**Step 0: complete contact matrix for GB**

**Supporting information Table S8.4**. Contact matrix of all reported contacts in Great Britain consisting of the average number of contact persons recorded per day per survey participant

a) all reported contacts (physical and non-physical contacts)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **age group of participant** | | | | | | | | | | | | | | |
| **age of contact** | | 00-04 | 05-09 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65-69 | 70+ |
|  | 00-04 | 1.92 | 0.65 | 0.41 | 0.24 | 0.46 | 0.73 | 0.67 | 0.83 | 0.24 | 0.22 | 0.36 | 0.20 | 0.20 | 0.26 | 0.13 |
|  | 05-09 | 0.95 | 6.64 | 1.09 | 0.73 | 0.61 | 0.75 | 0.95 | 1.39 | 0.90 | 0.16 | 0.30 | 0.22 | 0.50 | 0.48 | 0.20 |
|  | 10-14 | 0.48 | 1.31 | 6.85 | 1.52 | 0.27 | 0.31 | 0.48 | 0.76 | 1.00 | 0.69 | 0.32 | 0.44 | 0.27 | 0.41 | 0.33 |
|  | 15-19 | 0.33 | 0.34 | 1.03 | 6.71 | 1.58 | 0.73 | 0.42 | 0.56 | 0.85 | 1.16 | 0.70 | 0.30 | 0.20 | 0.48 | 0.63 |
|  | 20-24 | 0.45 | 0.30 | 0.22 | 0.93 | 2.59 | 1.49 | 0.75 | 0.63 | 0.77 | 0.87 | 0.88 | 0.61 | 0.53 | 0.37 | 0.33 |
|  | 25-29 | 0.79 | 0.66 | 0.44 | 0.74 | 1.29 | 1.83 | 0.97 | 0.71 | 0.74 | 0.85 | 0.88 | 0.87 | 0.67 | 0.74 | 0.33 |
|  | 30-34 | 0.97 | 1.07 | 0.62 | 0.50 | 0.88 | 1.19 | 1.67 | 0.89 | 1.02 | 0.91 | 0.92 | 0.61 | 0.76 | 0.63 | 0.27 |
|  | 35-39 | 1.02 | 0.98 | 1.26 | 1.09 | 0.76 | 0.95 | 1.53 | 1.50 | 1.32 | 1.09 | 0.83 | 0.69 | 1.02 | 0.96 | 0.20 |
|  | 40-44 | 0.55 | 1.00 | 1.14 | 0.94 | 0.73 | 0.88 | 0.82 | 1.23 | 1.35 | 1.27 | 0.89 | 0.67 | 0.94 | 0.81 | 0.80 |
|  | 45-49 | 0.29 | 0.54 | 0.57 | 0.77 | 0.97 | 0.93 | 0.57 | 0.80 | 1.32 | 1.87 | 0.61 | 0.80 | 0.61 | 0.59 | 0.57 |
|  | 50-54 | 0.33 | 0.38 | 0.40 | 0.41 | 0.44 | 0.85 | 0.60 | 0.61 | 0.71 | 0.95 | 0.74 | 1.06 | 0.59 | 0.56 | 0.57 |
|  | 55-59 | 0.31 | 0.21 | 0.25 | 0.33 | 0.39 | 0.53 | 0.68 | 0.53 | 0.55 | 0.51 | 0.82 | 1.17 | 0.85 | 0.85 | 0.33 |
|  | 60-64 | 0.26 | 0.25 | 0.19 | 0.24 | 0.19 | 0.34 | 0.40 | 0.39 | 0.47 | 0.55 | 0.41 | 0.78 | 0.65 | 0.85 | 0.57 |
|  | 65-69 | 0.09 | 0.11 | 0.12 | 0.20 | 0.19 | 0.22 | 0.13 | 0.30 | 0.23 | 0.13 | 0.21 | 0.28 | 0.36 | 0.70 | 0.60 |
|  | 70+ | 0.14 | 0.15 | 0.21 | 0.10 | 0.24 | 0.17 | 0.15 | 0.41 | 0.50 | 0.71 | 0.53 | 0.76 | 0.47 | 0.74 | 1.47 |

