

Covid-19 isolation and quarantine orders in a district of Berlin, Germany How many, how long, to whom and predictive factors

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# {width=30%}
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#####
# Setting options for knitr, ggplot, fonts
#####

# Disabeling scientific notation
options(scipen = 999)

# Create correct figure caption
knitr::opts_knit$set(eval.after = 'fig.cap')

# Adjust the big mark for large numbers
knitr::knit_hooks$set(inline = function(x) { prettyNum(x, big.mark=" ") })
```

About this Repository

The following R-Script calculates all the necessary numbers and figures for a publication. All necessary files to reproduce are available. The analysis is done in R. This project uses Renv. See the file .Rprofile for used packages. This script runs with the package target. The important parts of the script lie in the functions in the code folder. You can check the file _targets.R to see the different steps in their sequential order.

Results

```
df <- tar_read(df)
demographiedaten <- tar_read(demographiedaten)
zeiten <- tar_read(externalinput)$zeiten
externalinput <- tar_read(externalinput)
resultslist <- tar_read(results)
```

We extracted 109 087 datasets from SurvNet. 73 220 entries fulfilled the definition (11 215 had missing dates, 108 entries had an IDs that did not lead to an existing person and 24 563 separation orders did not begin in the study period). We removed 371 entries because they had a presumed typing error in one of the dates. We also removed 30 duplicated isolations and 2 497 duplicated quarantines. For 3 484 quarantines we reduced the length by the overlap with a following isolation period. In the demographic data we found 266

123 inhabitants registered in Berlin Reinickendorf (18 084 in the age group <7; 27 001 in the age group 7-17; 158 199 in the age group 18-64 and 62 839 in the age group >64).

Results of statistical measures

- *Analysis of quantity of isolation and quarantines:* The local public health agency ordered $n_i = 24\,433$ isolations and $n_q = 45\,335$ quarantines ($n_{i-p100} = 9.2$ isolations and $n_{q-p100} = 17$ quarantines per 100 inhabitants). The number of quarantines and isolations by age group and recommendation period can be seen in @ref(tab:agegrouptable)). Remarkably the number of quarantines per 100 inhabitants n_{q-p100} was resultslistagegroup_ableq_p[1] for the age group of children aged 0 to 6 and resultslistagegroup_ableq_p[2] in the age group 7 to 17 compared to resultslistagegroup_ableq_p[3] in adults or resultslistagegroup_ableq_p[4] in the elderly. 46 817 (81.5 %) of persons had one separation order (quarantine or isolation), 9 061 (15.8 %) had two separation orders, 1 359 (2.4 %) had three separation orders, 163 (0.3 %) had four separation orders and 20 had five separation orders - the maximum.
- *Analysis of the duration of isolation quarantines:* The median duration for isolations was $\tilde{d}_i = 10$ days (interquartile range 8 - 13). The duration did change in between different periods of recommendations. The median of the duration during the recommendation periods were: 14 days for the period No. 1, 8 days for the period No. 2 and 12 days for the period No. 3. The overall median duration for quarantines was $\tilde{d}_q = 8$ days (interquartile range 6 - 11). The median duration did differ between periods of different recommendations and age groups. The median of the duration during the recommendation periods were: 9 days for the period No. 1, 9 days for the period No. 2, 10 days for the period No. 3 and 4 days for the period No. 4. See Fig @ref(fig:duration). All together the public health agency ordered 684 years of isolations and 1 031 years of quarantine or 1 714 years in total.
- *Analysis of the ratio of contact persons per case:* The overall ratio of contact persons was $r_{qi} = 1.89$. In the period of the contact person definition no. 1 the ratio was 2.88 in the period no. 2 the ratio was 1.96 and in the period no. 3 the ratio was: 0.95.
- *Analysis of isolations following quarantines:* In the time period from the start of the recording of quarantines 3 483 of 23 892 isolations had a directly preceding quarantine and 532 a preceding quarantine in the 1 to 7 days before the isolations. 3 483 of 45 272 quarantines in that time period had a directly following isolation (contained case) and 535 a isolation following in the days 1 to 7 after the quarantine (non-contained case). This did differ between different periods and recommendations see Fig @ref(fig:adjoining-quarantines-and-isolation).
- *Reduction of the reproductive number:* Assuming a total prevention of transmission by the quarantine order we calculated a reduction of 0.15 of the reproductive Number by quarantine orders.
- *Analysis of timeliness:* Our approximation of the median time period between the last contact and the beginning of the quarantine order was $\tilde{d}_{\text{delay}} = 4$ (interquartile range 1 - 6) during the time periods when 14 days were recommended as a quarantine duration.

All results

```
resultslist
```

```
## $queried
## [1] 109087
##
## $emptydates
## [1] 11215
##
## $wrongid
## [1] 108
```

