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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```
# ![]("https://www.horizont.net/news/media/32/Das-neue-Berlin-Logo-315209.jpeg"){width=30%}
# ![]("https://www.ultrasoundsymposium.org/wp-content/uploads/2017/08/fhg-1.gif"){width=30%}
# ![](https://www.lsc-digital-public-health.de/images/partners/leibniz-institut-bips.png){width=30%}
```

About this Repository

The following R-Script calculates all the necessary numbers and figures for a publication. All necessary files to reproduce are available.

Aim of the publication

What you need to reproduce the script

Files

- All necessary files are in this repository

Softare

- R. This project uses Renv. See the file .Rprofile for used packages

Fonts

> Setup: You will only need to run this once, but it will take a few minutes to finish Install https://fonts.google.com/specimen/PT+Sans on your local computer install.packages("extrafont") library(extrafont) font_import() # Import all the .ttf files from your system. On Linux see also: https://stackoverflow.com/questions/61204259/how-can-i-resolve-the-no-font-name-issue-when-importing-fonts-into-r-using-ext

How the script is set up

This script runs with the package target as some steps take long to calculate. The important parts lie in the functions in the code folder. You can check the file _targets.R to see the different steps in their sequential order.

Setup

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=" ") })
```

Results

```
# Hier wird die gespeicherte Tabelle eingelesen
df <- tar_read(df)
demographiedaten <- tar_read(demographiedaten)
zeiten <- tar_read(externalinput)$zeiten
externalinput <- tar_read(externalinput)
resultslist <- tar_read(results)
```

Text for results

We extracted 109 087 datasets from SurvNet. 73 753 entries fullfilled the definition (11 215 had missing dates, 108 entries had an IDs that did not lead to an existing person and 24 030 separation orders did not begin in the study period). We removed 1 188 entries because they had a presumed typing error in one of the dates. We also removed 30 duplicated isolations and 2 389 duplicated quarantines. For 3 473 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).

Analysis of quantity of isolation and quarantines: The local public health institute Reinickendorf von Berlin ordered n_i = 24 603 isolations and 45 014 quarantines. This calculates to 9.2 isolations per 100 inhabitants and 16.9 quarantines per 100 inhabitants. The number of quarantines and isolations by age group and recommendation period can bee seen in @ref(tab:agegrouptable)). 46 743 (81.6 %) of persons had one spearation order (quarantine or isolation), 9 031 (15.8 %) had two spearation orders, 1 366 (2.4 %) had three spearation orders, 156 (0.3 %) had four spearation orders and 18 (0 %) had five spearation orders - the maximum.

```
knitr::kable(resultslist$agegroup_table)
```

AgeGroup	N	q_n	i_n	q_p	i_p	q_d	$ ilde d_{ ext{i}}$	q_sum	i_sum	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	toolatep
0 to 6	18084	9166	1403	50.7	7.8	8.1	11.2	203.2	42.9	4.1	0.9	438	4.8	99	1.1
7 to 17	27001	17454	4016	64.6	14.9	7.8	11.1	375.3	122.3	5.1	1.7	869	5.0	197	1.1
18 to 64	158199	16439	16146	10.4	10.2	8.7	10.0	390.9	444.1	0.9	1.0	1822	11.1	208	1.3
65 to 110	62839	1955	3038	3.1	4.8	8.4	9.4	45.1	78.2	0.3	0.5	343	17.5	34	1.7

Analysis of the duration of isolation quarantines: The median duration for isolations was 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 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 figure @ref(fig:duration). All together the public health agency ordered 688 years of isolations and 1 015 years of quarantine or 1 702 years in total.

Analysis of the ratio of contact persons per case: The overal ratio of contact persons was 1.87. In the period of the contact person defintion no. 1 the ratio was 2.82 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 3 448 of 23 863 isolations had a directly preceeding quarantine and 530 a preceeding quarantine in the 1 to 7 days before the isolations. 3 471 of 44 623 quarantines in that time period had a directly following isolation (contained case) and 538 a isolation following in the days 1 to 7 after the quarantine (non-contained case). This did differ between different periods and recommendations see figure @ref(fig:adjoining-quarantines-and-isolation). Assuming a total prevention of transmission by the quarantine order this leads to a directly measurable reduction of 0.15 on the R value.

