

Reasonable Worst-Case Planning Scenario – 26/03/2020**Purpose:**

The table below sets out a view on planning assumptions for the whole UK reasonable worst-case scenario, as agreed by SAGE on 26 March, 2020.

SAGE (Scientific Advisory Group for Emergencies) provides scientific advice to Government. It does not make decisions on what scenario Government should be planning for. The Cabinet Office Civil Contingencies Secretariat will advise HMG on the scenario on which they should be planning for, and if they should need to work to revised planning assumptions.

Epidemic parameters	COVID-19 RWCS estimates
Reproduction number, when unmitigated	2.8
Doubling time (Time required for the number of infections to double, pre-mitigations)	3.3 days
Infection fatality rate (the proportion of infected people, including those without symptoms, who would die without mitigations)	1% (highly age-dependent, see annex)
Proportion of infected people hospitalised	5% (highly age-dependent, see annex)
Fatality rate of hospitalised people	12% (highly age-dependent, see annex)
Proportion of hospitalised patients requiring ventilation	30% (highly age-dependent)
Fatality rate for people requiring invasive ventilation	50%
Proportion of cases asymptomatic	33%
Number of Direct Covid-19 deaths in a first wave (This does not take into account the number of deaths that could occur due to lack of NHS capacity)	Wave 1: 50,000 (to the nearest 1,000, 30 th March - Sept 2020) Weekly direct covid-19 deaths over 2000 for 14 weeks (Peak 2,700 - nearest 100) The peak weeks are from start of April with a very slow decline in the RWC scenario.
Number of cases requiring hospitalisation in a first wave	Wave 1: 260,000 (to the nearest 10,000, 30 th March - Sept 2020)
Number of cases requiring ICU admission in a first wave	Wave 1: 66,000 (nearest 1000, 30 th March - Sept 2020), peaking at 3,700 admissions per week
Average length of stay in ICU	9.5 days

Timing

The RWC is based on a mitigated epidemic. The mitigations modelled reflect those in place at the time of writing which are:

- Case isolation
- Voluntary home quarantine
- Closure of schools and universities
- Social distancing for the entire population, including shielding of vulnerable groups.

These policies were enacted on 17th March, barring school closures which began effective from the 23rd March, and social distancing for the entire population is assumed to be concurrent with this.

In the model presented here, the **mitigations were assumed to be in place for a 6-month period, following which all measures have been completely removed effective immediately**. It is important to note that based on this, both scenarios presented produced a significant second peak shortly after the removal of mitigating measures. However, it is noted that the profile of any such second peak is highly dependent on mitigation policies set by UK government beyond the suppression of the first wave.

Assumptions

The **Reasonable Worst-Case Scenario** assumes a poor compliance. The specific assumptions in the modelling are detailed below:

- School closures lead to an increase in contacts within the home by 100%
- Social distancing reduces contacts outside the home and workplace by 66%
- 50% of households adhere to household quarantine and 70% of symptomatic cases adhere to case isolation.
- Quarantined households and isolated individual cases reduce contacts outside the household by 75%.

Also included below is a second **scenario based on good compliance**. This is not the Reasonable Worst-Case Scenario used as the basis for planning, but provides a second set of data for context. The "good compliance" scenario assumes:

- School closures lead to an increase in contacts within the home by 50%.
- Social distancing reduces workplace contacts by 50% and other contacts outside the household by 90%
75% of households adhere to household quarantine and 70% of symptomatic cases adhere to case isolation.
- Quarantined households and isolated individual cases reduce contacts outside the household by 75%.

NOTE 1: The modelling here is appropriate for short-term planning and is based on mitigations designed to suppress the immediate wave. There will need to be further detailed discussions around planning beyond the short-term.

NOTE 2: Both modelled scenarios include substantial numbers of individuals in their 70s and 80s occupying ICU beds. This is not routinely observed in practice.

NOTE 3: One might ask why UK interventions are expected to make our epidemic plateau relatively soon, compared to events in Spain and Italy. There is tentative, emerging evidence that cases have started to plateau in Spain in recent days. The epidemic in Italy behaving as multiple epidemics. Some are declining slowly now (e.g. in Lombardy), but others are taking off. There hasn't been the same uniformity of interventions as we model here.

