Code for Model 2B: First Responders' willingness to triage patients with radioactive contamination with radiation subject matter experts present

```
breed [doctors doctor]                    ;; designates the first responder agents
breed [SMEs SME]                          ;; designates the radiation subject matter experts (SME)
breed [civilians civilian]                ;; designates the civilian agents

doctors-own [                             ;; designates variables which the first responder agents possess
  my-neighbors
  nearest-neighbor
  flockmates
  mineRadiationTolerance
  triage-willing
]


SMEs-own [                                ;; designates variables which the SME agents possess
  my-neighbors
  nearest-neighbor
  flockmates
  mineRadiationTolerance
]


civilians-own [                           ;; designates variables which the first responder agents possess
health
triage-status
mineRadiationTolerance
]

patches-own [                             ;; in this model patches are not assigned specific variables
]

to setup
  clear-all
  reset-ticks
  setup-patches
  setup-doctors
  setup-SMEs
  setup-civilians
end
```

;; this command series determines the visual characteristics of the first responder agents and restricts generation of only one agent per patch area also determines the "mineradiationtolerance" numerical value representative of the assigned personal perception radiation risk

```
to setup-doctors
```

```
  set-default-shape doctors "person doctor"
  ask n-of initial-number-FirstResponders
   patches with [ pcolor = 45 ]
    [ sprout-doctors 1 ]

  ask doctors [
    set color green
    set triage-willing 0                    ;; this sets a base value for the "triage-willing variable" at 0 (baseline)
    set mineRadiationTolerance random-poisson 2.5
    if mineRadiationTolerance < 1
       [set mineRadiationTolerance 1]
     if mineRadiationTolerance > 5
       [set mineRadiationTolerance 5]
          ]
end

;; this command series determines the visual characteristics of the SME agents and restricts generation
of only one agent per patch area
;;SME have a baseline "mineRadiationTolerance of 10

to setup-SMEs ;; (SMEs)
  set-default-shape SMEs "person doctor"
   ask n-of initial-number-SMEs
  patches with [ pcolor = 45 ]
    [ sprout-SMEs 1 ]

  ask SMEs [
    set color red
    set mineRadiationTolerance 10
  ]
end

;; this command series determines the visual characteristics of the civilian agents and restricts
generation of only one agent per patch area

to setup-civilians
  set-default-shape civilians "person"
   ask n-of initial-number-civilians
  (patches with [pxcor < -10 ])
    [ sprout-civilians 1 ]

  ask civilians [
    set color blue
    set mineRadiationTolerance 0              ;; this sets a base value for the "triage-willing variable" at 0
    set health random-Poisson 50            ;; this sets the range for the "health" variable of civilian agents
    set triage-status .1                        ;; this sets the "triage-status" variable at .1 (baseline)
  ]
end
```

;;this command series determines the background setup of the model and includes a series of commands affecting patches

```
to setup-patches
  ask patches  [
    set pcolor 69
    set plabel-color black
    ask patch 35 28 [set plabel "Triage Area"]
    setup-triageEnd
    setup-triage_area
  ]
end
```

```
to go
move-civilians
move-doctors
move-SMEs
health_status
triage
end_triage
leave-the-model
check-death
tick
end
```

;;this directs movement of the civilian agents- it first tells them to orient their movement toward the right side of the model
;;if they form a link they must stop movement
;; if their "health" variable is >= 75 it tells them to move to the right along the path of patches colored white and if their "health" variable is < 75 they are directed to stop and wait at the right side of the model

```
to move-civilians
   ask civilians [
    face min-one-of patches with [ pcolor = 45.1 ] [ distance myself ]
     if any? my-links [stop]
    if health >= 75
    [set heading towards min-one-of patches with [ pcolor = 49] [distance myself]]
   if health >= 75 and [pcolor] of patch-here = 49
    [set heading towards min-one-of patches with [pcolor = 45.1] [distance myself]]
     if health < 75 and pxcor = 36 [stop]
   forward .1
]
end
```

;;this directs first responder agents to move in random motion within a constrained area and to stop movement when they form a link with another agent

```
to move-doctors
  ask doctors  [
    if any? my-links [stop]
    right random 5 forward .03
  ]
end
```

;;this directs SME agents to move in random motion within a constrained area and to stop movement when they form a link with another agent

```
to move-SMEs
  ask SMEs  [
    if any? my-links [stop]
    right random 5 forward .03
  ]
end
```

;;this tells the agents to communicate the mean mineRadiationTolerance variable to each other

```
to-report average_mineRadiationTolerance
    let myRT mean [mineRadiationTolerance] of flockmates
    report mean myRT
end
```