b) physical contacts

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **age group of participant** | | | | | | | | | | | | | | |
| **age of contact** | | 00-04 | 05-09 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65-69 | 70+ |
|  | 00-04 | 1.49 | 0.59 | 0.25 | 0.18 | 0.42 | 0.61 | 0.57 | 0.74 | 0.18 | 0.20 | 0.36 | 0.15 | 0.18 | 0.26 | 0.07 |
|  | 05-09 | 0.74 | 3.82 | 0.53 | 0.44 | 0.37 | 0.42 | 0.68 | 0.99 | 0.66 | 0.15 | 0.17 | 0.19 | 0.41 | 0.30 | 0.07 |
|  | 10-14 | 0.36 | 0.73 | 3.19 | 0.79 | 0.17 | 0.14 | 0.32 | 0.51 | 0.69 | 0.27 | 0.20 | 0.19 | 0.17 | 0.26 | 0.17 |
|  | 15-19 | 0.26 | 0.22 | 0.52 | 3.10 | 0.85 | 0.12 | 0.17 | 0.29 | 0.48 | 0.51 | 0.27 | 0.13 | 0.09 | 0.26 | 0.37 |
|  | 20-24 | 0.39 | 0.19 | 0.09 | 0.38 | 1.32 | 0.49 | 0.28 | 0.16 | 0.23 | 0.44 | 0.20 | 0.28 | 0.11 | 0.15 | 0.00 |
|  | 25-29 | 0.53 | 0.37 | 0.11 | 0.20 | 0.58 | 0.64 | 0.35 | 0.21 | 0.23 | 0.25 | 0.30 | 0.30 | 0.20 | 0.04 | 0.03 |
|  | 30-34 | 0.77 | 0.72 | 0.29 | 0.17 | 0.31 | 0.42 | 0.80 | 0.21 | 0.27 | 0.38 | 0.23 | 0.20 | 0.23 | 0.15 | 0.07 |
|  | 35-39 | 0.73 | 0.65 | 0.61 | 0.35 | 0.20 | 0.24 | 0.47 | 0.76 | 0.47 | 0.29 | 0.18 | 0.11 | 0.32 | 0.04 | 0.03 |
|  | 40-44 | 0.38 | 0.59 | 0.58 | 0.47 | 0.27 | 0.29 | 0.25 | 0.49 | 0.45 | 0.40 | 0.12 | 0.19 | 0.23 | 0.15 | 0.30 |
|  | 45-49 | 0.22 | 0.23 | 0.22 | 0.34 | 0.46 | 0.29 | 0.17 | 0.17 | 0.35 | 0.58 | 0.15 | 0.19 | 0.14 | 0.11 | 0.20 |
|  | 50-54 | 0.26 | 0.21 | 0.14 | 0.17 | 0.22 | 0.17 | 0.15 | 0.14 | 0.19 | 0.27 | 0.33 | 0.35 | 0.20 | 0.04 | 0.07 |
|  | 55-59 | 0.22 | 0.12 | 0.10 | 0.10 | 0.14 | 0.22 | 0.13 | 0.21 | 0.05 | 0.25 | 0.17 | 0.52 | 0.32 | 0.44 | 0.10 |
|  | 60-64 | 0.22 | 0.15 | 0.10 | 0.10 | 0.10 | 0.14 | 0.15 | 0.20 | 0.19 | 0.13 | 0.09 | 0.24 | 0.27 | 0.30 | 0.13 |
|  | 65-69 | 0.05 | 0.08 | 0.07 | 0.08 | 0.07 | 0.12 | 0.08 | 0.16 | 0.11 | 0.04 | 0.05 | 0.07 | 0.17 | 0.37 | 0.43 |
|  | 70+ | 0.09 | 0.09 | 0.10 | 0.08 | 0.19 | 0.10 | 0.05 | 0.13 | 0.24 | 0.29 | 0.23 | 0.22 | 0.11 | 0.22 | 0.70 |