RWC Scenario Charts (Poor Compliance with BSIs) – UK

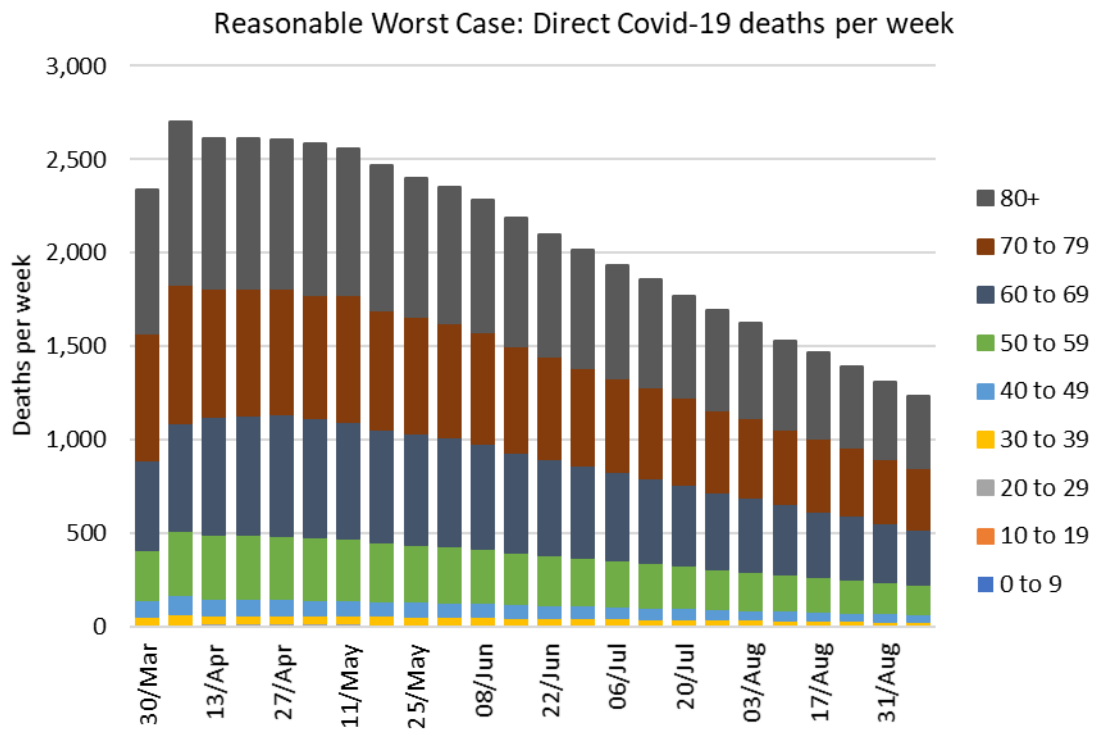


Figure 1 - Number of deaths directly from Covid-19 by age group under RWC planning scenario – (Poor compliance with BSIs)

