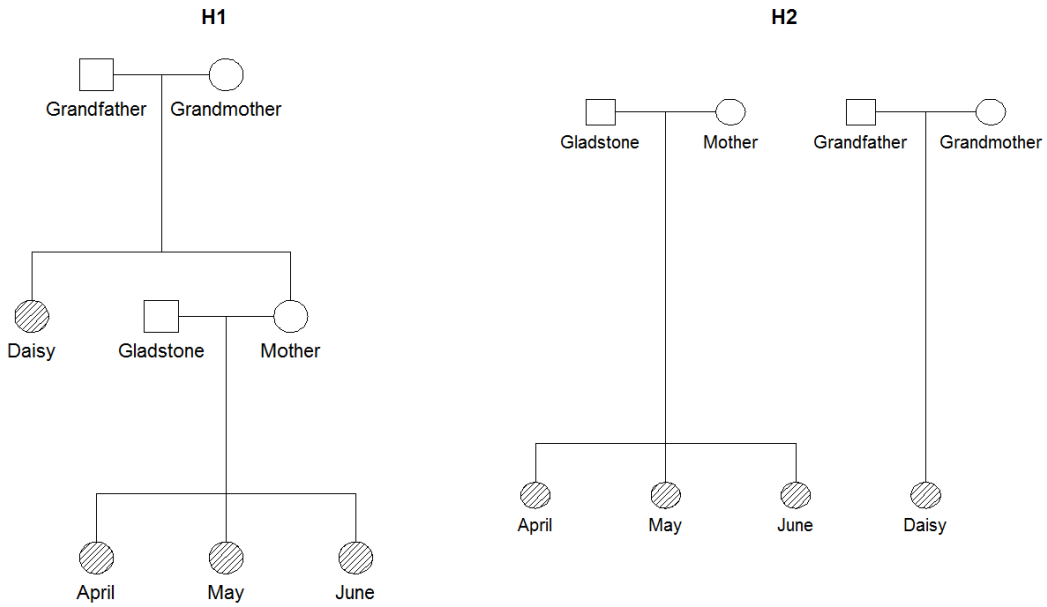
Exercise 4


Results
View data (Beta)
Marker
Accumulated LR
Marginal LR
Cluster1
DXS10148 12.8958 12.8958
DXS10135 178.311 13.8271
DXS8378 626.434 3.51315
Cluster2
DXS7132 3309.1 5.28244
DXS10079 558.18 0.16868
DXS10074 692.154 1.24002
Cluster3
DXS10103 6577.13 9.5024
HPRTB 25915.6 3.94026
DXS10101 1.84379e+007 711.46
Cluster4
DXS10146 2.40583e+008 13.0483
DXS10134 1.70307e+007 0.0707891
DXS7423 1.63361e+007 0.959219
Save
Close
Three Full Sib
LR (Exact): 1.
<- Prev
Calculate
Simulate
R/Posterior
Scale
Set prior
iew results
ave results

