**TRAINING ON THE USE OF SCHNAPS SIMULATOR**

**REFERENCE DOCUMENT**

This document aims at providing training to the use of LSD's SCHNAPS simulator. The train is based on progressive exercises that little by little will lead the reader to the commands of the simulator.

**CONTENT**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  | Page |
| 1 | Installation | Installation of Python and LSD-inputGUI | 2 |
| 2 | Opening LSD-inputGUI | Open LSD-inputGUI | 2 |
| 3 | Building a population | Exercice #1: Building a population distributed by age and sex | 3 |
|  |  | Exercice #2: Attributing a risk of becoming sick | 4 |
| 4 | Simulation | Exercice #3: evaluation of the virtual population | 5 |

1. **Installation of Python and LSD-inputGUI**

In order to do the exercises, Python and LSD-inputGUI most be installed on the computer.

To install the software on your computer, follow the instruction provided in:

<https://www.youtube.com/watch?v=7LR89-AONqk>

This will require access to two the following websites:

https://github.com/LaboratoireLSD/LSD-inputGUI/tree/vpython2

https://www.lfd.uci.edu/~gohlke/pythonlibs/#pyqt4

https://www.python.org/downloads/



Once the software is installed, SCHNAPS is accessible through the following procedure:

1. **Open LSD-inputGUI**

Double click on the icon LSDInput2.7

If you don't have this icon installed on your computer, proceed as follows*:*

*In windows, open* ***command prompt****. On your screen, something as C:\Users\name> will appear*

*Paste the src folder path of LSD-inputGUI.*

*cd .\Dropbox\SCHNAPS\LSD-inputGUI\src\*

*You should see something as (if you use a dropbox and have created a LSD folder):*

*C:\Users\name> cd .\Dropbox\LSD\SCHNAPS\LSD-inputGUI\src\*

*Press enter and add at the end: Main.py. You should see (again, if you use dropbox and have created a LSD folder):*

*C:\Users\name\Dropbox\LSD\SCHNAPS\LSD-inputGUI\src>Main.py*

The program should then open on your screen

Search of previous LSD data:

* Simulation results: http://koksoak.gel.ulaval.ca/?path=Results
* Simulations trees: http://koksoak.gel.ulaval.ca/?path=Projects

Just download what you're looking for. You can then open the projects (with the extension “.lsd”) through the open command of LSD simulator Dashboard

1. **Building a population**

Learning to build a virtual population will be done through a series of exercise. The aim is to have a population that can be screened for a disease called WOW that is sex and age dependant

**Exercise #1: building a single cohort population based on age and sex**

We want to study a screening program for a disease called WOW that is sex and age dependant. This population must have the demographic characteristic of the Quebec population. As the disease affects only adults, the population can be limited to adults. In order to reduce boring repetitive tasks, we propose to build a population aged 19 to 30 years old.

1. source of data

The first step is to find the data on age and sex distribution. These data, for Quebec, can be found on the Statistic Institute of Quebec (ISQ) at the following page:

http://www.stat.gouv.qc.ca/statistiques/population-demographie/structure/index\_an.html

Go to this page and retrieve data necessary to build a virtual population consisting of 19 to 30 years old people representative of the Quebec population in terms of sex and age composition.

1. building the population

Build the population in LSD-inputGUI

**Solution**

* Open LSD simulator dashboard (**LSD-inputGUI.**)
* Click on **Edit profile(s)**, choose: **add empty profile**, click on **add** (under event variables)

*Create the age variable*

Age distribution is the basis of the population building. We start with defining the age structure we need. In our case, 19 to 30 years old individual. The % of each age corresponds to the % of the age in the Quebec population, on the total of 19 to 30 years old individual.

* Go to LSD dashboard
* Define a new variables: click on **add**, **name** the new variable *age* and define it as **int** (integer number), double click on distribution
  + **control** > drag **branch multiple** in the nothing box
  + in branch probabilities, indicate the % of each age group in order, separated by | (0.072|0.075|…..0.082). The sum must = 1.
  + **data** > drag **value** in the nothing box, put the first age (19) and define it as int (integer)
  + with the right button of your mouse, click on value and choose **insert after selected group**, and put the second age (20). Repeat until all age groups are completed

*Create the sex variable*

* Define a new variable: click on **add**, **name** the new variable sex and define it as **string** (nominal), double click on distribution
  + **control** > drag **choice is equal** into the nothing box: in choice, put the ages separated by | (19|20|21….|30), type int (integer), value: put individual variable > age
  + **control** > drag **branch** into the nothing box: in the probability box, put the % of being male in the first age group (19): 0.5119
  + **data** > drag **value** into the nothing box. Put M in the upper box, define it as string, put F in the button box, and define it as string
  + with the right button of your mouse, click on branch and select **insert after selected group**, and put the values for the second age group (20). Repeat until all age groups are completed

**Exercise #2: attributing a risk of becoming sick**

Let's admit that WOW affects 2% of males aged 19, and increases by 1% each subsequent year (3% of 20 years old males, 4% of 21 years old males …), while it affects women only when they are 28 years old (before, the %=0). Women who are 28 years old have a 2% risk of getting WOW, and here too, the % increases by 1% each year.

Introduce in your population 2 new variables, the risk of getting WOW and having WOW.

**Solution**

We have first to define the risk of getting the disease. This risk is dependent on 2 variables: age and sex. Let's start with creating a new variable called riskWow

* Go to LSD Dashboard
* **Add** new variable, riskWow, define it as double, and double click on distribution
* We start linking it with age: **control** > drag **choice (is equal)**; write in choice the ages separated by "|" (19|20|21….|30), type Int and put in value, the individual variable age
* Then, we link it with the second variable, which is sex: **control** > drag **condition** in the nothing box
* We have now to tell the computer that there are 2 sexes concerned: **operator** > drag **is equal? (complex)** in the first nothing box. **Data** > drag **value** into the upper right nothing box, define the value as individual variable sex. **Data** > drag **value** into the lower right nothing box, write in value M and define it as string. Then, **Data** > drag **value** into if true box: put the % of risk of getting the disease at 19 years old, when you're a male (0.02). **Data** > drag **value** into if false (else) box: put the % of risk of getting the disease at 19 years old, when you're a female (0.0)
* Click on the condition box with the right button, chose **insert after selected node**, and repeat the operation for each of the ages considered for the simulation.

Now, we have to define a new variable, wow, which is having or not the disease (the outcome). This outcome is dependent on the variable "riskWow", which dependent on age and sex.

* Go to LSD Dashboard
* **Add** new variable, Wow, define it as bool, and double click on distribution
* **data** > drag **value** into the nothing box, put value type bool, and above, false in the value box.

1. **Simulations**

This section is about performing simulation in order to check the validity of the virtual population that has been constituted. The validity is defined usually as a difference ≤ 5% compared to real data on variables used to constitute the population. We can check the age distribution, the sex ratio, as these data exist for the province.

**Exercice #3: evaluation of the validity of the virtual population**

Now that the basic variables have been constituted, simulate the number of girls, boys and WOW. Evaluate the validity of your results.