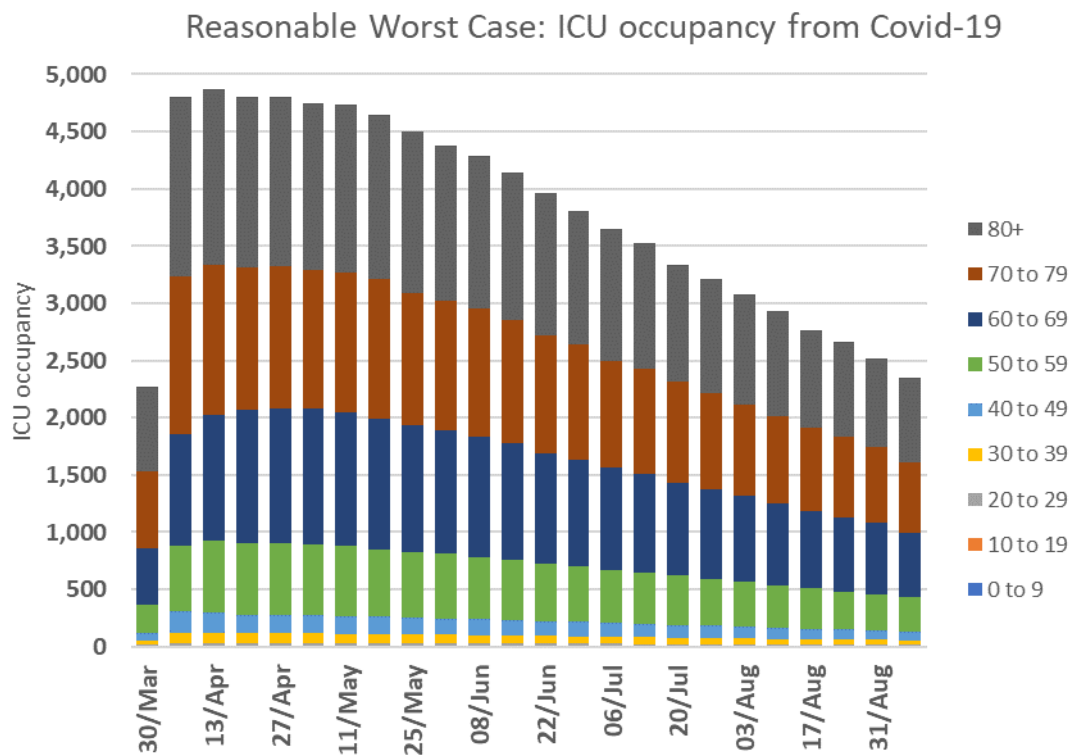


Figure 2 – ICU occupancy by age group under RWC planning scenario – (Poor compliance with BSIs)

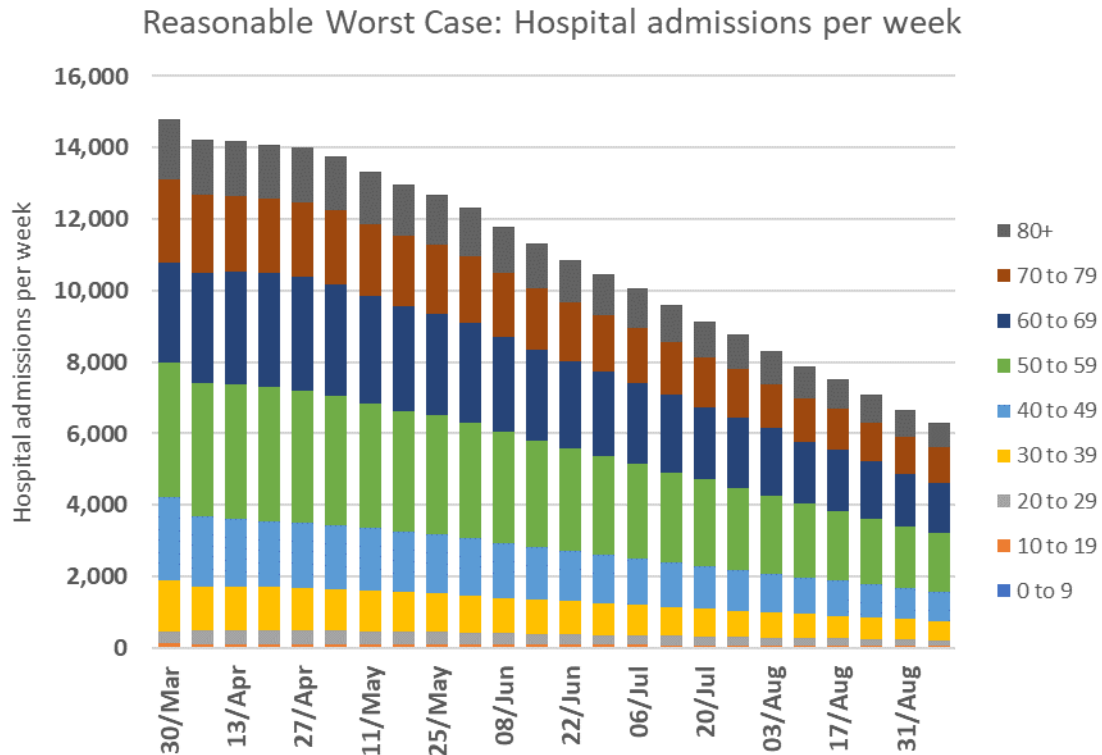


Figure 3 - Number of hospital admissions per week by age group under RWC planning scenario – (Poor compliance with BSIs)