```

##
## $outofrange
## [1] 24563
##
## $definitionfullfilled
## [1] 73220
##
## $typingerror
## [1] 371
##
## $deleted_duplicates_table
##   DatensatzKategorie deleted_duplicates
##           COVID-19           30
##   Kontakt-COVID-19       2497
##
## $deleted_duplicates_quarantines
## [1] 2497
##
## $deleted_duplicates_isolations
## [1] 30
##
## $adjustedQuarantines
## [1] 3484
##
## $N
## [1] 266123
##
## $N_0_6
## [1] 18084
##
## $N_7_17
## [1] 27001
##
## $N_18_64
## [1] 158199
##
## $N_65_110
## [1] 62839
##
## $I_n
## [1] 24433
##
## $Q_n
## [1] 45335
##
## $I_p
## [1] 9.2
##
## $Q_p
## [1] 17
##
## $totaltime_groups
## # A tibble: 8 x 7
##   DatensatzKategor~ AgeGroup completeduration~ completeduration~ value percentage

```

```

##      <chr>          <chr>          <dbl>          <dbl> <dbl>          <dbl>
## 1 COVID-19         0 to 6          15491          42.4  18084          6.2
## 2 COVID-19         7 to 17         44356          122.   27001          17.8
## 3 COVID-19        18 to 64        161215         442.  158199          64.6
## 4 COVID-19        65 to 1~        28445          77.9  62839          11.4
## 5 Kontakt-COVID-19 0 to 6          74977          205.   18084          19.9
## 6 Kontakt-COVID-19 7 to 17        139069          381.   27001           37
## 7 Kontakt-COVID-19 18 to 64       145456          399.  158199          38.7
## 8 Kontakt-COVID-19 65 to 1~       16712           45.8  62839           4.4
## # ... with 1 more variable: completeduration_person <dbl>
##
## $QundIproPerson_table
## # A tibble: 5 x 3
##   number      n      p
##   <int> <int> <dbl>
## 1     1  46817  81.5
## 2     2   9061  15.8
## 3     3   1359   2.4
## 4     4    163   0.3
## 5     5     20   0
##
## $QundIproPerson_1_order_n
## [1] 46817
##
## $QundIproPerson_1_order_p
## [1] 81.5
##
## $QundIproPerson_2_order_n
## [1] 9061
##
## $QundIproPerson_2_order_p
## [1] 15.8
##
## $QundIproPerson_3_order_n
## [1] 1359
##
## $QundIproPerson_3_order_p
## [1] 2.4
##
## $QundIproPerson_4_order_n
## [1] 163
##
## $QundIproPerson_4_order_p
## [1] 0.3
##
## $QundIproPerson_5_order_n
## [1] 20
##
## $QundIproPerson_5_order_p
## [1] 0
##
## $MedianeDauerI
##   0%  25%  50%  75% 100%
##   1    8   10   13   30

```

```

##
## $MedianeDauerI_Rec
## # A tibble: 3 x 2
##   I_Duration    quint
##   <chr>        <dbl>
## 1 I_Duration_1    14
## 2 I_Duration_2     8
## 3 I_Duration_3    12
##
## $MedianeDauerI_Rec_1
## 50%
## 14
##
## $MedianeDauerI_Rec_2
## 50%
## 8
##
## $MedianeDauerI_Rec_3
## 50%
## 12
##
## $MedianeDauerQ
##   0%  25%  50%  75% 100%
##   1    6    8   11   28
##
## $MedianeDauerQ_Rec
## # A tibble: 4 x 2
##   Q_Duration    quint
##   <chr>        <dbl>
## 1 Q_Duration_1     9
## 2 Q_Duration_2     9
## 3 Q_Duration_3    10
## 4 Q_Duration_4     4
##
## $MedianeDauerQ_Rec_1
## 50%
## 9
##
## $MedianeDauerQ_Rec_2
## 50%
## 9
##
## $MedianeDauerQ_Rec_3
## 50%
## 10
##
## $MedianeDauerQ_Rec_4
## 50%
## 4
##
## $qi_d
## [1] 625721
##
## $qi_d_in_y

```

```

## [1] 1714
##
## $q_d_in_y
## [1] 1031
##
## $i_d_in_y
## [1] 684
##
## $K_F_Verhaeltnis
## [1] 1.89
##
## $K_F_Verhaeltnis_QDef
## # A tibble: 3 x 4
##   q_def   covid_19 kontakt_covid_19 verhaeltnis
##   <chr>     <int>         <int>         <dbl>
## 1 Q_Def_1    10402         29965          2.88
## 2 Q_Def_2     2446          4791          1.96
## 3 Q_Def_3    11044         10516          0.95
##
## $K_F_Verhaeltnis_QDef_1
## [1] 2.88
##
## $K_F_Verhaeltnis_QDef_2
## [1] 1.96
##
## $K_F_Verhaeltnis_QDef_3
## [1] 0.95
##
## $I_after_Q
## $I_after_Q$I_correct_after_Q
## [1] 3483
##
## $I_after_Q$I_too_long_after_Q
## [1] 532
##
## $I_after_Q$No_I_after_Q
## [1] 19877
##
##
## $I_n_kptime
## [1] 23892
##
## $Q_with_I_after
## $Q_with_I_after$I_correct_after_Q
## [1] 3483
##
## $Q_with_I_after$I_too_long_after_Q
## [1] 535
##
## $Q_with_I_after$No_I_after_Q
## [1] 41254
##
##
## $Q_n_kptime

```

