

# MERS Korea 2015 - Marta Smith

2025-12-01

## Introduction

In this R Markdown, I analyze the `mers_korea_2015` data set from the “outbreaks” package.

### Loading packages

```
library(dplyr)

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##     filter, lag

## The following objects are masked from 'package:base':
##     intersect, setdiff, setequal, union

library(tidyr)
library(stringr)
library(ggplot2) # ggplot()
library(outbreaks) # data(mers_korea_2015)
library(forcats) # to use fct_infreq
library(lubridate) # to extract weeks from dates

##
## Attaching package: 'lubridate'

## The following objects are masked from 'package:base':
##     date, intersect, setdiff, union

library(tinytex)
```

### Loading and inspecting the data

```
# loading the raw data
data("mers_korea_2015")
```

## Quick questions

**Q:** What object class is `mers_korea_2015` in R? Describe what this class is like, and how is it different from a simple atomic type in R (like a `string` like “hello world!” or a `logical` value like `true`) or a `vector` type defined with `c()`

A: `mers_korea_2015` is a list. A list is a collection of data which is ordered and changeable (source).

**Q:** What sub-items exist within this item?

A: It contains 2 sub-items that are dataframes: `linelist` and `contacts`.

`linelist`: A dataframe of MERS-CoV cases and their attributes (source). `contacts`: A dataframe describing the relationship between MERS Co-V cases (source).

```
# inspecting the raw data
class(mers_korea_2015) # this is a list that contains 2 data sets
```

```
## [1] "list"

class(mers_korea_2015$linelist)

## [1] "data.frame"

class(mers_korea_2015$contacts)

## [1] "data.frame"

length(mers_korea_2015) # number of elements the list contains

## [1] 2

names(mers_korea_2015) # names of the elements of the list

## [1] "linelist" "contacts"

str(mers_korea_2015) # structure function

## List of 2
## $ linelist:'data.frame': 162 obs. of 15 variables:
##   ..$ id           : chr [1:162] "SK_1" "SK_2" "SK_3" "SK_4" ...
##   ..$ age          : int [1:162] 68 63 76 46 50 71 28 46 56 44 ...
##   ..$ age_class    : chr [1:162] "60-69" "60-69" "70-79" "40-49" ...
##   ..$ sex          : Factor w/ 2 levels "F","M": 2 1 2 1 2 2 1 1 2 2 ...
##   ..$ place_infect : Factor w/ 2 levels "Middle East",...: 1 2 2 2 2 2 2 2 2 2 ...
##   ..$ reporting_ctry: Factor w/ 2 levels "China","South Korea": 2 2 2 2 2 2 2 2 2 1 ...
##   ..$ loc_hosp     : Factor w/ 13 levels "365 Yeollin Clinic, Seoul",...: 10 10 10 10 10 10 10 13 10 ...
```

```

##   ..$ dt_onset      : Date[1:162], format: "2015-05-11" "2015-05-18" ...
##   ..$ dt_report     : Date[1:162], format: "2015-05-19" "2015-05-20" ...
##   ..$ week_report   : Factor w/ 5 levels "2015_21","2015_22",...: 1 1 1 2 2 2 2 2 2 ...
##   ..$ dt_start_exp  : Date[1:162], format: "2015-04-18" "2015-05-15" ...
##   ..$ dt_end_exp    : Date[1:162], format: "2015-05-04" "2015-05-20" ...
##   ..$ dt_diag       : Date[1:162], format: "2015-05-20" "2015-05-20" ...
##   ..$ outcome        : Factor w/ 2 levels "Alive","Dead": 1 1 2 1 1 2 1 1 1 ...
##   ..$ dt_death      : Date[1:162], format: NA NA ...
## $ contacts:'data.frame': 98 obs. of 4 variables:
##   ..$ from          : chr [1:98] "SK_14" "SK_14" "SK_14" "SK_14" ...
##   ..$ to            : chr [1:98] "SK_113" "SK_116" "SK_41" "SK_112" ...
##   ..$ exposure      : Factor w/ 5 levels "Contact with HCW",...: 2 2 2 2 2 2 2 2 2 ...
##   ..$ diff_dt_onset: int [1:98] 10 13 14 14 15 15 15 16 16 ...

```

**Q:** How can one access the sub-items within the `mers_korea_2015`?

```

# separating the data sets
# Same ways of accessing the sub-items: either with a $ or [1]
mers_korea_2015$linelist

```

	id	age	age_class	sex	place_infect	reporting_ctry
## 1	SK_1	68	60-69	M	Middle East	South Korea
## 2	SK_2	63	60-69	F	Outside Middle East	South Korea
## 3	SK_3	76	70-79	M	Outside Middle East	South Korea
## 4	SK_4	46	40-49	F	Outside Middle East	South Korea
## 5	SK_5	50	50-59	M	Outside Middle East	South Korea
## 6	SK_6	71	70-79	M	Outside Middle East	South Korea
## 7	SK_7	28	20-29	F	Outside Middle East	South Korea
## 8	SK_8	46	40-49	F	Outside Middle East	South Korea
## 9	SK_9	56	50-59	M	Outside Middle East	South Korea
## 10	SK_10	44	40-49	M	Outside Middle East	China
## 11	SK_11	79	70-79	F	Outside Middle East	South Korea
## 12	SK_12	49	40-49	F	Outside Middle East	South Korea
## 13	SK_13	49	40-49	M	Outside Middle East	South Korea
## 14	SK_14	35	30-39	M	Outside Middle East	South Korea
## 15	SK_15	35	30-39	M	Outside Middle East	South Korea
## 16	SK_16	40	40-49	M	Outside Middle East	South Korea
## 17	SK_17	45	40-49	M	Outside Middle East	South Korea
## 18	SK_18	77	70-79	F	Outside Middle East	South Korea
## 19	SK_19	60	60-69	M	Outside Middle East	South Korea
## 20	SK_20	40	40-49	M	Outside Middle East	South Korea
## 21	SK_21	59	50-59	F	Outside Middle East	South Korea
## 22	SK_22	39	30-39	F	Outside Middle East	South Korea
## 23	SK_23	73	70-79	M	Outside Middle East	South Korea
## 24	SK_24	78	70-79	M	Outside Middle East	South Korea
## 25	SK_25	57	50-59	F	Outside Middle East	South Korea
## 26	SK_26	43	40-49	M	Outside Middle East	South Korea
## 27	SK_27	55	50-59	M	Outside Middle East	South Korea
## 28	SK_28	58	50-59	M	Outside Middle East	South Korea
## 29	SK_29	77	70-79	F	Outside Middle East	South Korea
## 30	SK_30	60	60-69	M	Outside Middle East	South Korea
## 31	SK_31	69	60-69	M	Outside Middle East	South Korea
## 32	SK_32	54	50-59	M	Outside Middle East	South Korea