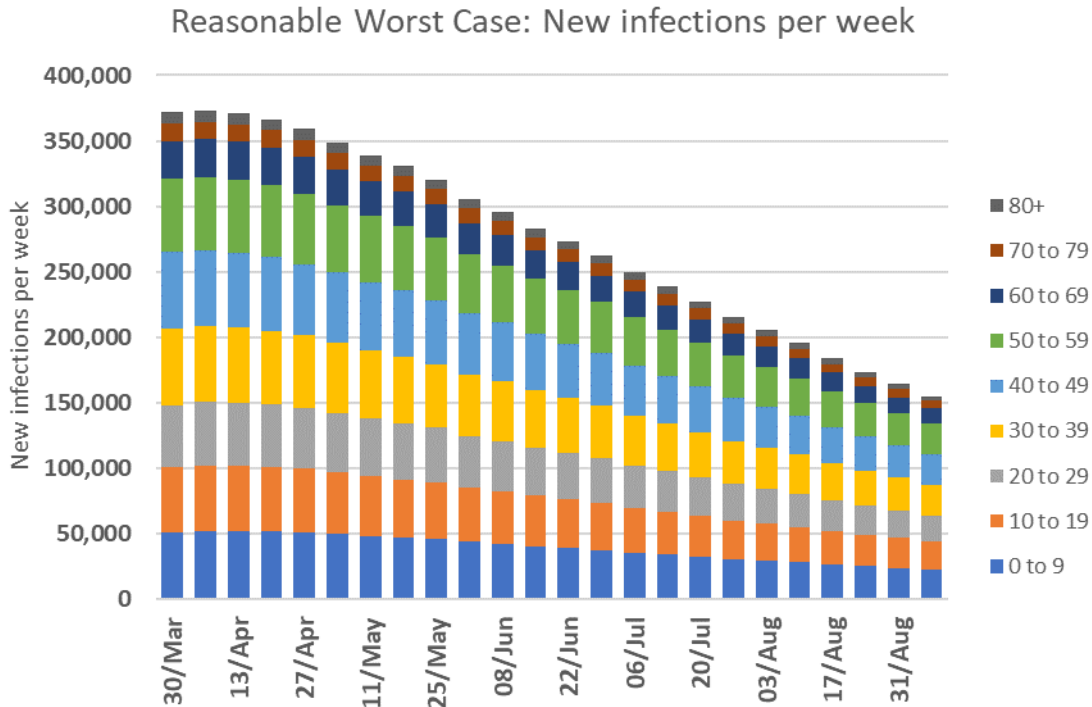


Figure 4 - Number of new infections per week by age group under RWC planning scenario – (Poor compliance with BSIs). Note that because behavioural and social interventions reduce the proportion of infected people who are in older age groups, the number of deaths is less than 1% of the number of infections

