# ESWG Paper challenge 2016

In order to compare statistical calculations among the laboratories, you are encouraged to do this paper challenge. You should submit an LR for each marker and the total LR combining the individual contributions. No algebraic formulas are requested, but may optionally be supplied.

The exercise is divided into four different parts with increasing difficulty. To obtain a certificate participants are obliged to complete *Part 1* whereas completing *Part 2*, *3* and *4* are optional. Nevertheless, participants are encouraged to complete all parts for the sake of exercising.

The typing results ([Genemapper format](http://familias.name/ESWG/ESWG_typingresults_2016%20(Genemapper).txt) and [Famililias format](http://familias.name/ESWG/ESWG_typingresults_2016%20(Familias).txt)) and frequency data ([Plain frequencies](http://familias.name/ESWG/ESWG_FrequencyDatabase_2016.txt) and [Familias database](http://familias.name/ESWG/ESWG_FrequencyDatabase_2016.fam)) are available in the given links. The data is also collected into a single file available at <http://familias.name/ESWG/ESWG_Collected_Data_2016.xlsx>.

Please use the supplied Excel questionnaire (<http://familias.name/ESWG/ESWG_Questionnaire_2016.xlsx>) to fill in your answers. As mentioned above, theoretical formulas are not asked for but may be entered into the questionnaire.

## Part 1 (Mandatory)

The case is a paternity trio with the undisputed mother (M), a male child (C) and the alleged father (F).

The hypotheses are given as,

*H1:*

C

F

*H2:*

C

F

Compute the LR comparing the genotype data given each hypothesis. There is assumed to be no subpopulation structure, in other words use θ=0 in the calculations.

## Part 2 (Optional)

Your laboratory is faced with a twist in the case as the alleged father (F) is also the father of the mother (M). In other words, the man (F) allegedly has a child (C) with his own daughter (M).

The hypotheses are given as,

C

F

*H3:*

*H4:*

C

F

Compute the LR comparing the genotype data given each hypothesis. There is assumed to be no subpopulation structure, in other words use θ=0 in the calculations.

## Part 3 (Optional)

An alternative man (B) is presented as a possible father. M is still the mother of the child (C) and F is still the father of V. B is also the full brother of M and thus the son of F.

The hypotheses are given as,

*H5:*

C

F

B

*H6:*

C

F

B

Compute the LR comparing the genotype data given each hypothesis. There is assumed to be no subpopulation structure, in other words use θ=0 in the calculations.

## Part 4 (Optional)

Finally, a third man (U) is presented as an alternative father. M is still the mother of the child (C) and F is still the father of M. B is still the full brother of M and thus the son of F. U is also the uncle of M and B as well as the full brother of F.

The hypotheses are given as,

*H7:*

C

F

B

U

*H8:*

C

F

B

U

Compute the LR comparing the genotype data given each hypothesis. There is assumed to be no subpopulation structure, in other words use θ=0 in the calculations.

Finally, now that you possess the knowledge of all the relations between the alternative men, see *H8*, compute the LRs in Part 2 and Part 3 again, but now use the extra information about the relatedness between U, F and B. Hint: You may replace *H4* and *H6* with *H8* and change *H3* and *H5* to include the relations to the other relatives. Compute also the posterior probability using equal priors (0.25) for each hypothesis (*H3*, *H5*, *H7* and *H8*).