```
extensions [gis]
globals [roads-dataset bbox mask-allotted vaccine-allotted virus-allotted virus-count mask-count
vaccine-count virus-max]
breed [people person]

patches-own [road-here]
people-own [virus? mask? vaccine? age amt-moved status virus-start]

to setup
  clear-all
  ask patches [set pcolor white]
  load-gis
  create-agents
  reset-ticks
end

to load-gis

  import-drawing "bbox_map_2.png"

  gis:load-coordinate-system (word "/Users/aashni/QGIS_Projects/new_roads.prj")

  ;load the shapefile
  set roads-dataset gis:load-dataset "/Users/aashni/QGIS_Projects/new_roads.shp"

  set bbox gis:load-dataset "/Users/aashni/QGIS_Projects/smaller_clip.shp"

  gis:set-world-envelope gis:envelope-of bbox

  ;draw it on our canvas
  gis:set-drawing-color black
  gis:draw roads-dataset 2

  ;set patches based on GIS data - just drawing doesn't change anything.
  ;;ask patches [set pcolor black]
  ask patches gis:intersecting roads-dataset
  [ set pcolor grey
   set road-here 1
  ]
end

to create-agents
  set mask-allotted 0
  set vaccine-allotted 0
```

```
set virus-allotted 0
create-people 200
[
  set age random 100
  set size 4
  set status "alive"
  let choose-virus random 100
  ifelse choose-virus <= 5 and virus-allotted < 9
  [set virus? 1
    set color red
    set virus-allotted virus-allotted + 1]
  [ set virus? 0
    set color green]

  set virus-count virus-allotted
  set virus-max virus-allotted

  if use-masks = true [
    let choose-mask random 100
    ifelse choose-mask >= 66 and mask-allotted < 134
    [set mask? 1
      set mask-allotted mask-allotted + 1
      set shape "circle"]
    [set mask? 0]

    set mask-count mask-allotted
  ]

  if use-vaccine = true [
    let choose-vaccine random 100
    ifelse choose-vaccine < 5 and vaccine-allotted < 9 and virus? = 0
    [set vaccine? 1
      set color blue
      set vaccine-allotted vaccine-allotted + 1]
    [ set vaccine? 0
      if virus? = 0
      [set color green]]

    set vaccine-count vaccine-allotted
  ]

  setxy random-xcor random-ycor
  move-to one-of patches with [road-here = 1]
```

```
  ]
end

to go
  if ticks >= 8760
  [ stop ]
  if use-masks = true
  [mask-on]
  if use-vaccine = true
  [vaccinated]
  virus-length
  virus-transmit
  death
  move
  tick
end

to check-max
  if virus-count >= virus-max
  [set virus-max virus-count]
end

to virus-length
  ask people with [status = "alive"]
  [if virus? = 1
    [ let virus-stop ticks
      if virus-stop - virus-start = 240
      [ set virus? 0
        set color green
        set virus-count virus-count - 1
        check-max
      ]
    ]
  ]
end


to mask-on
  ask people with [status = "alive" and mask? = 0] ; for a subset that don't have the mask
        [let people-near-me turtles-on patches in-radius 3
          if count people-near-me with [mask? = 1] >= 4
          ;[if mask? = 1
            [set mask-count mask-count + 1
             set mask? 1
```

```
          set shape "circle"]]
  ask people with [status = "alive" and mask? = 1] ; for a subset that have the mask
       [let people-near-me turtles-on patches in-radius 3
        if count people-near-me with [mask? = 0] >= 4
        ;[if mask? = 0
          [set mask-count mask-count - 1
          set mask? 0
          set shape "default"]]
end

to vaccinated
  ask people with [status = "alive" and vaccine? = 0] ; for a subset that don't have the vaccine
       [let people-near-me turtles-on patches in-radius 3
        if count people-near-me with [vaccine? = 1] >= 2
        [ if vaccine? = 0
          [set vaccine? 1
           set vaccine-count vaccine-count + 1
           set color blue]]]
end

to virus-transmit
  ask people with [status = "alive" and virus? = 0] ; for a subset that don't have the virus yet but
       [let people-near-me turtles-on patches in-radius 3
        if any? people-near-me with [(virus? = 1 and mask? = 0)]
          [
           if mask? = 0 and vaccine? = 0
             [set virus? 1
              set color red
              set virus-start ticks
              set virus-count virus-count + 1
              check-max]
        ]
  ]
end

to death
  ask people with [status = "alive"][

  let choose-death random 100
  if choose-death <= age and virus? = 1 and age >= 50 ; this is for death
  [ set virus-count virus-count - 1
    set size 0
    set status "dead" ; this way we can still count how many died
   move-to patch -90 70 ; they won't interact with anyone here
```

```
   set hidden? true
    check-max] ; you wont see them here either

  ]
end

to move
  ask people with [status = "alive"] [
   let choose-movement random-float 1
 ; ifelse virus? = true
 ; [set choose-movement random 30]
  ;  []

    ;[let close-neighbors people-on neighbors
    ;ifelse count patches with [ any? neighbors with [ pcolor = red ] ] >= 1
    ;[set choose-movement random 50]
    ;[set choose-movement random 100]
   ;]
  ;set choose-movement choose-movement / 100

  ifelse [road-here] of patch-ahead 1 = 1 ; for road following behavior
  [fd choose-movement  set amt-moved choose-movement]
   [ifelse any? neighbors with [road-here = 1]
    [face one-of neighbors with [road-here = 1] fd choose-movement]
    [let nearest-road min-one-of patches with [road-here = 1][distance myself]
      face nearest-road move-to nearest-road]
  ]
  ]
end
```