RWC Scenario Charts (Good Compliance with BSIs) – UK

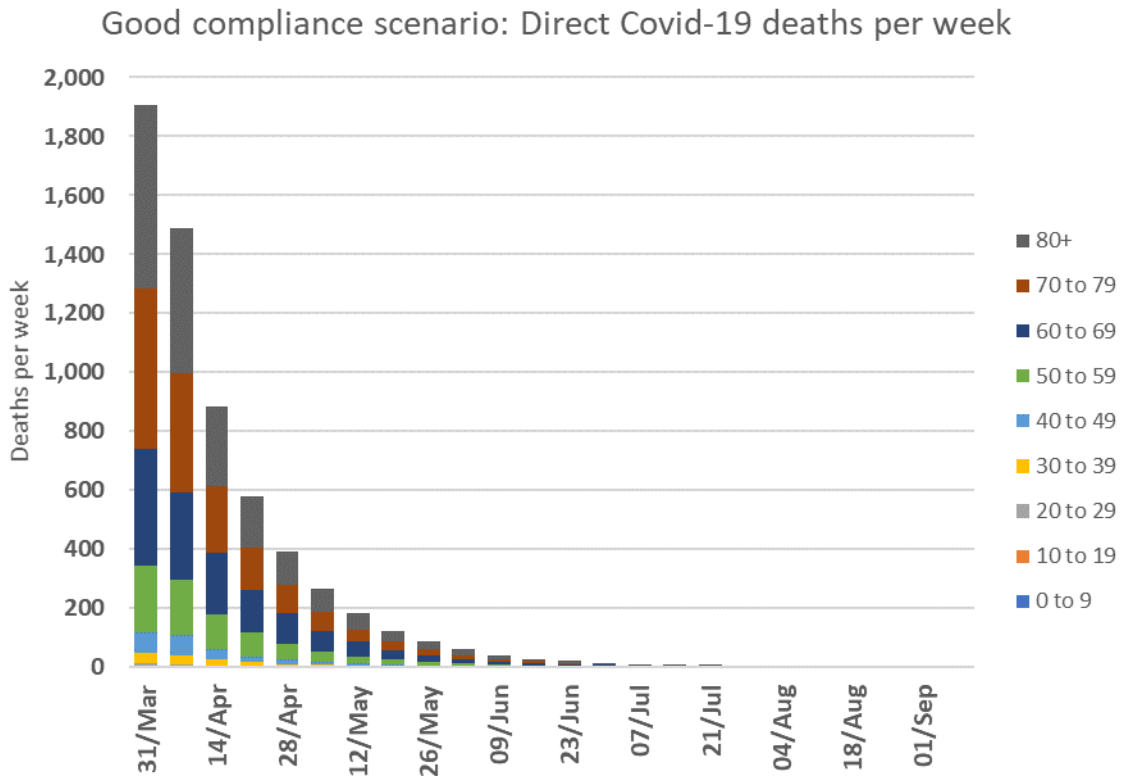


Figure 5 - Number of deaths directly from Covid-19 under Good Compliance planning scenario