## 33	SK_33	47	40-49	M Outside Middle East	South Korea
## 34	SK_34	25	20-29	F Outside Middle East	South Korea
## 35	SK_35	38	30-39	M Outside Middle East	South Korea
## 36	SK_36	82	80-89	M Outside Middle East	South Korea
## 37	SK_37	45	40-49	M Outside Middle East	South Korea
## 38	SK_38	49	40-49	M Outside Middle East	South Korea
## 39	SK_39	62	60-69	M Outside Middle East	South Korea
## 40	SK_40	24	20-29	M Outside Middle East	South Korea
## 41	SK_41	70	70-79	F Outside Middle East	South Korea
## 42	SK_42	54	50-59	F Outside Middle East	South Korea
## 43	SK_43	24	20-29	F Outside Middle East	South Korea
## 44	SK_44	51	50-59	F Outside Middle East	South Korea
## 45	SK_45	65	60-69	M Outside Middle East	South Korea
## 46	SK_46	56	50-59	M Outside Middle East	South Korea
## 47	SK_47	68	60-69	F Outside Middle East	South Korea
## 48	SK_48	39	30-39	M Outside Middle East	South Korea
## 49	SK_49	75	70-79	M Outside Middle East	South Korea
## 50	SK_50	81	80-89	F Outside Middle East	South Korea
## 51	SK_51	72	70-79	F Outside Middle East	South Korea
## 52	SK_52	54	50-59	F Outside Middle East	South Korea
## 53	SK_53	51	50-59	M Outside Middle East	South Korea
## 54	SK_54	63	60-69	F Outside Middle East	South Korea
## 55	SK_55	36	30-39	M Outside Middle East	South Korea
## 56	SK_56	45	40-49	M Outside Middle East	South Korea
## 57	SK_57	57	50-59	M Outside Middle East	South Korea
## 58	SK_58	55	50-59	M Outside Middle East	South Korea
## 59	SK_59	44	40-49	M Outside Middle East	South Korea
## 60	SK_60	37	30-39	F Outside Middle East	South Korea
## 61	SK_61	55	50-59	M Outside Middle East	South Korea
## 62	SK_62	32	30-39	M Outside Middle East	South Korea
## 63	SK_63	58	50-59	F Outside Middle East	South Korea
## 64	SK_64	75	70-79	M Outside Middle East	South Korea
## 65	SK_65	55	50-59	F Outside Middle East	South Korea
## 66	SK_66	42	40-49	F Outside Middle East	South Korea
## 67	SK_67	16	10-20	M Outside Middle East	South Korea
## 68	SK_68	55	50-59	F Outside Middle East	South Korea
## 69	SK_69	57	50-59	M Outside Middle East	South Korea
## 70	SK_70	59	50-59	M Outside Middle East	South Korea
## 71	SK_71	40	40-49	F Outside Middle East	South Korea
## 72	SK_72	56	50-59	M Outside Middle East	South Korea
## 73	SK_73	65	60-69	F Outside Middle East	South Korea
## 74	SK_74	71	70-79	M Outside Middle East	South Korea
## 75	SK_75	63	60-69	F Outside Middle East	South Korea
## 76	SK_76	75	70-79	F Outside Middle East	South Korea
## 77	SK_77	63	60-69	M Outside Middle East	South Korea
## 78	SK_78	41	40-49	F Outside Middle East	South Korea
## 79	SK_79	24	20-29	F Outside Middle East	South Korea
## 80	SK_80	35	30-39	M Outside Middle East	South Korea
## 81	SK_81	62	60-69	M Outside Middle East	South Korea
## 82	SK_82	83	80-89	F Outside Middle East	South Korea
## 83	SK_83	65	60-69	M Outside Middle East	South Korea
## 84	SK_84	80	80-89	M Outside Middle East	South Korea
## 85	SK_85	66	60-69	F Outside Middle East	South Korea
## 86	SK_86	76	70-79	F Outside Middle East	South Korea

## 87	SK_87	78	70-79	F Outside Middle East	South Korea
## 88	SK_88	47	40-49	M Outside Middle East	South Korea
## 89	SK_89	59	50-59	M Outside Middle East	South Korea
## 90	SK_90	62	60-69	M Outside Middle East	South Korea
## 91	SK_91	49	40-49	M Outside Middle East	South Korea
## 92	SK_92	27	20-29	M Outside Middle East	South Korea
## 93	SK_93	64	60-69	F Outside Middle East	South Korea
## 94	SK_94	71	70-79	M Outside Middle East	South Korea
## 95	SK_95	76	70-79	M Outside Middle East	South Korea
## 96	SK_96	42	40-49	F Outside Middle East	South Korea
## 97	SK_97	46	40-49	M Outside Middle East	South Korea
## 98	SK_98	58	50-59	M Outside Middle East	South Korea
## 99	SK_99	48	40-49	M Outside Middle East	South Korea
## 100	SK_100	32	30-39	F Outside Middle East	South Korea
## 101	SK_101	84	80-89	M Outside Middle East	South Korea
## 102	SK_102	48	40-49	F Outside Middle East	South Korea
## 103	SK_103	66	60-69	M Outside Middle East	South Korea
## 104	SK_104	55	50-59	M Outside Middle East	South Korea
## 105	SK_105	63	60-69	M Outside Middle East	South Korea
## 106	SK_106	60	60-69	F Outside Middle East	South Korea
## 107	SK_107	64	60-69	F Outside Middle East	South Korea
## 108	SK_108	32	30-39	F Outside Middle East	South Korea
## 109	SK_109	39	30-39	F Outside Middle East	South Korea
## 110	SK_110	57	50-59	F Outside Middle East	South Korea
## 111	SK_111	43	40-49	F Outside Middle East	South Korea
## 112	SK_112	63	60-69	M Outside Middle East	South Korea
## 113	SK_113	64	60-69	M Outside Middle East	South Korea
## 114	SK_114	46	40-49	M Outside Middle East	South Korea
## 115	SK_115	77	70-79	M Outside Middle East	South Korea
## 116	SK_116	56	50-59	F Outside Middle East	South Korea
## 117	SK_117	25	20-29	F Outside Middle East	South Korea
## 118	SK_118	67	60-69	F Outside Middle East	South Korea
## 119	SK_119	35	30-39	M Outside Middle East	South Korea
## 120	SK_120	75	70-79	M Outside Middle East	South Korea
## 121	SK_121	77	70-79	M Outside Middle East	South Korea
## 122	SK_122	55	50-59	F Outside Middle East	South Korea
## 123	SK_123	65	60-69	M Outside Middle East	South Korea
## 124	SK_124	36	30-39	M Outside Middle East	South Korea
## 125	SK_125	56	50-59	M Outside Middle East	South Korea
## 126	SK_126	70	70-79	F Outside Middle East	South Korea
## 127	SK_127	76	70-79	F Outside Middle East	South Korea
## 128	SK_128	87	80-89	M Outside Middle East	South Korea
## 129	SK_129	86	80-89	M Outside Middle East	South Korea
## 130	SK_130	65	60-69	F Outside Middle East	South Korea
## 131	SK_131	59	50-59	M Outside Middle East	South Korea
## 132	SK_132	55	50-59	M Outside Middle East	South Korea
## 133	SK_133	70	70-79	M Outside Middle East	South Korea
## 134	SK_134	67	60-69	F Outside Middle East	South Korea
## 135	SK_135	33	30-39	M Outside Middle East	South Korea
## 136	SK_136	67	60-69	M Outside Middle East	South Korea
## 137	SK_137	55	50-59	M Outside Middle East	South Korea
## 138	SK_138	37	30-39	M Outside Middle East	South Korea
## 139	SK_139	64	60-69	F Outside Middle East	South Korea
## 140	SK_140	80	80-89	F Outside Middle East	South Korea

## 141	SK_141	42	40-49	M Outside Middle East	South Korea
## 142	SK_142	31	30-39	M Outside Middle East	South Korea
## 143	SK_143	31	30-39	M Outside Middle East	South Korea
## 144	SK_144	71	70-79	M Outside Middle East	South Korea
## 145	SK_145	37	30-39	M Outside Middle East	South Korea
## 146	SK_146	55	50-59	M Outside Middle East	South Korea
## 147	SK_147	46	40-49	F Outside Middle East	South Korea
## 148	SK_148	39	30-39	F Outside Middle East	South Korea
## 149	SK_149	84	80-89	F Outside Middle East	South Korea
## 150	SK_150	44	40-49	M Outside Middle East	South Korea
## 151	SK_151	38	30-39	F Outside Middle East	South Korea
## 152	SK_152	66	60-69	M Outside Middle East	South Korea
## 153	SK_153	61	60-69	F Outside Middle East	South Korea
## 154	SK_154	52	50-59	M Outside Middle East	South Korea
## 155	SK_155	42	40-49	F Outside Middle East	South Korea
## 156	SK_156	66	60-69	M Outside Middle East	South Korea
## 157	SK_157	60	60-69	M Outside Middle East	South Korea
## 158	SK_158	50	50-59	M Outside Middle East	South Korea
## 159	SK_159	49	40-49	M Outside Middle East	South Korea
## 160	SK_160	31	30-39	M Outside Middle East	South Korea
## 161	SK_161	79	70-79	F Outside Middle East	South Korea
## 162	SK_162	33	30-39	M Outside Middle East	South Korea
##				loc_hosp	
## 1				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 2				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 3				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 4				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 5				365 Yeollin Clinic, Seoul	
## 6				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 7				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 8				Seoul Clinic, Asan, Chungcheongnam	
## 9				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 10				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 11				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 12				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 13				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 14				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 15				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 16				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 17				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 18				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 19				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 20				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 21				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 22				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 23				Konyang University Hospital, Daejeon	
## 24				Konyang University Hospital, Daejeon	
## 25				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 26				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 27				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 28				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 29				Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 30				Dae Cheong Hospital, Daejeon	
## 31				Konyang University Hospital, Daejeon	