;;this creates a new variable "flockmates" and tells the first responder agents which other agents around them are considered in their group

```
to find-flockmates
  let FirstResponders turtles with [mineRadiationTolerance >= 1]
  set flockmates FirstResponders in-radius Communication
end
```

;;this command series tells the first responder or SME agents to triage civilian agents with health < 75
;;it also reports whether the first responders are "triage-willing" based on their mineRadiationTolerance score
;;if they are already triage-willing (mineRadiationTolerance >=4 they report "triage-willing" as 1 (TRUE)
;;if they are triage-willing (TRUE) and have not already formed a link they will move towards the nearest civilian agent with health < 75 and form a link
;;if they are triage-willing (FALSE) (mineRadiationTolerance < 4) they are directed to look around at their "flockmates" or neighbors and determine the mean mineRadiationTolerance of their neighbors
;;if that subsequent mean is >= 4 then they will engage in the same triage algorithm listed above

```
to triage
  ask doctors [set my-neighbors ( civilians with [health < 75]) in-radius 2] ;; removed "other" civilians
  ask doctors with [mineRadiationTolerance >= 4 ]
        [set triage-willing 1]
  ask doctors with [mineRadiationTolerance >= 4 and count my-links < 1]
    [if any? civilians with [health < 75 and triage-status < 1 ] in-radius 6
     [set heading towards min-one-of civilians with [health < 75 and triage-status < 1] [distance myself]]
     forward .1
     if any? my-neighbors with [triage-status < 1] [create-links-with n-of 1 my-neighbors with [triage-
status < 1] ]]


  ask doctors with [ mineRadiationTolerance <= 3 and count my-links < 1 ]
  [ find-flockmates
    if any? flockmates
    [let F count flockmates
   if F > 0
   [ let myRT mean [mineRadiationTolerance] of flockmates
       if myRT >= 4
       [set triage-willing 1]
     if myRT >= 4
       [if any? civilians with [health < 75 and triage-status < 1 ] in-radius 6
         [set heading towards min-one-of civilians  with [health < 75 and triage-status < 1] [distance
myself]]
               forward .1
        if any? my-neighbors with [triage-status < 1] [create-links-with n-of 1 my-neighbors with [triage-
status < 1] ]
  ]]]]

 ask SMEs  [set my-neighbors ( civilians with [health < 75 ]) in-radius 2]  ;; removed "other" civilians
 ask SMEs with [ count my-links < 1 ]
   [ if any? civilians with [health < 75 and triage-status < 1] in-radius 6
     [set heading towards min-one-of civilians with [health < 75 and triage-status < 1] [distance myself]]
   forward .1
     if any? my-neighbors with [triage-status < 1] [create-links-with n-of 1 my-neighbors with [triage-
status < 1] ]]

 ask links [set color red]

  tick

  ;;this directs civilian agents who have formed a link/interaction with a first responder to report they
have been triaged

 ask civilians with [
    count my-links >= 1] [set triage-status 1]
```

;;this tells the first responders or SMES who have formed links to increase the health score of civilian agents with a starting health score >30 thus if an agent has a health score too low- they will be quickly triaged and then released but additional time will not be spent on that agent to increase their health

```
  ask doctors [if any? my-links
    [ask my-neighbors with [count my-links >= 1]
     [if health < 75 and health > 30
       [set health health + .1]
      ]
  ]]
ask SMEs  [if any? my-links
    [ask my-neighbors with [count my-links >= 1]
    [
      if  health < 75 and health > 30
         [set health health + .1]
   ]
]]
  tick

end
```

;;this breaks the links

```
to end_triage
  ask civilians with [count my-links >= 1 and health <= 30] [ask my-links [die]]
  ask civilians with [count my-links >= 1 and health >= 75] [ask my-links [die]]
end
```

;;this changes the color of the civilian based on their health score
;;the higher the health score the darker the blue color

```
to health_status
 ask civilians [if pcolor = 69 and count my-links = 0 and triage-status = .1 [set health health - .1]]
 ask civilians [ set color scale-color blue health 100 0]
end
```

;;this stops the triaged civilian agents at the far edge of the model

```
to leave-the-model
  ask civilians [if pxcor = 39 [stop]]
end
```

;;this directs a civilian agent with a very low health score to "die"

```
to check-death
  ask civilians [ if health <= 5 [die]]
end

;;these are patch commands which help setup the model background

to setup-triageEnd
  if pxcor = 39
  [set pcolor 45.1]
end


;;these are patch commands which help setup the model background

to setup-triage_area
  if pxcor >= -10 and pxcor <= 38
    [set pcolor 45]
  if pxcor > -8 and (pycor = 14 or pycor = -1 or pycor = -19)
  [set pcolor 49]
end
```