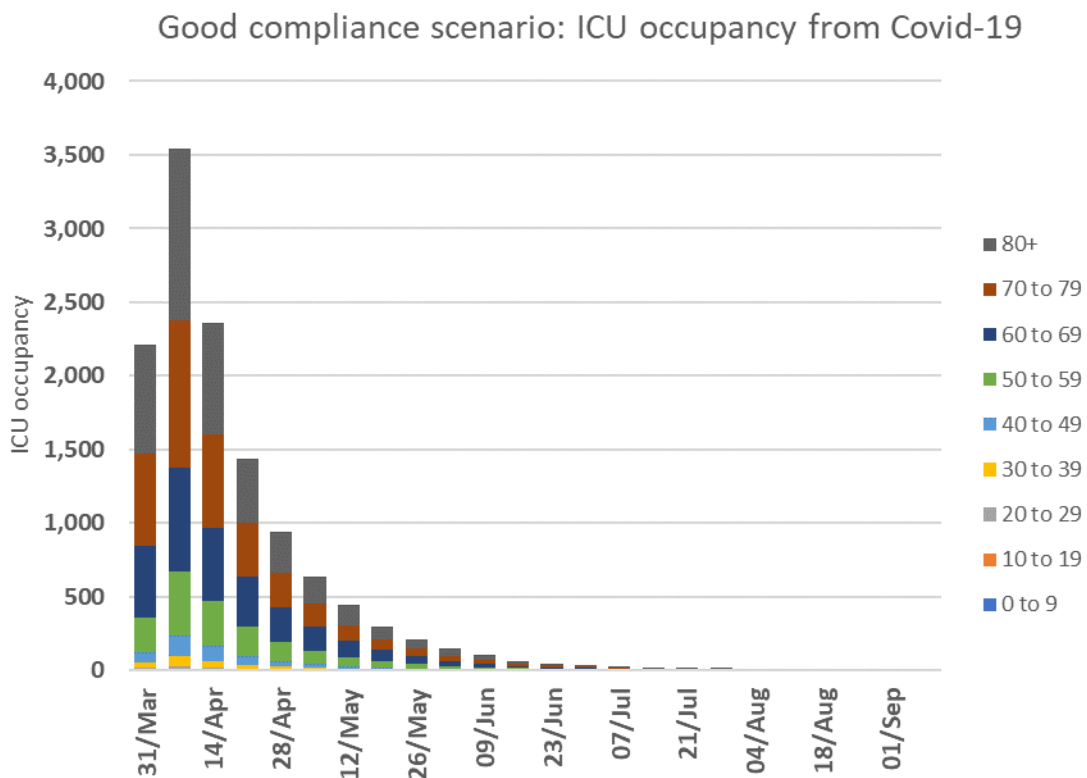


Figure 6- ICU occupancy from Covid-19 under Good Compliance planning scenario

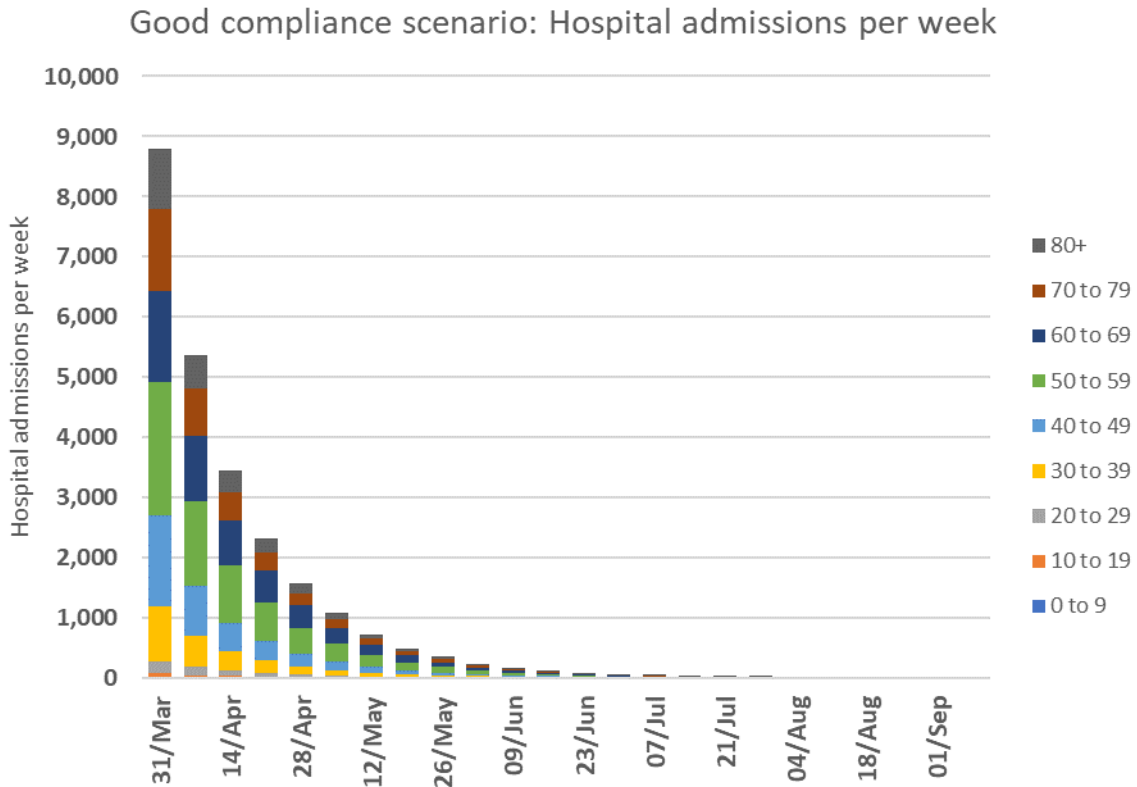


Figure 7- Hospital admissions per week under Good Compliance planning scenario

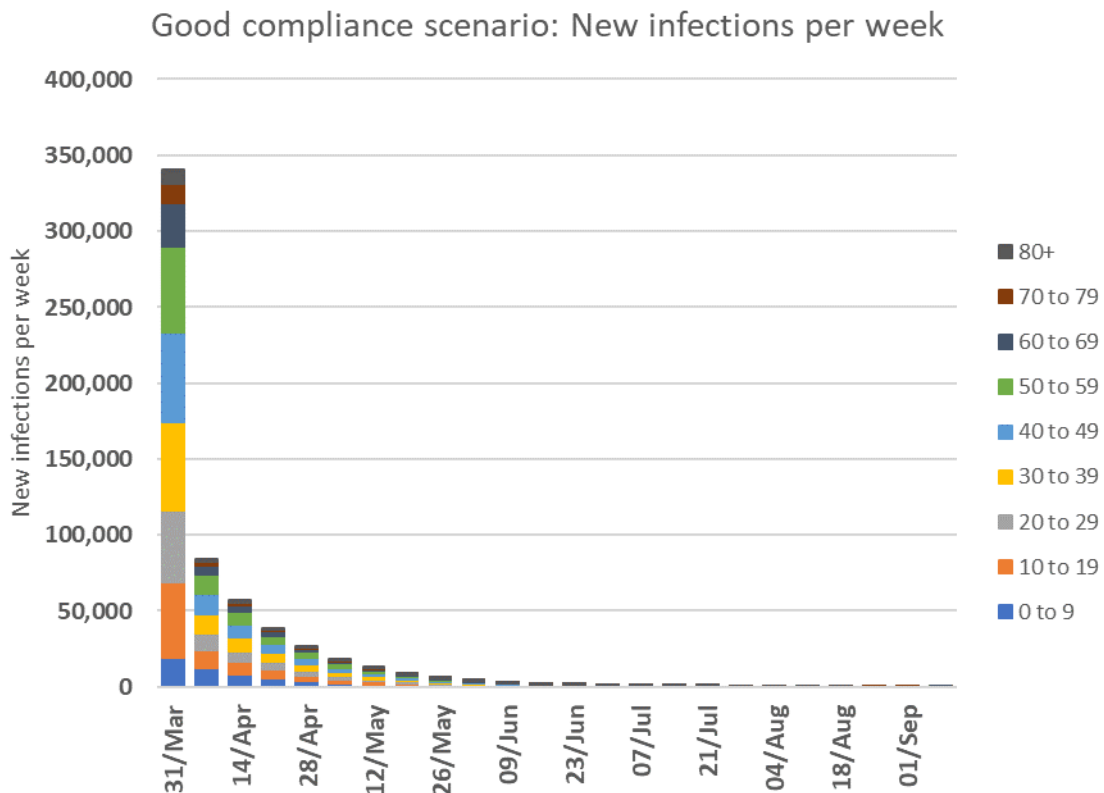


Figure 8 - Number of new infections per week under Good Compliance planning scenario. **Note that because behavioural and social interventions reduce the proportion of infected people who are in older age groups, the number of deaths is less than 1% of the number of infections**

RWC Scenario Data Tables (Poor Compliance with BSIs) – UK

Note that because behavioural and social interventions reduce the proportion of infected people who are in older age groups, the number of deaths is less than 1% of the number of infections.

Dates	Deaths	Infections	Hospitalisations	ICU Admissions	ICU Occupancy	Deaths (per 100k)	Infections (per 100k)	Hospitalisations (per 100k)
30/03/2020	2.3k	371.8k	14.8k	3.7k	2.3k	3.6	551.6	22.2
06/04/2020	2.7k	372.7k	14.2k	3.5k	4.8k	4.1	552.8	21.3
13/04/2020	2.6k	371.0k	14.2k	3.5k	4.9k	4.0	550.3	21.2
20/04/2020	2.6k	366.4k	14.1k	3.5k	4.8k	4.0	543.4	21.1
27/04/2020	2.6k	359.1k	14.0k	3.5k	4.8k	4.0	532.7	21.0