Analysis of timeliness: Our approximation of the median time period between the last contact and the beginning of the quarantine order was 4 (interquartile range 2 - 6) during the time periods when 14 days were recommended as a quarantine duration.

Text for discussion

The local public health agency Reinickendorf ordered isolations for slightly less than 10% and quarantines for a bit more than 15% of the population. This amounts to XXX days per person. The local public health agency of Reinickendorf ordered roughly 1700 years of quarantine in total.

```
library(flextable)
```

```
##
## Attaching package: 'flextable'
```

```
## The following object is masked from 'package:purrr':
##
##     compose
```

```
ft <- flextable(resultslist$agegroup_table)
ft <- add_footer_lines(ft, "Daily air quality measurements in New York, May to September 1973.")
ft
```

```
## Warning: Warning: fonts used in `flextable` are ignored because the `pdflatex`
## engine is used and not `xelatex` or `lualatex`. You can avoid this warning
## by using the `set_flextable_defaults(fonts_ignore=TRUE)` command or use a
## compatible engine by defining `latex_engine: xelatex` in the YAML header of the
## R Markdown document.
```

AgeGroup	N	q_n	i_n	q_p	i_p	q_d	$ ilde d_{ ext{i}}$	q_sum_in_y	y_s
0 to 6	18,084	9,166	1,403	50.7	7.8	8.1	11.2	203.2	

Daily air quality measurements in New York, May to September 1973.

AgeGroup	N	q_n	i_n	q_p	i_p	q_d	$ ilde d_{ ext{i}}$	q_sum_in_y_s
7 to 17	27,001	17,454	4,016	64.6	14.9	7.8	11.1	375.3
18 to 64	158,199	16,439	16,146	10.4	10.2	8.7	10.0	390.9
65 to 110	62,839	1,955	3,038	3.1	4.8	8.4	9.4	45.1

Daily air quality measurements in New York, May to September 1973.

Tables

Graphs

Graph timeliness over time

```
# DAs hier sollte noch in die Resultsberechnungen mit rein.

#  %>%
#
# df %>%
#   filter(DatensatzKategorie == "Kontakt-COVID-19") %>%
#   mutate(Q_Duration_number = str_split(Q_Duration_shortvalue, " ", simplify = TRUE)[1]) %>%
#   mutate(Q_Duration_number = as.numeric(Q_Duration_number)) %>%
#   filter(Q_Duration_number == 14) %>%
#   mutate(Q_timeliness = dauer - Q_Duration_number) %>%
#   group_by(Meldewoche) %>%
#   summarise(timeliniess = mean(Q_timeliness))
#   ggplot(aes(Meldewoche, timeliniess)) +
#   ester_theme() +
#   geom_col(fill = brewer.pal(3, mypalette)[2])
```