## 32 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 33 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 34 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 35 Samsung Medical Center, Seoul  
## 36 Konyang University Hospital, Daejeon  
## 37 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 38 Dae Cheong Hospital, Daejeon  
## 39 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 40 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 41 Samsung Medical Center, Seoul  
## 42 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 43 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 44 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 45 Konyang University Hospital, Daejeon  
## 46 Samsung Medical Center, Seoul  
## 47 Samsung Medical Center, Seoul  
## 48 Samsung Medical Center, Seoul  
## 49 Samsung Medical Center, Seoul  
## 50 Samsung Medical Center, Seoul  
## 51 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 52 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 53 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 54 Dae Cheong Hospital, Daejeon  
## 55 Samsung Medical Center, Seoul  
## 56 Samsung Medical Center, Seoul  
## 57 Samsung Medical Center, Seoul  
## 58 Samsung Medical Center, Seoul  
## 59 Samsung Medical Center, Seoul  
## 60 Samsung Medical Center, Seoul  
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## 76 Samsung Medical Center, Seoul  
## 77 Samsung Medical Center, Seoul  
## 78 Samsung Medical Center, Seoul  
## 79 Samsung Medical Center, Seoul  
## 80 Samsung Medical Center, Seoul  
## 81 Samsung Medical Center, Seoul  
## 82 Konyang University Hospital, Daejeon  
## 83 Konyang University Hospital, Daejeon  
## 84 Dae Cheong Hospital, Daejeon  
## 85 Dae Cheong Hospital, Daejeon

## 86 Dae Cheong Hospital, Daejeon  
## 87 Dae Cheong Hospital, Daejeon  
## 88 Samsung Medical Center, Seoul  
## 89 Samsung Medical Center, Seoul  
## 90 Samsung Medical Center, Seoul  
## 91 Samsung Medical Center, Seoul  
## 92 Seoul Clinic, Asan, Chungcheongnam  
## 93 Hallym University Medical Center  
## 94 Hallym University Medical Center  
## 95 Konyang University Hospital, Daejeon  
## 96 Samsung Medical Center, Seoul  
## 97 Samsung Medical Center, Seoul  
## 98 Samsung Medical Center, Seoul  
## 99 Samsung Medical Center, Seoul  
## 100 Samsung Medical Center, Seoul  
## 101 Samsung Medical Center, Seoul  
## 102 Samsung Medical Center, Seoul  
## 103 Samsung Medical Center, Seoul  
## 104 Samsung Medical Center, Seoul  
## 105 Samsung Medical Center, Seoul  
## 106 Konyang University Hospital, Daejeon  
## 107 Dae Cheong Hospital, Daejeon  
## 108 Hallym University Medical Center  
## 109 Samsung Medical Center, Seoul  
## 110 Samsung Medical Center, Seoul  
## 111 Samsung Medical Center, Seoul  
## 112 Samsung Medical Center, Seoul  
## 113 Samsung Medical Center, Seoul  
## 114 Samsung Medical Center, Seoul  
## 115 Samsung Medical Center, Seoul  
## 116 Samsung Medical Center, Seoul  
## 117 Hallym University Dongtan Sacred Heart Hospital, Hwaseong, Gyeonggi  
## 118 Pyeongtaek goodmorning hospital  
## 119 Pyeongtaek fraternity hospital  
## 120 Samsung Medical Center, Seoul  
## 121 Pyeongtaek goodmorning hospital  
## 122 Samsung Medical Center, Seoul  
## 123 Samsung Medical Center, Seoul  
## 124 Samsung Medical Center, Seoul  
## 125 Samsung Medical Center, Seoul  
## 126 Pyeongtaek goodmorning hospital  
## 127 Konyang University Hospital, Daejeon  
## 128 Dae Cheong Hospital, Daejeon  
## 129 Dae Cheong Hospital, Daejeon  
## 130 Dae Cheong Hospital, Daejeon  
## 131 Samsung Medical Center, Seoul  
## 132 Samsung Medical Center, Seoul  
## 133 Samsung Medical Center, Seoul  
## 134 Samsung Medical Center, Seoul  
## 135 Samsung Medical Center, Seoul  
## 136 Samsung Medical Center, Seoul  
## 137 Samsung Medical Center, Seoul  
## 138 Samsung Medical Center, Seoul  
## 139 Samsung Medical Center, Seoul

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## 140 Samsung Medical Center, Seoul
## 141 Samsung Medical Center, Seoul
## 142 Samsung Medical Center, Seoul
## 143 Dae Cheong Hospital, Daejeon
## 144 Hallym University Medical Center
## 145 Samsung Medical Center, Seoul
## 146 Samsung Medical Center, Seoul
## 147 Samsung Medical Center, Seoul
## 148 Konyang University Hospital, Daejeon
## 149 Samsung Medical Center, Seoul
## 150 Konkuk University hospital
## 151 Samsung Medical Center, Seoul
## 152 Samsung Medical Center, Seoul
## 153 Hallym University Dongtan Sacred Heart Hospital, Hwaseong, Gyeonggi
## 154 Samsung Medical Center, Emergency room,Seoul
## 155 Samsung Medical Center, Emergency room,Seoul
## 156 Samsung Medical Center, Emergency room,Seoul
## 157 Samsung Medical Center, Emergency room,Seoul
## 158 Samsung Medical Center, Emergency room,Seoul
## 159 Hallym University Dongtan Sacred Heart Hospital, Hwaseong, Gyeonggi
## 160 Gangdong Kyuang Hee University Hospital
## 161 Pyeongtaek goodmorning hospital
## 162 Samsung Medical Center, Seoul
##       dt_onset  dt_report week_report dt_start_exp dt_end_exp   dt_diag
## 1 2015-05-11 2015-05-19    2015_21 2015-04-18 2015-05-04 2015-05-20
## 2 2015-05-18 2015-05-20    2015_21 2015-05-15 2015-05-20 2015-05-20
## 3 2015-05-20 2015-05-20    2015_21 2015-05-16 2015-05-16 2015-05-21
## 4 2015-05-25 2015-05-26    2015_22 2015-05-16 2015-05-20 2015-05-26
## 5 2015-05-25 2015-05-27    2015_22 2015-05-17 2015-05-17 2015-05-26
## 6 2015-05-24 2015-05-28    2015_22 2015-05-15 2015-05-17 2015-05-28
## 7 2015-05-21 2015-05-28    2015_22 2015-05-16 2015-05-17 2015-05-28
## 8 2015-05-26 2015-05-29    2015_22 2015-05-15 2015-05-15 2015-05-29
## 9 <NA> 2015-05-29    2015_22 2015-05-15 2015-05-17 2015-05-29
## 10 2015-05-21 2015-05-29   2015_22 2015-05-16 2015-05-16 2015-05-29
## 11 2015-05-20 2015-05-29   2015_22 2015-05-15 2015-05-17 2015-05-29
## 12 2015-05-21 2015-05-29   2015_22 2015-05-15 2015-05-17 2015-05-29
## 13 2015-05-21 2015-05-30   2015_22 2015-05-15 2015-05-17 2015-05-29
## 14 2015-05-17 2015-05-31   2015_23 2015-05-15 2015-05-17 2015-05-30
## 15 2015-05-24 2015-05-31   2015_23 2015-05-15 2015-05-17 2015-05-30
## 16 2015-05-20 2015-06-01   2015_23 2015-05-15 2015-05-17 2015-05-31
## 17 2015-05-22 2015-06-01   2015_23 2015-05-15 2015-05-16 2015-05-31
## 18 2015-05-20 2015-06-01   2015_23 2015-05-15 2015-05-16 2015-05-31
## 19 2015-05-28 2015-06-02   2015_23 2015-05-16 2015-05-17 2015-06-01
## 20 2015-05-23 2015-06-02   2015_23 2015-05-15 2015-05-17 2015-06-01
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## 160 Alive      <NA>
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## 162 Alive      <NA>