04/05/2020	2.6k	348.7k	13.8k	3.5k	4.8k	3.9	517.3	20.6
11/05/2020	2.6k	338.9k	13.3k	3.4k	4.7k	3.9	502.8	20.0
18/05/2020	2.5k	330.7k	13.0k	3.3k	4.6k	3.7	490.6	19.4
25/05/2020	2.4k	320.6k	12.7k	3.2k	4.5k	3.6	475.5	19.0
01/06/2020	2.4k	305.5k	12.3k	3.1k	4.4k	3.6	453.2	18.5
08/06/2020	2.3k	295.5k	11.8k	3.0k	4.3k	3.5	438.3	17.7
15/06/2020	2.2k	282.9k	11.3k	2.9k	4.1k	3.3	419.7	17.0
22/06/2020	2.1k	273.4k	10.9k	2.7k	4.0k	3.2	405.5	16.3
29/06/2020	2.0k	262.5k	10.5k	2.6k	3.8k	3.1	389.4	15.7
06/07/2020	1.9k	249.5k	10.1k	2.6k	3.6k	2.9	370.1	15.1
13/07/2020	1.9k	238.6k	9.6k	2.4k	3.5k	2.8	354.0	14.4
20/07/2020	1.8k	227.0k	9.1k	2.3k	3.3k	2.7	336.7	13.7
27/07/2020	1.7k	215.3k	8.8k	2.2k	3.2k	2.6	319.3	13.1
03/08/2020	1.6k	205.4k	8.3k	2.1k	3.1k	2.5	304.7	12.4
10/08/2020	1.5k	195.6k	7.9k	2.0k	2.9k	2.3	290.2	11.8
17/08/2020	1.5k	183.8k	7.5k	1.9k	2.8k	2.2	272.7	11.3
24/08/2020	1.4k	173.1k	7.1k	1.8k	2.7k	2.1	256.8	10.6
31/08/2020	1.3k	164.0k	6.7k	1.7k	2.5k	2.0	243.3	10.0

Scenario Data under Good Compliance with BSIs – UK

Note that because behavioural and social interventions reduce the proportion of infected people who are in older age groups, the number of deaths is less than 1% of the number of infections.

