Cost Health Geography

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Model

Assumptions

- Population growth logistic based on US 2017
- Income growth logistic based on US 2017

Cost estimation based on:

- Number of beds per habitant
- Number of km of Roads per habitant
- Percentage of income used on the region for health system

R codes

```
gdp_capita_2017 <- 59927.9 # /1000000
population_2017 <- 325.7 * 1000000
roads_km_1000habitant_2002 <- 22.22
hosp_beds_1000habitants_2014 <- 2.83

LVmod <- function(Time, State, Pars) {
  with(as.list(c(State, Pars)), {
    roads    <- roadsinit  + as.integer(km_roads*Pop)
    GrowthPop   <-  rGrow_Pop * Pop * (1 - Pop/Pop_2017)
    beds <- as.integer(beds_hosp*Pop)
    incomegrw <- rGrow_Inc * income * (1 - income/Inc_2017)

    Pop        <- GrowthPop
    income <- incomegrw
    cost    <- (income) * assEff + pricehospbed*beds + priceroadkm*roads

    return(list(c(Pop, cost,income)))
  })
}

pars  <- c(roadsinit   = 1.0,    # initial number of roads
           rGrow_Pop  = 0.005,    # /day, growth rate of population
           rGrow_Inc  = 0.01,    # /day, growth rate of population
           assEff = 0.00005,    # /day percentage of income used on the region for health
           km_roads = roads_km_1000habitant_2002/10000,  # km per habitant
           beds_hosp = hosp_beds_1000habitants_2014/1000, # beds per habitant
           Pop_2017 = population_2017,     # carrying capacity population
           Inc_2017 = gdp_capita_2017*population_2017,
           pricehospbed = 100000000/1000000,
           priceroadkm = 10000/1000000)
```

```
yini  <- c(Pop = .95*population_2017, cost = .1*gdp_capita_2017*population_2017,income = .9*gdp_capita_
times <- seq(0, 300, by = 1)
out   <- ode(yini, times, LVmod, pars)
```

Results

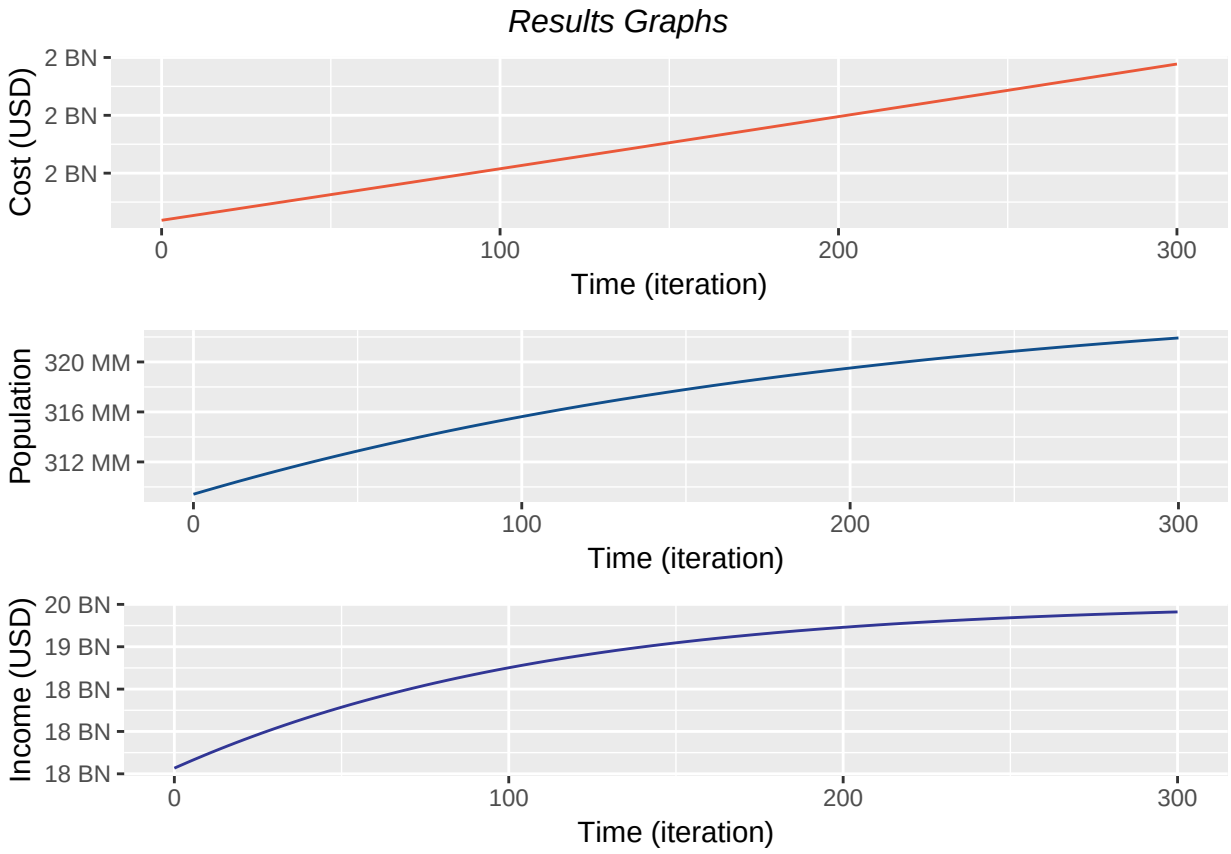

Table 1: Summary: Figues in millions

	Pop	cost	income
Min.	309415000	1.951852e+12	1.756667e+13
1st Qu.	314329714	1.958524e+12	1.854517e+13
Median	317799071	1.965260e+12	1.904632e+13
Mean	317092838	1.965293e+12	1.886765e+13
3rd Qu.	320228269	1.972045e+12	1.929258e+13
Max.	321919477	1.978868e+12	1.941114e+13
N	301	3.010000e+02	3.010000e+02
sd	3577317	7.842070e+09	5.100523e+11

Logic

After calibrating this model it will be possible to represent the data available for the US health system. The model is based on rates (GDP per capita, beds per habitant, km of roads per habitant, etc), and we propose to modify them to accurately describe Azores environment.