Graph: Incidence

Graph: Quarantine duration by age group

Graph: Adjoining quarantines and isolation

Session Info

```
sessionInfo()
```

```
## R version 4.0.4 (2021-02-15)
## Platform: x86_64-pc-linux-gnu (64-bit)
## Running under: Ubuntu 21.10
##
## Matrix products: default
## BLAS:   /usr/lib/x86_64-linux-gnu/blas/libblas.so.3.9.0
## LAPACK: /usr/lib/x86_64-linux-gnu/lapack/liblapack.so.3.9.0
##
## locale:
```

```
##  [1] LC_CTYPE=de_DE.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=de_DE.UTF-8        LC_COLLATE=de_DE.UTF-8
##  [5] LC_MONETARY=de_DE.UTF-8    LC_MESSAGES=de_DE.UTF-8
##  [7] LC_PAPER=de_DE.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=de_DE.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] graphics  grDevices datasets  grid      stats     utils     methods
## [8] base
##
## other attached packages:
##  [1] flextable_0.7.0           forcats_0.5.1
##  [3] stringr_1.4.0             dplyr_1.0.8
##  [5] purrr_0.3.4               readr_2.1.2
##  [7] tidyr_1.2.0               tibble_3.1.6
##  [9] ggplot2_3.3.5             tidyverse_1.3.1
## [11] targets_0.11.0            gridExtra_2.3
## [13] tidyquant_1.0.3           quantmod_0.4.18
## [15] TTR_0.24.3                PerformanceAnalytics_2.0.4
## [17] xts_0.12.1                zoo_1.8-9
## [19] RColorBrewer_1.1-3        pander_0.6.5
## [21] knitr_1.38                mmtable2_0.1.3
## [23] DescTools_0.99.44         vistime_1.2.1
## [25] lubridate_1.8.0           janitor_2.1.0
## [27] ggthemes_4.2.4            here_1.0.1
##
## loaded via a namespace (and not attached):
##  [1] assertive.base_0.0-9      colorspace_2.0-3
##  [3] ellipsis_0.3.2            class_7.3-18
##  [5] rprojroot_2.0.3           snakecase_0.11.0
##  [7] base64enc_0.1-3           fs_1.5.2
##  [9] gld_2.6.4                 rstudioapi_0.13
## [11] proxy_0.4-26              ggrepel_0.9.1
## [13] fansi_1.0.3               mvtnorm_1.1-3
## [15] xml2_1.3.3                codetools_0.2-18
## [17] rootSolve_1.8.2.3         jsonlite_1.8.0
## [19] gt_0.4.0                  broom_0.8.0
## [21] dbplyr_2.1.1              compiler_4.0.4
## [23] httr_1.4.2                backports_1.4.1
## [25] assertthat_0.2.1          Matrix_1.3-2
## [27] fastmap_1.1.0             lazyeval_0.2.2
## [29] cli_3.2.0                 htmltools_0.5.2
## [31] tools_4.0.4               igraph_1.3.0
## [33] gtable_0.3.0              glue_1.6.2
## [35] lmom_2.8                  Rcpp_1.0.8.3
## [37] cellranger_1.1.0          vctrs_0.4.1
## [39] xfun_0.30                 ps_1.6.0
## [41] rvest_1.0.2               lifecycle_1.0.1
## [43] renv_0.15.4               pacman_0.5.1
## [45] MASS_7.3-53.1             scales_1.2.0
## [47] hms_1.1.1                 expm_0.999-6
## [49] yaml_2.3.5                curl_4.3.2
## [51] Exact_3.1                 gdtools_0.2.4
```

```
## [53] stringi_1.7.6             highr_0.9
## [55] e1071_1.7-9               zip_2.2.0
## [57] boot_1.3-27               systemfonts_1.0.4
## [59] rlang_1.0.2               pkgconfig_2.0.3
## [61] evaluate_0.15             lattice_0.20-41
## [63] htmlwidgets_1.5.4         assertive.properties_0.0-4
## [65] processx_3.5.3            tidyselect_1.1.2
## [67] magrittr_2.0.3            R6_2.5.1
## [69] generics_0.1.2            base64url_1.4
## [71] DBI_1.1.2                 pillar_1.7.0
## [73] haven_2.4.3               withr_2.5.0
## [75] modelr_0.1.8              crayon_1.5.1
## [77] assertive.types_0.0-3     uuid_1.0-4
## [79] Quandl_2.11.0             utf8_1.2.2
## [81] plotly_4.10.0             officer_0.4.2
## [83] tzdb_0.3.0                rmarkdown_2.13
## [85] readxl_1.4.0              data.table_1.14.2
## [87] callr_3.7.0               reprex_2.0.1
## [89] digest_0.6.29             munsell_0.5.0
## [91] viridisLite_0.4.0         quadprog_1.5-8
```