**Step 1: sum over contact age groups to aggregate into three groups**

a) all reported contacts (physical and non-physical contacts)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **age group of participant** | | | | | | | | | | | | | | |
| **age of contact** | | 00-04 | 05-09 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65-69 | 70+ |
|  | 00-14 | 3.35 | 8.60 | 8.35 | 2.49 | 1.34 | 1.79 | 2.10 | 2.98 | 2.14 | 1.07 | 0.98 | 0.86 | 0.97 | 1.15 | 0.66 |
|  | 15-64 | 5.30 | 5.73 | 6.12 | 12.66 | 9.82 | 9.72 | 8.41 | 7.85 | 9.10 | 10.03 | 7.68 | 7.56 | 6.82 | 6.84 | 4.60 |
|  | 65+ | 0.23 | 0.26 | 0.33 | 0.30 | 0.43 | 0.39 | 0.28 | 0.71 | 0.73 | 0.84 | 0.74 | 1.04 | 0.83 | 1.44 | 2.07 |

b) physical contacts

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **age group of participant** | | | | | | | | | | | | | | |
| **age of contact** | | 00-04 | 05-09 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65-69 | 70+ |
|  | 00-14 | 2.59 | 5.14 | 3.97 | 1.41 | 0.96 | 1.17 | 1.57 | 2.24 | 1.53 | 0.62 | 0.73 | 0.53 | 0.76 | 0.82 | 0.31 |
|  | 15-64 | 3.98 | 3.45 | 2.76 | 5.38 | 4.45 | 3.02 | 2.92 | 2.84 | 2.91 | 3.50 | 2.04 | 5.21 | 2.11 | 1.49 | 1.30 |
|  | 65+ | 0.14 | 0.17 | 0.17 | 0.16 | 0.45 | 0.32 | 0.18 | 0.42 | 0.59 | 0.62 | 0.28 | 0.29 | 0.28 | 0.59 | 1.13 |

**Step 2: use age percentages of participants to weight the fine-grained age groups within larger age groups**

**(Based on) supporting information Table 3.4.**

|  |  |  |
| --- | --- | --- |
|  | **Percentage of sample** | **% of larger age group** |
| **0-4** | 9.39% | 31.77664975% |
| **5-9** | 10.08% | 34.11167513% |
| **10-14** | 10.08% | 34.11167513% |
| **15-19** | 10.38% | 16.01110597% |
| **20-24** | 5.83% | 8.99275027% |
| **25-29** | 5.83% | 8.99275027% |
| **30-34** | 5.93% | 9.146999846% |
| **35-39** | 6.92% | 10.67407065% |
| **40-44** | 6.13% | 9.455498997% |
| **45-49** | 5.43% | 8.375751967% |
| **50-54** | 6.52% | 10.05707234% |
| **55-59** | 5.34% | 8.236927348% |
| **60-64** | 6.52% | 10.05707234% |
| **65-69** | 2.67% | 47.42451155% |
| **70 +** | 2.96% | 52.57548845% |
|  |  |  |

**Step 3: weight the contact figures accordingly**

1. all reported contacts (physical and non-physical contacts)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **age group of participant** | | | | | | | | | | | | | | |
| **age of contact** | | 00-04 | 05-09 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65-69 | 70+ |
|  | 00-14 | 1.065 | 2.934 | 2.848 | 0.399 | 0.121 | 0.161 | 0.192 | 0.318 | 0.202 | 0.090 | 0.099 | 0.071 | 0.098 | 0.545 | 0.347 |
|  | 15-64 | 1.684 | 1.955 | 2.088 | 2.027 | 0.883 | 0.874 | 0.769 | 0.838 | 0.860 | 0.840 | 0.772 | 0.623 | 0.686 | 3.244 | 2.418 |
|  | 65+ | 0.073 | 0.089 | 0.113 | 0.048 | 0.039 | 0.035 | 0.026 | 0.076 | 0.069 | 0.070 | 0.074 | 0.086 | 0.083 | 0.683 | 1.088 |

