Input: Data values taken from American Census Survey 2020
Repeat for each county-equivalent:
$a = \{0-5, 5-9, \ldots, 80-84, 85+\}$ defines the age brackets
$a_{>65}$ = the number of people over 65 living alone
a_{18-65} = the number of people 18 to 65 living alone
$\boldsymbol{N_a}$ = vector of vertices distributed by age
H = the total number of households
HS = average household size
mc = the number of married couples
mc_{18} = the number of married couples with 1 or more children under 18
sg_{18} = the number of single adults with 1 or more children under 18
$\boldsymbol{S}$ = school enrollment by level {Nursery, Elementary, High, College}
$\boldsymbol{O}$ = occupation numbers by industry sector
p_h = probability of contact between 2 people in same household
p_s = probability of contact between 2 people in same school level
p_o = probability of contact between 2 people in same occupation
p_p = probability of contact between 2 randomly chosen people in public
$\boldsymbol{V} = \boldsymbol{N_a}$ the set of vertices
$\boldsymbol{E} = \emptyset$ the set of edges
Output:
$\boldsymbol{G} = \{\boldsymbol{V}, \boldsymbol{E}\}$ the social contact network

Create Households:
$\boldsymbol{A_{>65}} \leftarrow$ random selection of $a_{>65}$ vertices from $\boldsymbol{N_{a_{>65}}}$
$\boldsymbol{A_{18-65}} \leftarrow$ random selection of a_{18-65} vertices from $\boldsymbol{N_{a_{18-65}}}$
$\boldsymbol{N_a} \leftarrow (\boldsymbol{N_a} - \boldsymbol{A_{>65}} - \boldsymbol{A_{18-65}})$
$\boldsymbol{M_1} \leftarrow$ random selection of mc vertices from $\boldsymbol{N_{a_{>18}}}$
$\boldsymbol{M_2} \leftarrow$ random selection of mc vertices from $\boldsymbol{N_{a_{>18}}} - \boldsymbol{M_1}$
for $i \in 1$ **to** mc **do**
  $u \leftarrow$ random draw from uniform random variable $U(0,1)$
  if $u \leq p_h$ **then**
    $\boldsymbol{E} \leftarrow \{(m_{1,i}, m_{2,i}), \ldots\}$ where $m_{1,i} \in \boldsymbol{M_1}$ and $m_{2,i} \in \boldsymbol{M_2}$
$\boldsymbol{N_a} \leftarrow (\boldsymbol{N_a} - \boldsymbol{M_1} - \boldsymbol{M_2})$
$\boldsymbol{C_{<18}} \leftarrow$ random selection of mc_{18} vertices from $\boldsymbol{N_{a_{<18}}}$
foreach $c \in \boldsymbol{C_{<18}}$ **do**
  $u \leftarrow$ random draw from uniform random variable $U(0,1)$
  if $u \leq p_h$ **then**
    $\boldsymbol{e} \leftarrow$ random edge $\boldsymbol{e} = (e_1, e_2)$ selected from $\boldsymbol{E}$
    $\boldsymbol{E} \leftarrow (e_1, c)$
    $\boldsymbol{E} \leftarrow (e_2, c)$
$\boldsymbol{N_a} \leftarrow (\boldsymbol{N_a} - \boldsymbol{C_{<18}})$
$\boldsymbol{Sg_{<18}} \leftarrow$ all remaining vertices from $\boldsymbol{N_{a_{<18}}}$
$\boldsymbol{P_s} \leftarrow$ random selection of sg_{18} vertices from $\boldsymbol{N_{a_{>18}}}$
foreach $s \in \boldsymbol{Sg_{<18}}$ **do**
  $u \leftarrow$ random draw from uniform random variable $U(0,1)$
  if $u \leq p_h$ **then**
    $\boldsymbol{E} \leftarrow (p, s)$ where $p \in \boldsymbol{P_s}$ and every p is used at least once
$\boldsymbol{N_a} \leftarrow (\boldsymbol{N_a} - \boldsymbol{Sg_{<18}} - \boldsymbol{P_s})$
$rH \leftarrow H - a_{>65} - a_{18-65} - mc - mc_{18} - sg_{18}$ (the remaining households)
$D_1 \leftarrow$ AverageDegree($\boldsymbol{E}$)
$D_2 \leftarrow 2HS - D_1$
for $n \leftarrow 1$ **to** rH **do**
  $u_1 \leftarrow$ random draw from uniform random variable $U(0,1)$
  if $u_1 \leq p_h$ **then**
    $u_2 \leftarrow$ random draw from uniform random variable $U(1, (2D_2 - 1))$
    $y \leftarrow$ single selection at random from $\boldsymbol{N_a}$
    $\boldsymbol{x}(u_2) \leftarrow$ random selection of size $\lfloor u_2 \rfloor$ from $\boldsymbol{N_a}$ excluding y
    $\boldsymbol{E} \leftarrow (y, x_i)$ for each $x_i \in \boldsymbol{x}(u_2)$
Create School Contacts:
foreach $s \in \boldsymbol{S}$ **do**
  $\boldsymbol{S_1} \leftarrow \lfloor \binom{s}{2} p_s \rfloor$ random selection of vertices from the age group for s
  $\boldsymbol{S_1} \leftarrow \lfloor \binom{s}{2} p_s \rfloor$ random selection of vertices from the age group for s
  $\boldsymbol{E} \leftarrow \{(s_{1,i}, s_{2,i}), \ldots\}$ where $i = \{1, \ldots, \lfloor \binom{s}{2} p_s \rfloor\}$ and $s_{1,i} \in \boldsymbol{S_1}$ and $s_{2,i} \in \boldsymbol{S_2}$
Create Occupation Contacts:
foreach $o \in \boldsymbol{O}$ **do**
  $\boldsymbol{O_1} \leftarrow \lfloor \binom{o}{2} p_o \rfloor$ random selection of vertices from $\boldsymbol{V_{a_{>16}}}$
  $\boldsymbol{O_1} \leftarrow \lfloor \binom{o}{2} p_o \rfloor$ random selection of vertices from $\boldsymbol{V_{a_{>16}}}$
  $\boldsymbol{E} \leftarrow \{(o_{1,i}, o_{2,i}), \ldots\}$ where $i = \{1, \ldots, \lfloor \binom{o}{2} p_o \rfloor\}$ and $o_{1,i} \in \boldsymbol{O_1}$ and $o_{2,i} \in \boldsymbol{O_2}$
Create Public Contacts:
$N \leftarrow |\boldsymbol{V}|$
$\boldsymbol{N_1} \leftarrow \lfloor \binom{N}{2} p_p \rfloor$ random selection of vertices from $\boldsymbol{V}$
$\boldsymbol{N_1} \leftarrow \lfloor \binom{n}{2} p_p \rfloor$ random selection of vertices from $\boldsymbol{V}$
$\boldsymbol{E} \leftarrow \{(n_{1,i}, n_{2,i}), \ldots\}$ where $i = \{1, \ldots, \lfloor \binom{n}{2} p_p \rfloor\}$ and $n_{1,i} \in \boldsymbol{N_1}$ and $n_{2,i} \in \boldsymbol{N_2}$