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```
mers_korea_2015[1]
```

```

## $linelist
##      id age age_class sex      place_infect reporting_ctry
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## 2   SK_2  63  60-69   F Outside Middle East    South Korea
## 3   SK_3  76  70-79   M Outside Middle East    South Korea
## 4   SK_4  46  40-49   F Outside Middle East    South Korea
## 5   SK_5  50  50-59   M Outside Middle East    South Korea
## 6   SK_6  71  70-79   M Outside Middle East    South Korea
## 7   SK_7  28  20-29   F Outside Middle East    South Korea
## 8   SK_8  46  40-49   F Outside Middle East    South Korea
## 9   SK_9  56  50-59   M Outside Middle East    South Korea
## 10  SK_10 44  40-49   M Outside Middle East      China
## 11  SK_11 79  70-79   F Outside Middle East    South Korea
## 12  SK_12 49  40-49   F Outside Middle East    South Korea
## 13  SK_13 49  40-49   M Outside Middle East    South Korea
## 14  SK_14 35  30-39   M Outside Middle East    South Korea
## 15  SK_15 35  30-39   M Outside Middle East    South Korea
## 16  SK_16 40  40-49   M Outside Middle East    South Korea
## 17  SK_17 45  40-49   M Outside Middle East    South Korea
## 18  SK_18 77  70-79   F Outside Middle East    South Korea
## 19  SK_19 60  60-69   M Outside Middle East    South Korea
## 20  SK_20 40  40-49   M Outside Middle East    South Korea
## 21  SK_21 59  50-59   F Outside Middle East    South Korea
## 22  SK_22 39  30-39   F Outside Middle East    South Korea
## 23  SK_23 73  70-79   M Outside Middle East    South Korea
## 24  SK_24 78  70-79   M Outside Middle East    South Korea

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## 32	SK_32	54	50-59	M Outside Middle East	South Korea
## 33	SK_33	47	40-49	M Outside Middle East	South Korea
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## 90	SK_90	62	60-69	M Outside Middle East	South Korea
## 91	SK_91	49	40-49	M Outside Middle East	South Korea
## 92	SK_92	27	20-29	M Outside Middle East	South Korea
## 93	SK_93	64	60-69	F Outside Middle East	South Korea
## 94	SK_94	71	70-79	M Outside Middle East	South Korea
## 95	SK_95	76	70-79	M Outside Middle East	South Korea
## 96	SK_96	42	40-49	F Outside Middle East	South Korea
## 97	SK_97	46	40-49	M Outside Middle East	South Korea
## 98	SK_98	58	50-59	M Outside Middle East	South Korea
## 99	SK_99	48	40-49	M Outside Middle East	South Korea
## 100	SK_100	32	30-39	F Outside Middle East	South Korea
## 101	SK_101	84	80-89	M Outside Middle East	South Korea
## 102	SK_102	48	40-49	F Outside Middle East	South Korea
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## 104	SK_104	55	50-59	M Outside Middle East	South Korea
## 105	SK_105	63	60-69	M Outside Middle East	South Korea
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## 107	SK_107	64	60-69	F Outside Middle East	South Korea
## 108	SK_108	32	30-39	F Outside Middle East	South Korea
## 109	SK_109	39	30-39	F Outside Middle East	South Korea
## 110	SK_110	57	50-59	F Outside Middle East	South Korea
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## 113	SK_113	64	60-69	M Outside Middle East	South Korea
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## 115	SK_115	77	70-79	M Outside Middle East	South Korea
## 116	SK_116	56	50-59	F Outside Middle East	South Korea
## 117	SK_117	25	20-29	F Outside Middle East	South Korea
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## 140 SK_140	80	80-89	F Outside Middle East	South Korea
## 141 SK_141	42	40-49	M Outside Middle East	South Korea
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## 153 SK_153	61	60-69	F Outside Middle East	South Korea
## 154 SK_154	52	50-59	M Outside Middle East	South Korea
## 155 SK_155	42	40-49	F Outside Middle East	South Korea
## 156 SK_156	66	60-69	M Outside Middle East	South Korea
## 157 SK_157	60	60-69	M Outside Middle East	South Korea
## 158 SK_158	50	50-59	M Outside Middle East	South Korea
## 159 SK_159	49	40-49	M Outside Middle East	South Korea
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## 161 SK_161	79	70-79	F Outside Middle East	South Korea
## 162 SK_162	33	30-39	M Outside Middle East	South Korea
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## 2			Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 3			Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 4			Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 5			365 Yeollin Clinic, Seoul	
## 6			Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 7			Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 8			Seoul Clinic, Asan, Chungcheongnam	
## 9			Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
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## 21			Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 22			Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi	
## 23			Konyang University Hospital, Daejeon	

## 24 Konyang University Hospital, Daejeon  
## 25 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 26 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 27 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 28 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 29 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 30 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 31 Dae Cheong Hospital, Daejeon  
## 32 Konyang University Hospital, Daejeon  
## 33 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 34 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 35 Samsung Medical Center, Seoul  
## 36 Konyang University Hospital, Daejeon  
## 37 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 38 Dae Cheong Hospital, Daejeon  
## 39 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 40 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 41 Samsung Medical Center, Seoul  
## 42 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
## 43 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
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## 53 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi  
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## 78	Samsung Medical Center, Seoul
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## 82	Konyang University Hospital, Daejeon
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## 84	Dae Cheong Hospital, Daejeon
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## 86	Dae Cheong Hospital, Daejeon
## 87	Dae Cheong Hospital, Daejeon
## 88	Samsung Medical Center, Seoul
## 89	Samsung Medical Center, Seoul
## 90	Samsung Medical Center, Seoul
## 91	Samsung Medical Center, Seoul
## 92	Seoul Clinic, Asan, Chungcheongnam
## 93	Hallym University Medical Center
## 94	Hallym University Medical Center
## 95	Konyang University Hospital, Daejeon
## 96	Samsung Medical Center, Seoul
## 97	Samsung Medical Center, Seoul
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## 102	Samsung Medical Center, Seoul
## 103	Samsung Medical Center, Seoul
## 104	Samsung Medical Center, Seoul
## 105	Samsung Medical Center, Seoul
## 106	Konyang University Hospital, Daejeon
## 107	Dae Cheong Hospital, Daejeon
## 108	Hallym University Medical Center
## 109	Samsung Medical Center, Seoul
## 110	Samsung Medical Center, Seoul
## 111	Samsung Medical Center, Seoul
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## 113	Samsung Medical Center, Seoul
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## 115	Samsung Medical Center, Seoul
## 116	Samsung Medical Center, Seoul
## 117	Hallym University Dongtan Sacred Heart Hospital, Hwaseong, Gyeonggi
## 118	Pyeongtaek goodmorning hospital
## 119	Pyeongtaek fraternity hospital
## 120	Samsung Medical Center, Seoul
## 121	Pyeongtaek goodmorning hospital
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## 124	Samsung Medical Center, Seoul
## 125	Samsung Medical Center, Seoul
## 126	Pyeongtaek goodmorning hospital
## 127	Konyang University Hospital, Daejeon
## 128	Dae Cheong Hospital, Daejeon
## 129	Dae Cheong Hospital, Daejeon
## 130	Dae Cheong Hospital, Daejeon
## 131	Samsung Medical Center, Seoul

