

Code analysis: Impact of intensified control strategies on incidence of visceral leishmaniasis in a highly endemic district of Bihar, India

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Preamble

Code run in R v3.5.1 with RStudio v1.1.453 and main package surveillance v1.16.2.

Load libraries & programme data

```
rm(list = ls())
library(readstata13) # read.dta13()
library(ggplot2) # graphs
library(fanplot) # fanplot
library(reshape2) # melt()
library(stats) # ts()
library(spdep) # nbOrder(), moran's I analysis

## Loading required package: sp

## Loading required package: spData

## To access larger datasets in this package, install the spDataLarge
## package with: `install.packages('spDataLarge',
## repos='https://nowosad.github.io/drat/', type='source')`

## Loading required package: sf

## Linking to GEOS 3.6.1, GDAL 2.2.3, PROJ 4.9.3

library(surveillance) # poly2adjmat(), hhh4_spacetime classes

## Loading required package: xtable

## Registered S3 method overwritten by 'spatstat':
##   method      from
##   print.boxx cli

## This is surveillance 1.18.0. For overview type 'help(surveillance)'.
```

```
library(sp) # shapefiles
library(latex2exp) # latex in graphs
library(abind) # combining matrices into an array
folder.loc = "C:/Users/mochu/OneDrive - University of Warwick/RMRI_analysis_tim/intensive_vaishali/paper
setwd(folder.loc)
df <- read.dta13('bihar_mo_KAPKDL_incid_dateformatted2012-7inclNovDec17.dta')
```

Estimating district populations for 2012-7 from census data

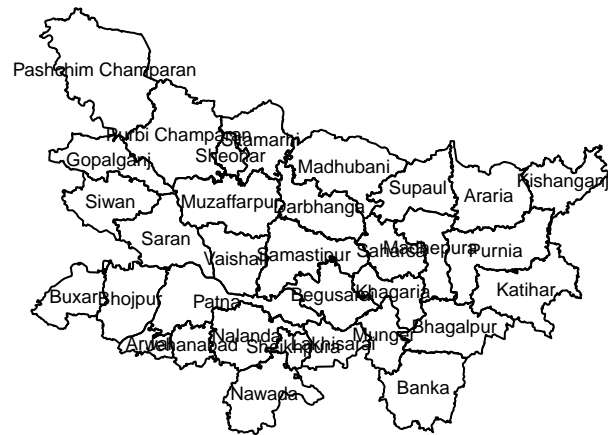
The population is estimated by a monthly geometric progression using the decadal change between the 2001 & 2011 censuses. We assume a constant population increase during each decadal period.

```
df.ka <- df[,c(1:33,166)] # take the KA columns and the month number column
setwd(folder.loc)
popn.df <- read.csv(file = 'Pop09_16v4.csv') # contains popn estimates 2012-7
popn.df[,1] # note Vaishali is row 32 in df.ka
popn.df <- popn.df[1:33,c(1,4:76)] # remove irrelevant cells
popn.df <- as.matrix(popn.df) # matrix coercion prevents later subset assignment from changing to a list
popn.time.matrix <- matrix(0,nrow = 72,ncol = 33) # 72mo x 33districts. 1st row = Jan 2012.
popn.time.matrix <- t(popn.df[1:33,3:74])
popn.time.matrix <- mapply(popn.time.matrix, FUN=as.numeric) # these two lines necessary to change it from list to matrix
popn.time.matrix <- matrix(data=popn.time.matrix, nrow = 72, ncol = 33)
```

Study area

There were 33 study districts in Bihar State, as no data for other 5. This is a map of Bihar state:

```
IND_adm2 <- readRDS(paste0(folder.loc,"/IND_adm2.rds")) # from https://gadm.org/maps/IND/bihar.html
IND_adm2 <- IND_adm2[IND_adm2$NAME_1 == 'Bihar',] # subset only Bihar regions
IND_adm2 <- IND_adm2[IND_adm2$NAME_2 != 'Aurangabad' & IND_adm2$NAME_2 != 'Gaya' & IND_adm2$NAME_2 != 'Patna',]
IND_adm2$NAME_2[23] <- 'Purbi Champaran'
plot(IND_adm2)
text(coordinates(IND_adm2), labels = IND_adm2$NAME_2, cex = 0.6)
```



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