Exercise 4

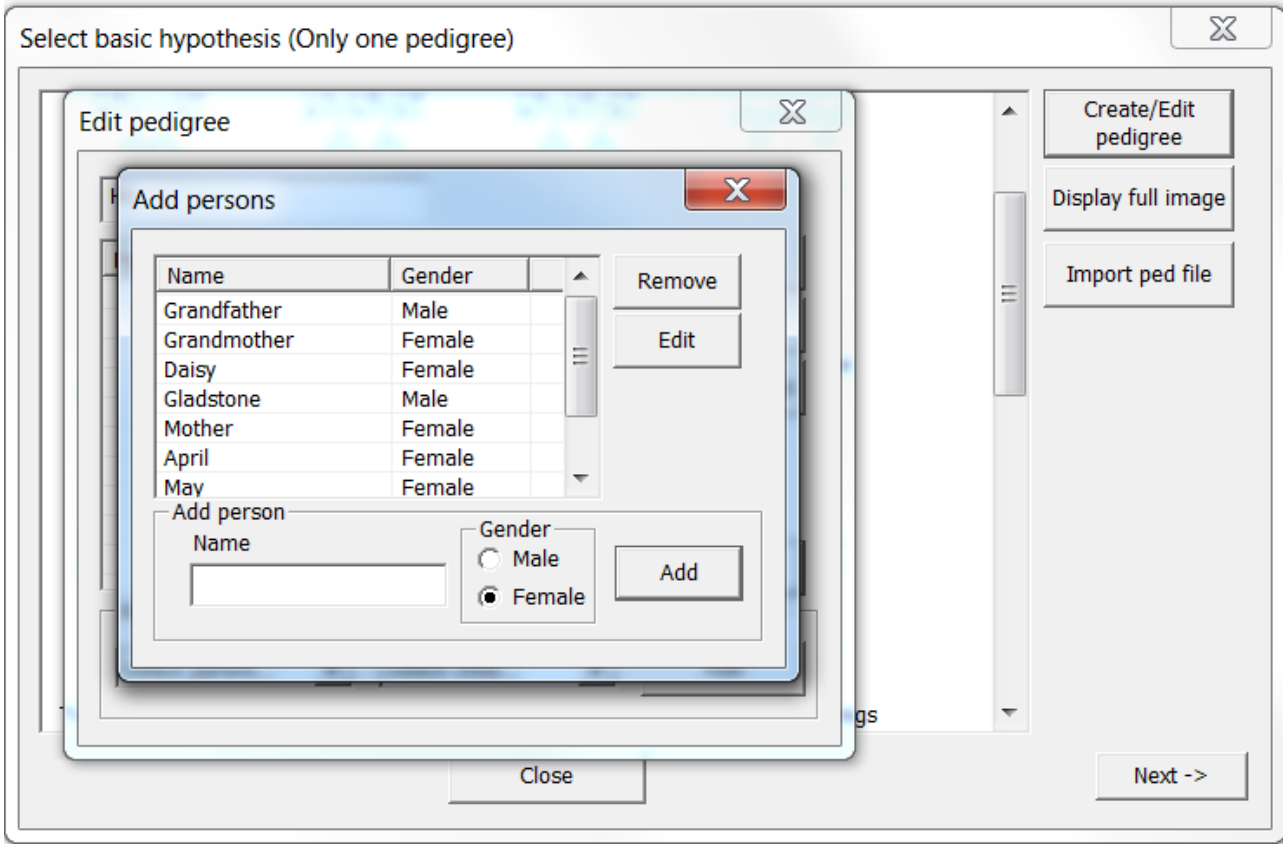
c) Assume the three girls are full siblings and construct the pedigree to test whether or not Daisy is their maternal aunt.

Hypotheses:

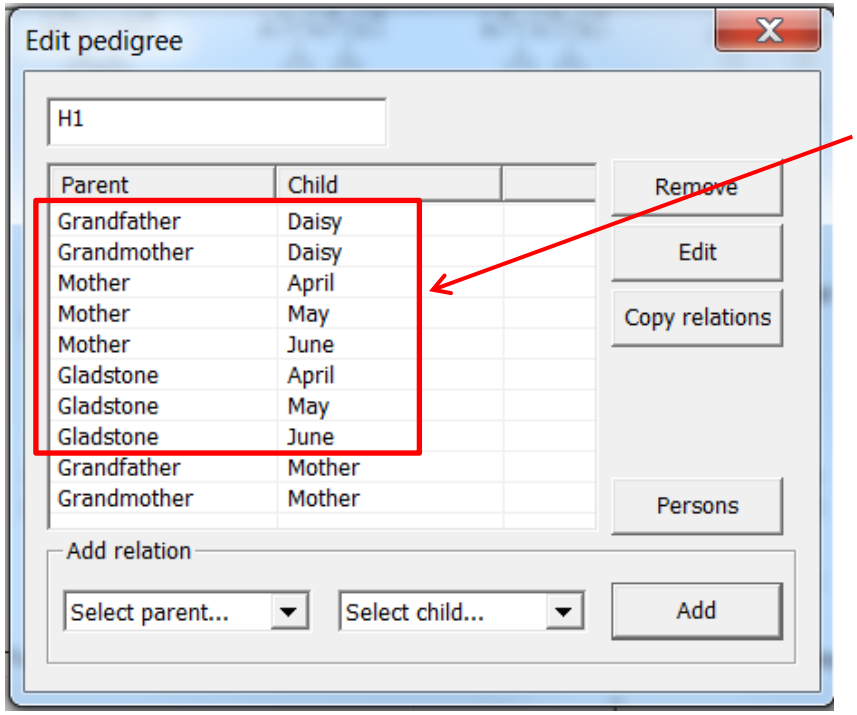


They do not exist in FamLinkX!