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## 132 Samsung Medical Center, Seoul
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## 142 Samsung Medical Center, Seoul
## 143 Dae Cheong Hospital, Daejeon
## 144 Hallym University Medical Center
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## 148 Konyang University Hospital, Daejeon
## 149 Samsung Medical Center, Seoul
## 150 Konkuk University hospital
## 151 Samsung Medical Center, Seoul
## 152 Samsung Medical Center, Seoul
## 153 Hallym University Dongtan Sacred Heart Hospital, Hwaseong, Gyeonggi
## 154 Samsung Medical Center, Emergency room,Seoul
## 155 Samsung Medical Center, Emergency room,Seoul
## 156 Samsung Medical Center, Emergency room,Seoul
## 157 Samsung Medical Center, Emergency room,Seoul
## 158 Samsung Medical Center, Emergency room,Seoul
## 159 Hallym University Dongtan Sacred Heart Hospital, Hwaseong, Gyeonggi
## 160 Gangdong Kyuang Hee University Hospital
## 161 Pyeongtaek goodmorning hospital
## 162 Samsung Medical Center, Seoul
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## 14 2015-05-17 2015-05-31      2015_23 2015-05-15 2015-05-17 2015-05-30
## 15 2015-05-24 2015-05-31      2015_23 2015-05-15 2015-05-17 2015-05-30
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## 19 2015-05-28 2015-06-02      2015_23 2015-05-16 2015-05-17 2015-06-01
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## 123 2015-06-07 2015-06-11 2015_24 2015-05-27 2015-05-29 2015-06-11
## 124 2015-06-08 2015-06-11 2015_24 2015-05-28 2015-05-29 2015-06-11
## 125 2015-06-10 2015-06-11 2015_24 2015-05-27 2015-05-27 2015-06-11
## 126 2015-06-07 2015-06-11 2015_24 2015-05-27 2015-05-27 2015-06-11
## 127 2015-06-06 2015-06-12 2015_24 2015-05-28 2015-05-30 2015-06-12
## 128 2015-06-03 2015-06-12 2015_24 2015-05-22 2015-05-28 2015-06-12
## 129 2015-06-10 2015-06-12 2015_24 2015-05-22 2015-05-28 2015-06-12
## 130 2015-06-11 2015-06-12 2015_24 2015-05-22 2015-05-28 2015-06-12

```

```

## 131 2015-06-07 2015-06-12      2015_24 2015-05-27 2015-05-27 2015-06-12
## 132 2015-06-08 2015-06-12      2015_24 2015-05-27 2015-05-28 2015-06-12
## 133 2015-06-08 2015-06-12      2015_24 2015-06-05 2015-06-06 2015-06-12
## 134 2015-06-04 2015-06-12      2015_24 2015-05-27 2015-05-28 2015-06-12
## 135 2015-06-08 2015-06-12      2015_24 2015-05-29 2015-05-29 2015-06-12
## 136 2015-06-01 2015-06-12      2015_24 2015-05-27 2015-05-27 2015-06-12
## 137 2015-06-11 2015-06-12      2015_24 2015-05-27 2015-05-29 2015-06-12
## 138 2015-06-10 2015-06-12      2015_24 2015-05-27 2015-05-27 2015-06-12
## 139 2015-06-05 2015-06-13      2015_24 2015-05-27 2015-05-29 2015-06-13
## 140 2015-06-10 2015-06-13      2015_24 2015-05-27 2015-05-28 2015-06-13
## 141 2015-06-09 2015-06-13      2015_24 2015-05-27 2015-05-27 2015-06-13
## 142 2015-06-05 2015-06-13      2015_24 2015-05-27 2015-05-29 2015-06-13
## 143 2015-06-02 2015-06-13      2015_24 2015-05-25 2015-05-28 2015-06-13
## 144 <NA> 2015-06-13          2015_24 2015-05-27 2015-05-29 2015-06-13
## 145 2015-06-10 2015-06-13      2015_24 2015-06-05 2015-06-06 2015-06-13
## 146 2015-06-13 2015-06-14      2015_25 2015-05-27 2015-05-27 2015-06-14
## 147 2015-06-10 2015-06-14      2015_25 2015-06-08 2015-06-08 2015-06-14
## 148 2015-06-05 2015-06-14      2015_25 2015-06-03 2015-06-03 2015-06-14
## 149 2015-06-04 2015-06-14      2015_25 2015-05-22 2015-05-28 2015-06-14
## 150 2015-06-11 2015-06-14      2015_25 2015-06-06 2015-06-06 2015-06-14
## 151 2015-06-05 2015-06-15      2015_25 2015-05-27 2015-05-28 2015-06-15
## 152 2015-06-06 2015-06-15      2015_25 2015-05-27 2015-05-27 2015-06-15
## 153 2015-06-15 2015-06-15      2015_25 2015-06-05 2015-06-05 2015-06-15
## 154 2015-06-13 2015-06-15      2015_25 2015-05-27 2015-05-28 2015-06-15
## 155 <NA> 2015-06-16          2015_25 2015-05-26 2015-05-29 2015-06-16
## 156 <NA> 2015-06-16          2015_25 2015-05-27 2015-05-27 2015-06-16
## 157 <NA> 2015-06-16          2015_25 2015-05-27 2015-05-27 2015-06-16
## 158 <NA> 2015-06-16          2015_25 2015-05-27 2015-05-27 2015-06-16
## 159 <NA> 2015-06-16          2015_25 2015-05-27 2015-05-29 2015-06-16
## 160 <NA> 2015-06-16          2015_25 2015-06-05 2015-06-05 2015-06-16
## 161 <NA> 2015-06-16          2015_25 2015-05-27 2015-05-27 2015-06-16
## 162 <NA> 2015-06-16          2015_25 <NA> <NA> 2015-06-16

##     outcome    dt_death
## 1     Alive <NA>
## 2     Alive <NA>
## 3   Dead 2015-06-04
## 4     Alive <NA>
## 5     Alive <NA>
## 6   Dead 2015-06-01
## 7     Alive <NA>
## 8     Alive <NA>
## 9     Alive <NA>
## 10    Alive <NA>
## 11    Alive <NA>
## 12    Alive <NA>
## 13    Alive <NA>
## 14    Alive <NA>
## 15    Alive <NA>
## 16    Alive <NA>
## 17    Alive <NA>
## 18    Alive <NA>
## 19    Alive <NA>
## 20    Alive <NA>
## 21    Alive <NA>

```

```
## 22 Alive      <NA>
## 23 Dead       <NA>
## 24 Dead       <NA>
## 25 Dead 2015-06-01
## 26 Alive      <NA>
## 27 Alive      <NA>
## 28 Dead       <NA>
## 29 Alive      <NA>
## 30 Alive      <NA>
## 31 Alive      <NA>
## 32 Alive      <NA>
## 33 Alive      <NA>
## 34 Alive      <NA>
## 35 Alive      <NA>
## 36 Dead 2015-06-03
## 37 Alive      <NA>
## 38 Dead       <NA>
## 39 Alive      <NA>
## 40 Alive      <NA>
## 41 Alive      <NA>
## 42 Alive      <NA>
## 43 Alive      <NA>
## 44 Alive      <NA>
## 45 Alive      <NA>
## 46 Alive      <NA>
## 47 Dead 2015-06-08
## 48 Alive      <NA>
## 49 Alive      <NA>
## 50 Alive      <NA>
## 51 Dead       <NA>
## 52 Alive      <NA>
## 53 Alive      <NA>
## 54 Alive      <NA>
## 55 Alive      <NA>
## 56 Alive      <NA>
## 57 Alive      <NA>
## 58 Alive      <NA>
## 59 Alive      <NA>
## 60 Alive      <NA>
## 61 Alive      <NA>
## 62 Alive      <NA>
## 63 Alive      <NA>
## 64 Dead 2015-06-05
## 65 Alive      <NA>
## 66 Alive      <NA>
## 67 Alive      <NA>
## 68 Alive      <NA>
## 69 Alive      <NA>
## 70 Alive      <NA>
## 71 Alive      <NA>
## 72 Alive      <NA>
## 73 Alive      <NA>
## 74 Alive      <NA>
## 75 Alive      <NA>
```