```

## [1] 45272
##
## $r
## [1] 0.15
##
## $Q_n_by_QDef
## # A tibble: 3 x 2
##   Q_Def      n
##   <chr>   <int>
## 1 Q_Def_1 29965
## 2 Q_Def_2 4791
## 3 Q_Def_3 10516
##
## $Q_with_correct_I_by_QDef_table
## # A tibble: 3 x 5
## # Groups:   Q_Def [3]
##   Q_Def      result      n      N percentage
##   <chr>   <chr>      <int> <int>      <dbl>
## 1 Q_Def_1 I_correct_after_Q 1802 29965      6
## 2 Q_Def_2 I_correct_after_Q   658 4791      14
## 3 Q_Def_3 I_correct_after_Q 1024 10516     10
##
## $Q_with_too_late_I_by_QDef_table
## # A tibble: 3 x 5
## # Groups:   Q_Def [3]
##   Q_Def      result      n      N percentage
##   <chr>   <chr>      <int> <int>      <dbl>
## 1 Q_Def_1 I_too_long_after_Q   205 29965     0.7
## 2 Q_Def_2 I_too_long_after_Q    52 4791     1.1
## 3 Q_Def_3 I_too_long_after_Q   278 10516     2.6
##
## $Q_n_by_AgeGroup
## # A tibble: 4 x 2
##   AgeGroup      n
##   <ord>   <int>
## 1 0 to 6    9149
## 2 7 to 17 17528
## 3 18 to 64 16678
## 4 65 to 110 1980
##
## $Q_with_correct_I_by_Agegroup_table
## # A tibble: 4 x 5
## # Groups:   AgeGroup [4]
##   AgeGroup      result      n      N percentage
##   <ord>   <chr>      <int> <int>      <dbl>
## 1 0 to 6    I_correct_after_Q  434 9149      4.7
## 2 7 to 17    I_correct_after_Q  867 17528     4.9
## 3 18 to 64    I_correct_after_Q 1838 16678     11
## 4 65 to 110  I_correct_after_Q  345 1980     17.4
##
## $Q_with_too_late_I_by_Agegroup_table
## # A tibble: 4 x 5
## # Groups:   AgeGroup [4]
##   AgeGroup      result      n      N percentage

```

```

##   <ord>      <chr>                <int> <int>      <dbl>
## 1 0 to 6    I_too_long_after_Q      97  9149      1.1
## 2 7 to 17   I_too_long_after_Q     194 17528      1.1
## 3 18 to 64  I_too_long_after_Q     210 16678      1.3
## 4 65 to 110 I_too_long_after_Q      34  1980      1.7
##
## $q_timeliness_median
##   0%  25%  50%  75% 100%
##   0   1   4   6  12
##
## $agegroup_table
## # A tibble: 4 x 16
##   AgeGroup      N    q_n    i_n    q_p    i_p    q_d    i_d q_sum_in_y i_sum_in_y
##   <chr>      <dbl> <int> <int> <dbl> <dbl> <dbl> <dbl>      <dbl>      <dbl>
## 1 0 to 6    18084  9149  1383  50.6   7.6   8.2  11.2      205.      42.4
## 2 7 to 17   27001 17528  3983  64.9  14.8   7.9  11.1      381      122.
## 3 18 to 64 158199 16678 16041  10.5  10.1   8.7  10.1      398.      442.
## 4 65 to 110 62839  1980  3026   3.2   4.8   8.4   9.4       45.8      77.9
## # ... with 6 more variables: q_sum_in_d_per_p <dbl>, i_sum_in_d_per_p <dbl>,
## #   contained <int>, containedp <dbl>, toolate <int>, toolatep <dbl>
##
## $qdef_table
## # A tibble: 3 x 16
##   Q_Def      N    q_n    i_n    q_p    i_p    q_d    i_d q_sum_in_y i_sum_in_y
##   <chr>      <dbl> <int> <int> <dbl> <dbl> <dbl> <dbl>      <dbl>      <dbl>
## 1 Q_Def_1 266123 29973 10876  11.3   4.1   8.9   8.3      734.      248.
## 2 Q_Def_2 266123  4791  2446   1.8   0.9   9.5  11.4      124.      76.2
## 3 Q_Def_3 266123 10571 11111   4     4.2   5.9  11.8      172.      360.
## # ... with 6 more variables: q_sum_in_d_per_p <dbl>, i_sum_in_d_per_p <dbl>,
## #   contained <int>, containedp <dbl>, toolate <int>, toolatep <dbl>
##
## $total_table
## # A tibble: 1 x 16
##   total      N    q_n    i_n    q_p    i_p    q_d    i_d q_sum_in_y i_sum_in_y
##   <chr>      <dbl> <int> <int> <dbl> <dbl> <dbl> <dbl>      <dbl>      <dbl>
## 1 total 266123 45335 24433   17   9.2   8.3  10.2     1031.      684.
## # ... with 6 more variables: q_sum_in_d_per_p <dbl>, i_sum_in_d_per_p <dbl>,
## #   contained <int>, containedp <dbl>, toolate <int>, toolatep <dbl>

```