1. physical contacts

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **age group of participant** | | | | | | | | | | | | | | |
| **age of contact** | | 00-04 | 05-09 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65-69 | 70+ |
|  | 00-14 | 0.823 | 1.753 | 1.354 | 0.226 | 0.086 | 0.105 | 0.144 | 0.239 | 0.145 | 0.052 | 0.073 | 0.044 | 0.076 | 0.389 | 0.163 |
|  | 15-64 | 1.265 | 1.177 | 0.942 | 0.861 | 0.400 | 0.272 | 0.267 | 0.303 | 0.275 | 0.293 | 0.205 | 0.429 | 0.212 | 0.707 | 0.683 |
|  | 65+ | 0.044 | 0.058 | 0.058 | 0.026 | 0.040 | 0.029 | 0.016 | 0.045 | 0.056 | 0.052 | 0.028 | 0.024 | 0.028 | 0.280 | 0.594 |

**Step 4: sum over the weighted figures to obtain final numbers**

a) all reported contacts (physical and non-physical contacts)

|  |  |
| --- | --- |
|  |  |
| **age of contact** | | 00-14 | 15-64 | 65+ |
|  | 00-14 | 6.846446701 | 1.749242635 | 0.8923801066 |
|  | 15-64 | 5.72639594 | 9.17289218 | 5.662309059 |
|  | 65+ | 0.2743451777 | 0.6061123461 | 1.771225577 |

1. physical contacts

|  |  |
| --- | --- |
|  |  |
| **age of contact** | | 00-14 | 15-64 | 65+ |
|  | 00-14 | 3.93058489 | 1.190114145 | 0.5518650089 |
|  | 15-64 | 3.383039627 | 3.518210743 | 1.390106572 |
|  | 65+ | 0.1024769442 | 0.3440814438 | 0.8739076376 |

1. non-physical contacts only

|  |  |
| --- | --- |
|  |  |
| **age of contact** | | 00-14 | 15-64 | 65+ |
|  | 00-14 | 2.915861811 | 0.55912849 | 0.3405150977 |
|  | 15-64 | 2.343356313 | 5.654681437 | 4.272202487 |
|  | 65+ | 0.1718682335 | 0.2620309023 | 0.8973179394 |

**Step 5: round figures**

a) all reported contacts (physical and non-physical contacts)

|  |  |
| --- | --- |
|  |  |
| **age of contact** | | 00-14 | 15-64 | 65+ |
|  | 00-14 | 6.8 | 1.7 | 0.9 |
|  | 15-64 | 5.7 | 9.2 | 5.7 |
|  | 65+ | 0.3 | 0.6 | 1.8 |

1. physical contacts

|  |  |
| --- | --- |
|  |  |
| **age of contact** | | 00-14 | 15-64 | 65+ |
|  | 00-14 | 3.9 | 1.2 | 0.6 |
|  | 15-64 | 3.4 | 3.5 | 1.4 |
|  | 65+ | 0.1 | 0.3 | 0.9 |

1. non-physical contacts only

|  |  |
| --- | --- |
|  |  |
| **age of contact** | | 00-14 | 15-64 | 65+ |
|  | 00-14 | 2.9 | 0.6 | 0.3 |
|  | 15-64 | 2.3 | 5.7 | 4.3 |
|  | 65+ | 0.2 | 0.3 | 0.9 |

**Significance of figures and implementation in code**

The significance of each table is shown in the Venn diagram below. Table a) represents the sum total of all shaded areas. Table b) represents the purple shaded area. Table c) represents the orange shaded area.

**Diagram, venn diagram

Description automatically generated**

The size of the overlap region (representing contacts which belong in both the disease network and the behaviour network) is unknown.

In the code, I have included an arbitrarily sized overlap region for each of the nine age relations as follows:

* Within the same age group for adults and children, the ring links are included in both types of network to represent contacts that are both physical and behavioural.
* For the elderly ring, which has no ring links, 50% of the physical links were coded to also be included in the behavioural network.
* For inter-ring links (across different age groups), a random 50% of physical contacts were also included in the behavioural network.