```
## 76     Dead 2015-06-10
## 77     Alive <NA>
## 78     Alive <NA>
## 79     Alive <NA>
## 80     Alive <NA>
## 81     Dead <NA>
## 82     Alive <NA>
## 83     Dead 2015-06-11
## 84     Dead 2015-06-08
## 85     Alive <NA>
## 86     Alive <NA>
## 87     Alive <NA>
## 88     Alive <NA>
## 89     Alive <NA>
## 90     Dead 2015-06-10
## 91     Alive <NA>
## 92     Alive <NA>
## 93     Alive <NA>
## 94     Alive <NA>
## 95     Alive <NA>
## 96     Alive <NA>
## 97     Alive <NA>
## 98     Dead <NA>
## 99     Alive <NA>
## 100    Alive <NA>
## 101    Alive <NA>
## 102    Alive <NA>
## 103    Alive <NA>
## 104    Alive <NA>
## 105    Alive <NA>
## 106    Alive <NA>
## 107    Alive <NA>
## 108    Alive <NA>
## 109    Alive <NA>
## 110    Alive <NA>
## 111    Alive <NA>
## 112    Alive <NA>
## 113    Alive <NA>
## 114    Alive <NA>
## 115    Alive <NA>
## 116    Alive <NA>
## 117    Alive <NA>
## 118    Dead <NA>
## 119    Alive <NA>
## 120    Alive <NA>
## 121    Alive <NA>
## 122    Alive <NA>
## 123    Dead <NA>
## 124    Alive <NA>
## 125    Alive <NA>
## 126    Alive <NA>
## 127    Alive <NA>
## 128    Alive <NA>
## 129    Alive <NA>
```

```

## 130 Alive      <NA>
## 131 Alive      <NA>
## 132 Alive      <NA>
## 133 Alive      <NA>
## 134 Alive      <NA>
## 135 Alive      <NA>
## 136 Alive      <NA>
## 137 Alive      <NA>
## 138 Alive      <NA>
## 139 Alive      <NA>
## 140 Alive      <NA>
## 141 Alive      <NA>
## 142 Alive      <NA>
## 143 Alive      <NA>
## 144 Alive      <NA>
## 145 Alive      <NA>
## 146 Alive      <NA>
## 147 Alive      <NA>
## 148 Alive      <NA>
## 149 Alive      <NA>
## 150 Alive      <NA>
## 151 Alive      <NA>
## 152 Alive      <NA>
## 153 Alive      <NA>
## 154 Alive      <NA>
## 155 Alive      <NA>
## 156 Alive      <NA>
## 157 Alive      <NA>
## 158 Alive      <NA>
## 159 Alive      <NA>
## 160 Alive      <NA>
## 161 Alive      <NA>
## 162 Alive      <NA>

# I decided to create variables for each data set
linelist <- mers_korea_2015$linelist
contacts <- mers_korea_2015$contacts

```

The “sub-items” within `mers_korea_2015` are different data sets within our project. Play with them! Open them, plot graphs, get your hands dirty. The questions won’t always tell you what data set to use! So know what you’re starting with, to make sure that you can

## Analyses

### Getting my hands dirty with the data

```

# creating a summarized data frame
admissions_summary <- linelist %>%
  group_by(dt_report, sex) %>%
  summarise(
    count = n(),

```

```

    mean_age = mean(age, na.rm= TRUE),
    .groups = 'drop'
)
admissions_summary

```

```

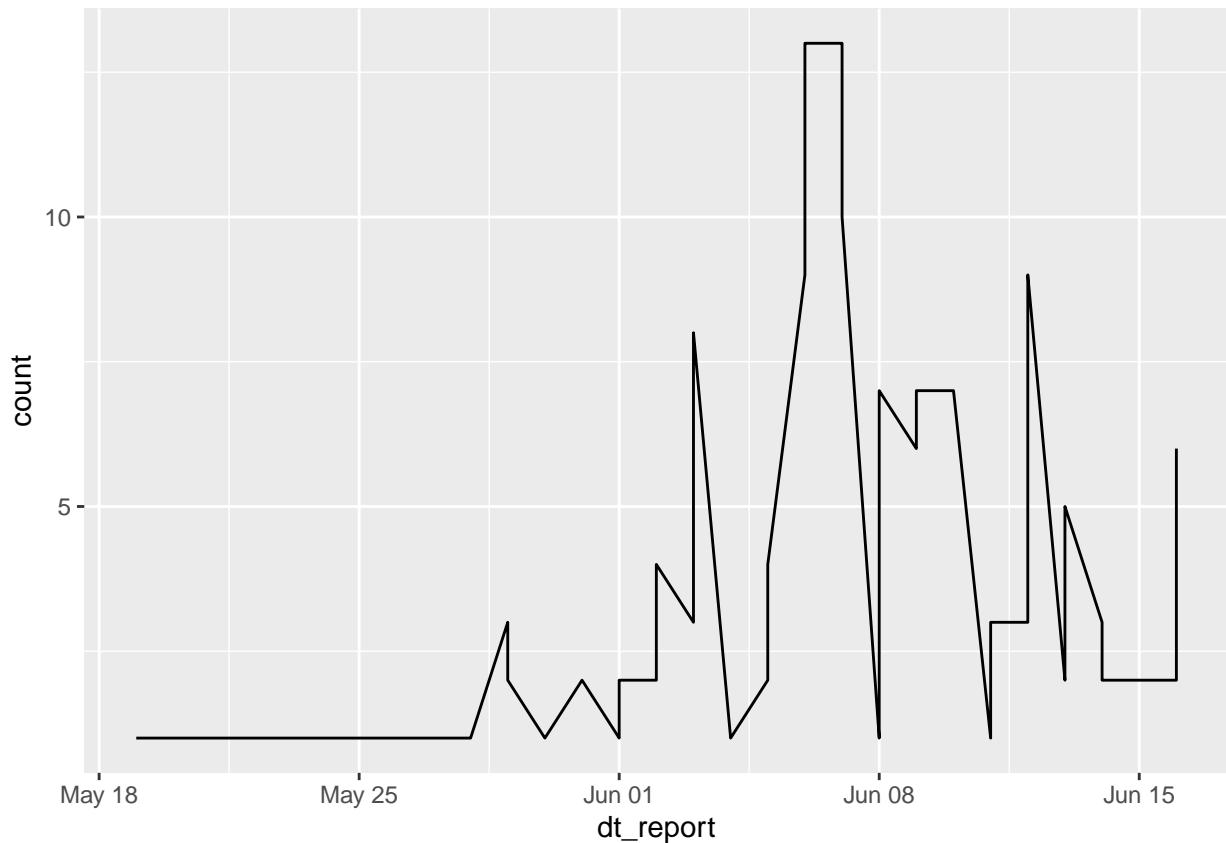
## # A tibble: 42 x 4
##   dt_report sex   count mean_age
##   <date>     <fct> <int>     <dbl>
## 1 2015-05-19 M      1      68
## 2 2015-05-20 F      1      63
## 3 2015-05-20 M      1      76
## 4 2015-05-26 F      1      46
## 5 2015-05-27 M      1      50
## 6 2015-05-28 F      1      28
## 7 2015-05-28 M      1      71
## 8 2015-05-29 F      3      58
## 9 2015-05-29 M      2      50
## 10 2015-05-30 M     1      49
## # i 32 more rows

```

```

ggplot(admissions_summary) +
  geom_line(aes(x=dt_report, y=count)) # first attempt at a line chart

```