Exercise 4

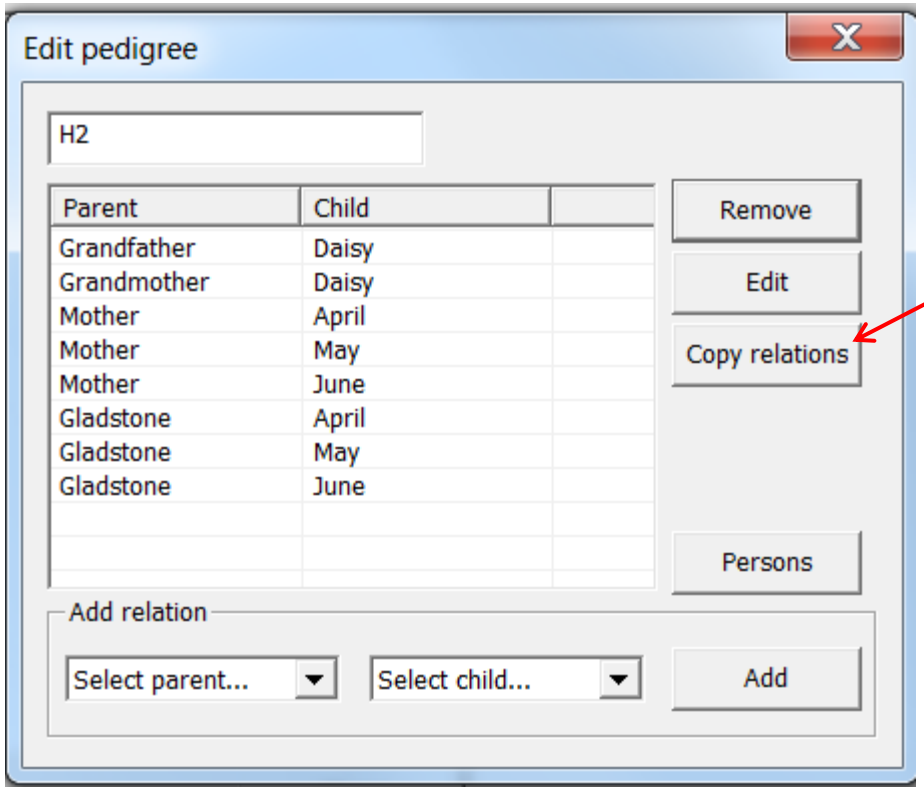

Select basic hypothesis (Only one pedigree)
Edit pedigree
Add persons
Name
Gender
Grandfather
Male
Grandmother
Female
Daisy
Female
Gladstone
Male
Mother
Female
April
Female
May
Female
Remove
Edit
Add person
Name
Gender
Male
Female
Add
Create/Edit pedigree
Display full image
Import ped file
Close
Next ->
gs

Exercise 4



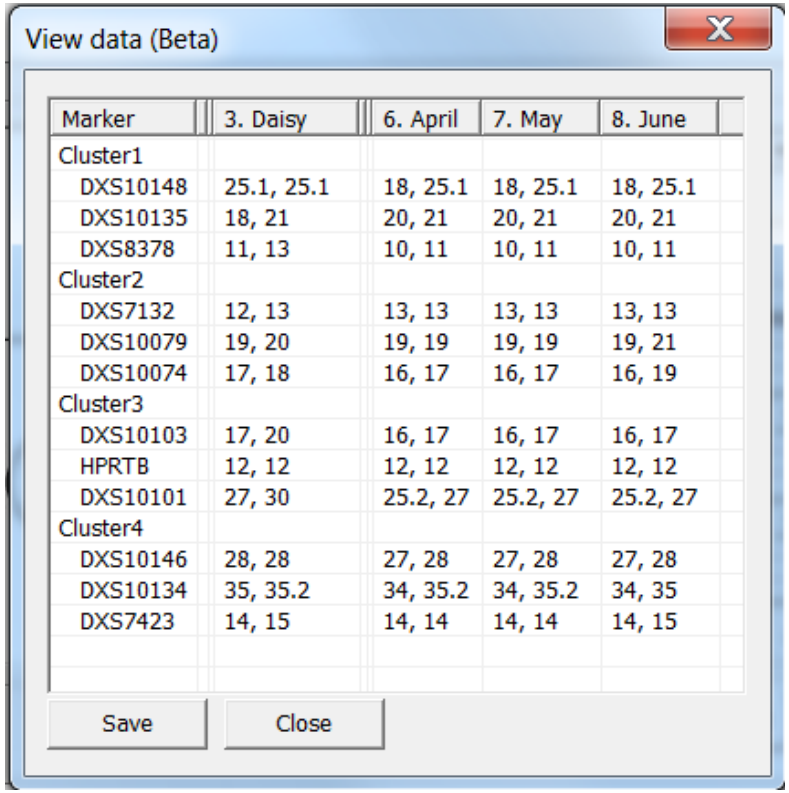
«Known relations»