Dates	Deaths	Infections	Hospitalisations	ICU Admissions	ICU Occupancy	Deaths (per 100k)	Infections (per 100k)	Hospitalisations (per 100k)
30/03/2020	1.9k	340.1k	8.8k	2.2k	2.2k	1.9	370.7	8.9
06/04/2020	1.5k	84.3k	5.4k	1.4k	3.5k	1.5	84.0	5.4
13/04/2020	0.9k	57.0k	3.4k	0.9k	2.4k	0.9	56.8	3.5
20/04/2020	0.6k	38.8k	2.3k	0.6k	1.4k	0.6	38.7	2.3
27/04/2020	0.4k	26.4k	1.6k	0.4k	0.9k	0.4	26.4	1.6
04/05/2020	0.3k	17.9k	1.1k	0.3k	0.6k	0.3	17.8	1.1
11/05/2020	0.2k	12.3k	0.7k	0.2k	0.4k	0.2	12.3	0.7
18/05/2020	0.1k	8.6k	0.5k	0.1k	0.3k	0.1	8.6	0.5
25/05/2020	0.1k	5.7k	0.4k	0.1k	0.2k	0.1	5.7	0.4
01/06/2020	0.1k	4.0k	0.2k	0.1k	0.1k	0.1	4.0	0.2
08/06/2020	0.0k	2.8k	0.2k	0.0k	0.1k	0.0	2.7	0.2
15/06/2020	0.0k	1.9k	0.1k	0.0k	0.1k	0.0	1.9	0.1
22/06/2020	0.0k	1.3k	0.1k	0.0k	0.0k	0.0	1.2	0.1
29/06/2020	0.0k	0.9k	0.0k	0.0k	0.0k	0.0	0.9	0.0
06/07/2020	0.0k	0.6k	0.0k	0.0k	0.0k	0.0	0.6	0.0
13/07/2020	0.0k	0.4k	0.0k	0.0k	0.0k	0.0	0.4	0.0
20/07/2020	0.0k	0.2k	0.0k	0.0k	0.0k	0.0	0.2	0.0
27/07/2020	0.0k	0.2k	0.0k	0.0k	0.0k	0.0	0.2	0.0
03/08/2020	0.0k	0.1k	0.0k	0.0k	0.0k	0.0	0.1	0.0
10/08/2020	0.0k	0.1k	0.0k	0.0k	0.0k	0.0	0.1	0.0
17/08/2020	0.0k	0.1k	0.0k	0.0k	0.0k	0.0	0.1	0.0
24/08/2020	0.0k	0.1k	0.0k	0.0k	0.0k	0.0	0.1	0.0
31/08/2020	0.0k	0.0k	0.0k	0.0k	0.0k	0.0	0.0	0.0

Annex: Reasonable Worst Case age dependent severity assumptions

Age band	Proportion of infected people who are hospitalised	Proportion of infected people who die	Proportion of hospitalised people who die
0 to 4	0.1%	0.00%	3.8%
5 to 9	0.1%	0.00%	3.8%
10 to 14	0.1%	0.00%	3.8%
15 to 19	0.2%	0.01%	3.8%
20 to 24	0.5%	0.02%	3.8%
25 to 29	1.0%	0.04%	3.8%
30 to 34	1.6%	0.06%	3.8%
35 to 39	2.3%	0.1%	4.0%
40 to 44	2.9%	0.1%	4.5%
45 to 49	3.9%	0.2%	5.6%
50 to 54	5.8%	0.5%	7.8%
55 to 59	7.2%	0.8%	11.3%
60 to 64	10.2%	1.7%	16.9%
65 to 69	11.7%	2.7%	23.2%
70 to 74	14.6%	4.3%	29.1%
75 to 79	17.7%	6.2%	34.8%
80+	0.1%	9.6%	53.5%