```

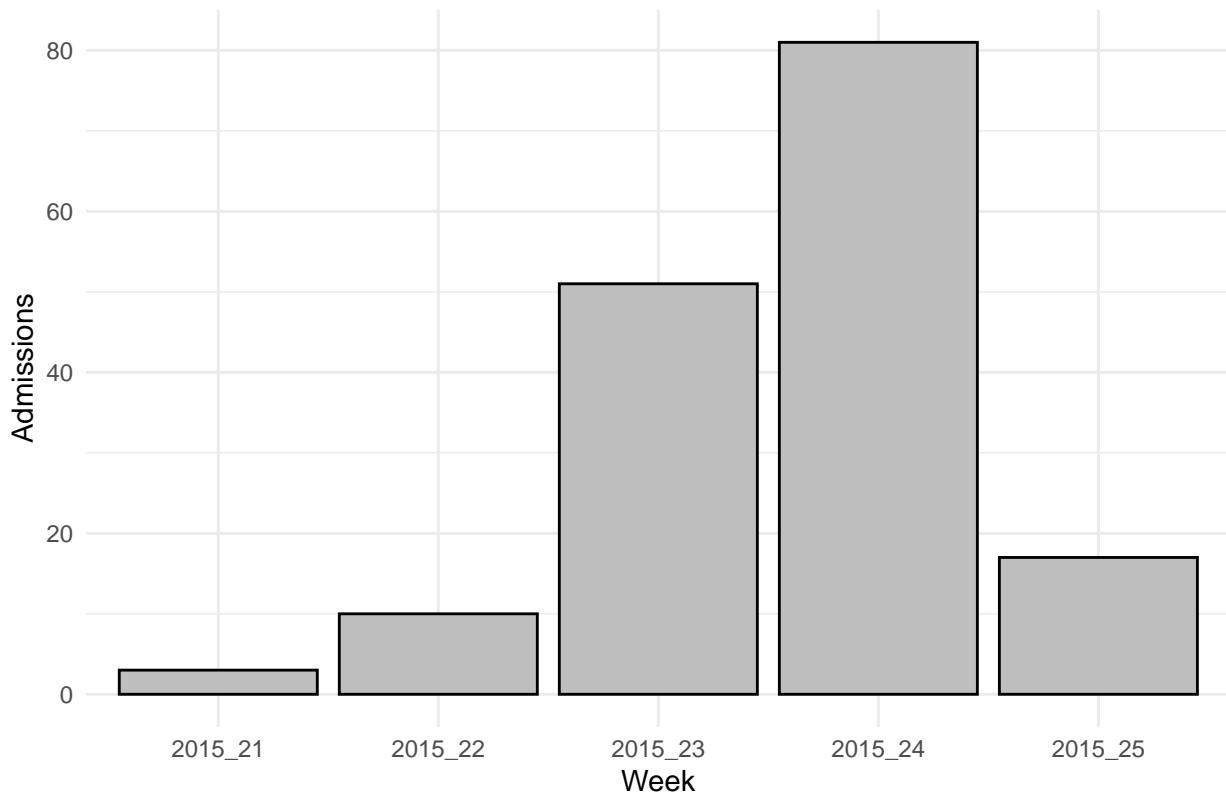
# Pivot table by ages per date of report
pivot_age <- admissions_summary %>%
  pivot_wider(
    id_cols = dt_report, # columns
    names_from = sex, # names of the column
    values_from = mean_age, # values
    names_prefix = "mean_age_" # optional
  )
pivot_age

## # A tibble: 24 x 3
##   dt_report  mean_age_M mean_age_F
##   <date>      <dbl>      <dbl>
## 1 2015-05-19     68        NA
## 2 2015-05-20     76        63
## 3 2015-05-26     NA        46
## 4 2015-05-27     50        NA
## 5 2015-05-28     71        28
## 6 2015-05-29     50        58
## 7 2015-05-30     49        NA
## 8 2015-05-31     35        NA
## 9 2015-06-01    42.5       77
## 10 2015-06-02    62.8       49
## # i 14 more rows

# count of admissions by the number of week
admissions_by_week <- ggplot(linelist) +
  geom_bar(aes(x=week_report), fill="gray", color="black") + # color is used for the outline
  theme_minimal() +
  labs(
    title="MERS admissions by week",
    x="Week",
    y="Admissions"
  )
admissions_by_week

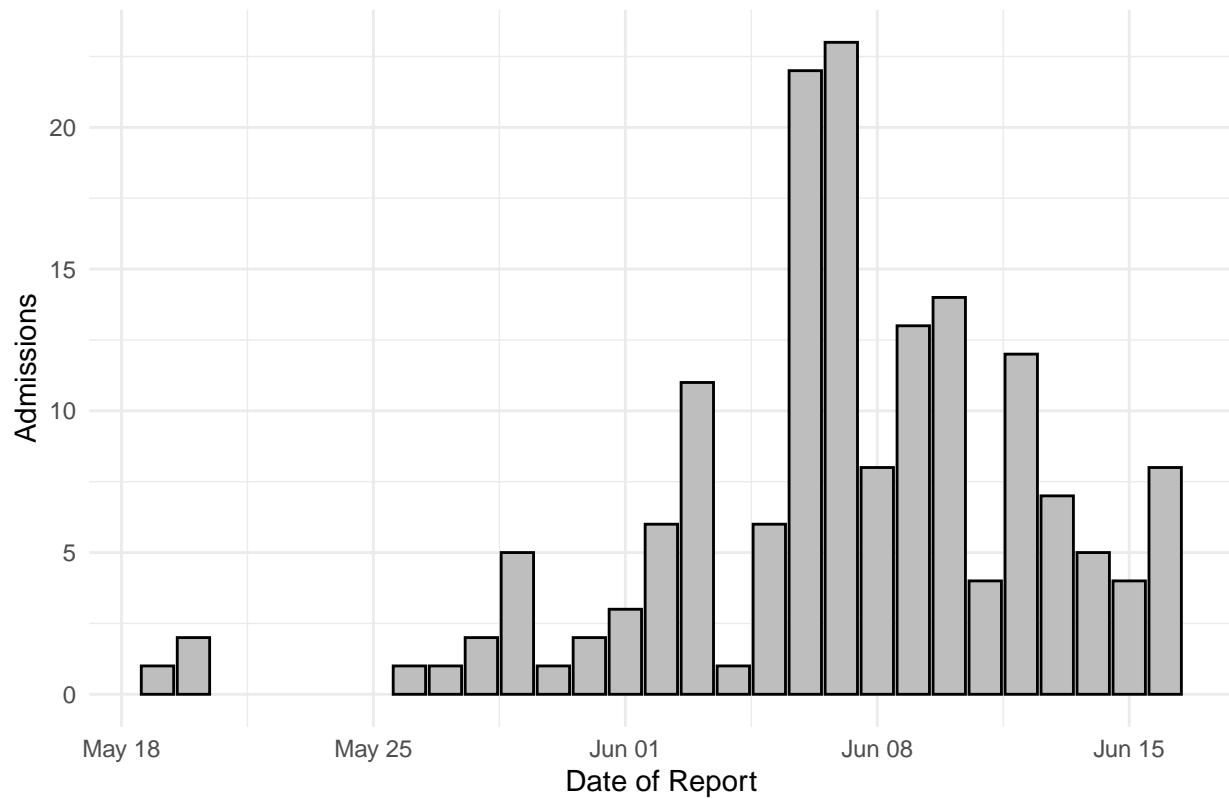
```

## MERS admissions by week

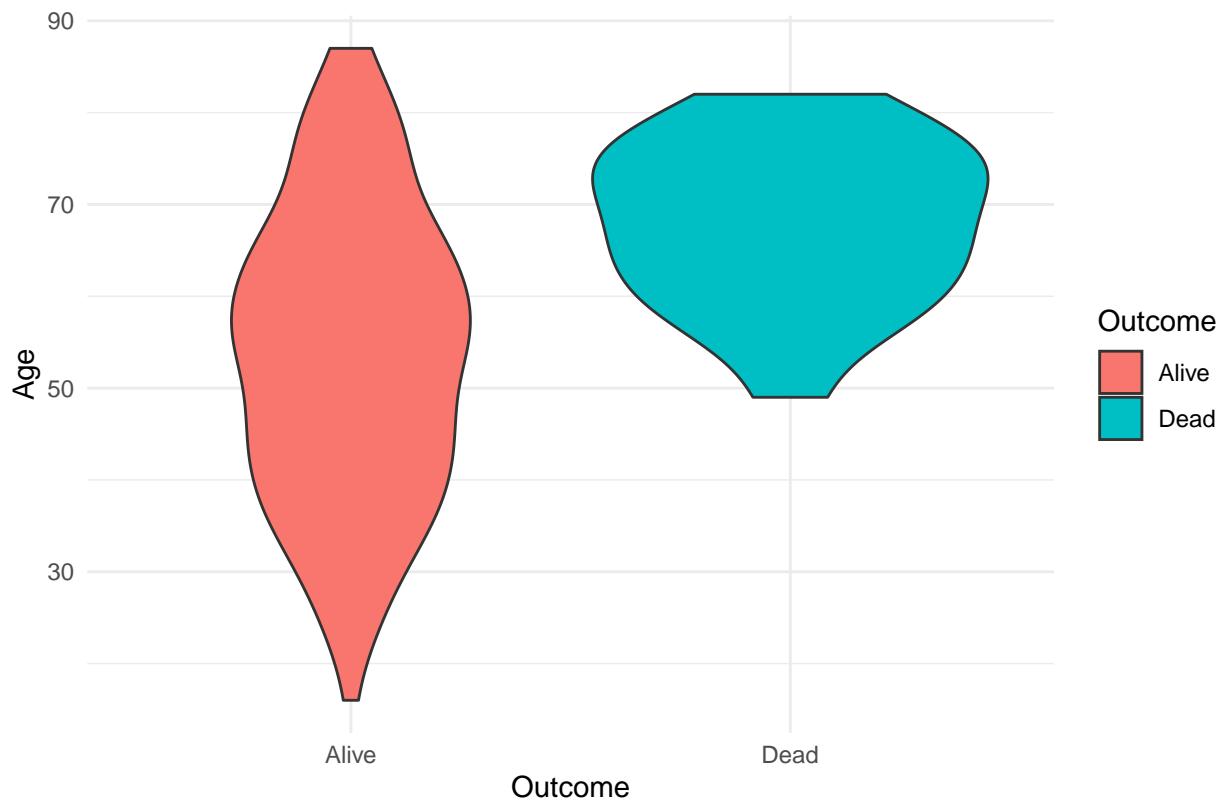