Exercise 4



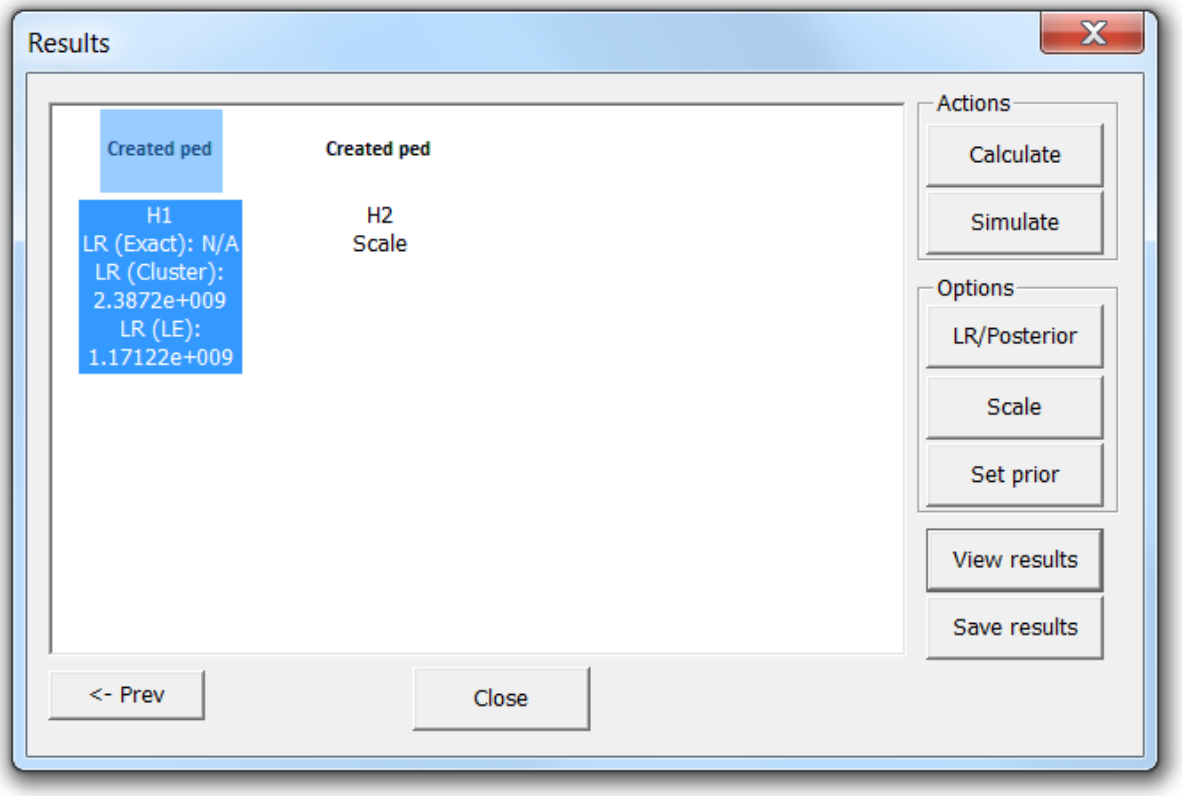
Copy relations from H1

Exercise 4



Marker	3. Daisy	6. April	7. May	8. June
Cluster1				
DXS10148	25.1, 25.1	18, 25.1	18, 25.1	18, 25.1
DXS10135	18, 21	20, 21	20, 21	20, 21
DXS8378	11, 13	10, 11	10, 11	10, 11
Cluster2				
DXS7132	12, 13	13, 13	13, 13	13, 13
DXS10079	19, 20	19, 19	19, 19	19, 21
DXS10074	17, 18	16, 17	16, 17	16, 19
Cluster3				
DXS10103	17, 20	16, 17	16, 17	16, 17
HPRTB	12, 12	12, 12	12, 12	12, 12
DXS10101	27, 30	25.2, 27	25.2, 27	25.2, 27
Cluster4				
DXS10146	28, 28	27, 28	27, 28	27, 28
DXS10134	35, 35.2	34, 35.2	34, 35.2	34, 35
DXS7423	14, 15	14, 14	14, 14	14, 15

Exercise 4



Check created pedigree in report!

Exercise 4

Report generated by FamLinkX version 2.6

Reference 1: Kling D, Tillmar A, Egeland T, Mostad P. Int J Legal Med. 2015 Sep;129(5):943-54.
Reference 2: Kling D, Dell'Amico B Tillmar AO. Forensic Sci Int Genet. 2015 Jul;17:1-7.

Timestamp: Fri Aug 17 13:17:51 2018
Database: Duckburg
File: P:/Prosjekt/Italian2018/Solutions/Exercise4c.sav

Created pedigrees

Pedigree 1 : (H1)

Parent	Child
Grandfather	Daisy
Grandmother	Daisy
Mother	April
Mother	May
Mother	June
Gladstone	April
Gladstone	May
Gladstone	June
Grandfather	Mother
Grandmother	Mother

Workshop: Paternity and kinship testing including X-chromosomal markers
Cases: Part 2

Thore Egeland[(1)] and Daniel Kling[(2)]

(1) Norwegian University of Life Sciences, (2) Department of Forensic Sciences, OUS, Norway