```
# admissions by date of report
admissions_by_dt_report <- ggplot(linelist) +
  geom_bar(aes(x=dt_report), fill="gray", color="black") + # color is used for the outline
  theme_minimal() +
  labs(
    title="MERS admissions by date of report",
    x="Date of Report",
    y="Admissions"
  )
admissions_by_dt_report
```

## MERS admissions by date of report



```
# first approach to understand the average age of the two populations
age_by_outcome <- ggplot(linelist) +
  geom_violin(aes(x=outcome, y=age, fill=outcome)) +
  theme_minimal() +
  labs(title="",
       x="Outcome", y="Age", fill="Outcome")
age_by_outcome
```



```
## ERROR HERE!! Needs reworking
# count of admissions by week - line chart
# weekly_cases <- linelist %>%
#count(dt_report, name="weekly_count") %>%
#filter(!is.na(dt_report)) %>% # to remove NAs
#mutate(
# dt_report = as.numeric(as.character(dt_report)),
# weekly_count = as.numeric(weekly_count)) # Convierte el integer a numeric

#ggplot(weekly_cases) +
# geom_line(aes(x=dt_report, y=weekly_cases))
```

## 1. Demographics

**Q:** Calculate the average age for patients with the outcome “Dead” and patients with the outcome “Alive.”

A: The average age of this sample was 55 years old. Dead cases: 68 years old; Alive cases: 53.6 years old.

```
# age distribution (not grouped)
age_stats <- linelist %>%
  summarise(
    count = n(),
    mean_age = mean(age, na.rm= TRUE),
    median_age = median(age, na.rm = TRUE),
```

```

    sd_age = sd(age, na.rm = TRUE),
    .groups = 'drop'
)
age_stats

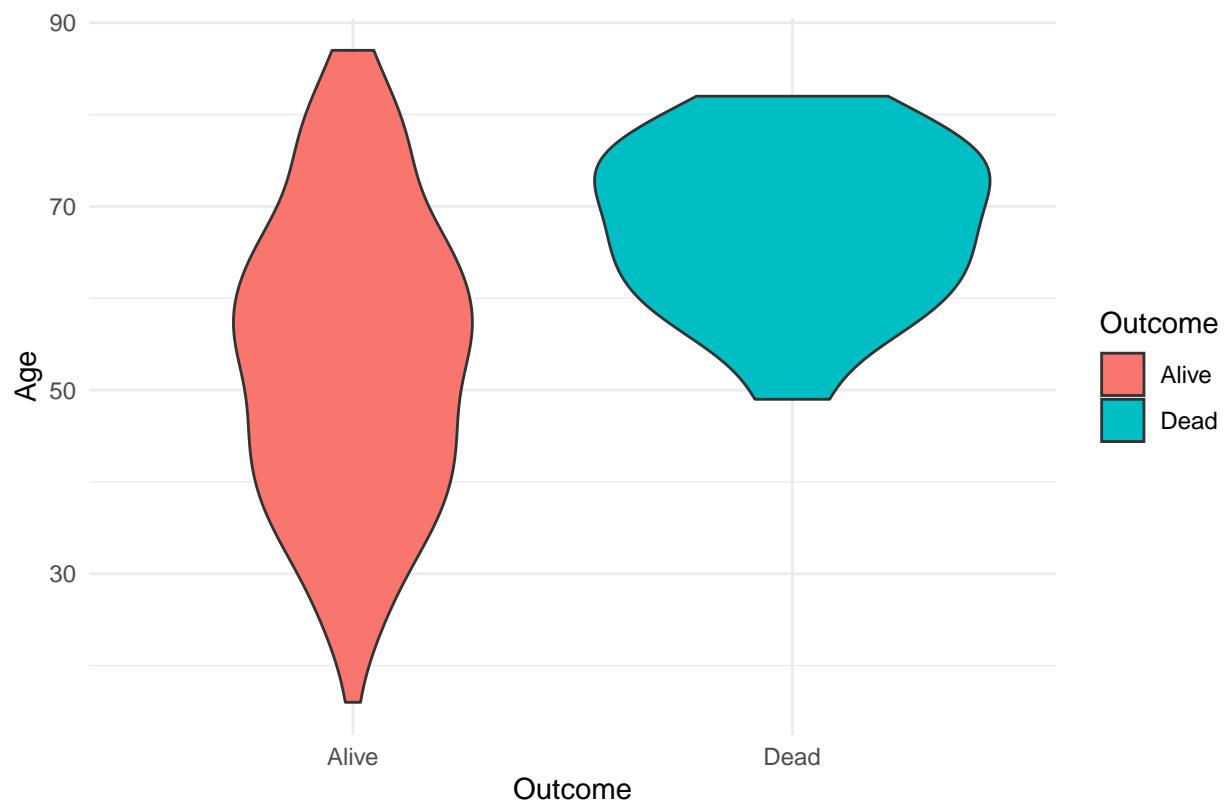
##   count mean_age median_age sd_age
## 1    162     55.32099      56    15.814

# summary table (grouped by outcome)
outcome_stats <- linelist %>%
  group_by(outcome) %>%
  summarise(
    count = n(),
    mean_age = mean(age, na.rm= TRUE),
    median_age = median(age, na.rm = TRUE),
    sd_age = sd(age, na.rm = TRUE),
    .groups = 'drop'
)
outcome_stats

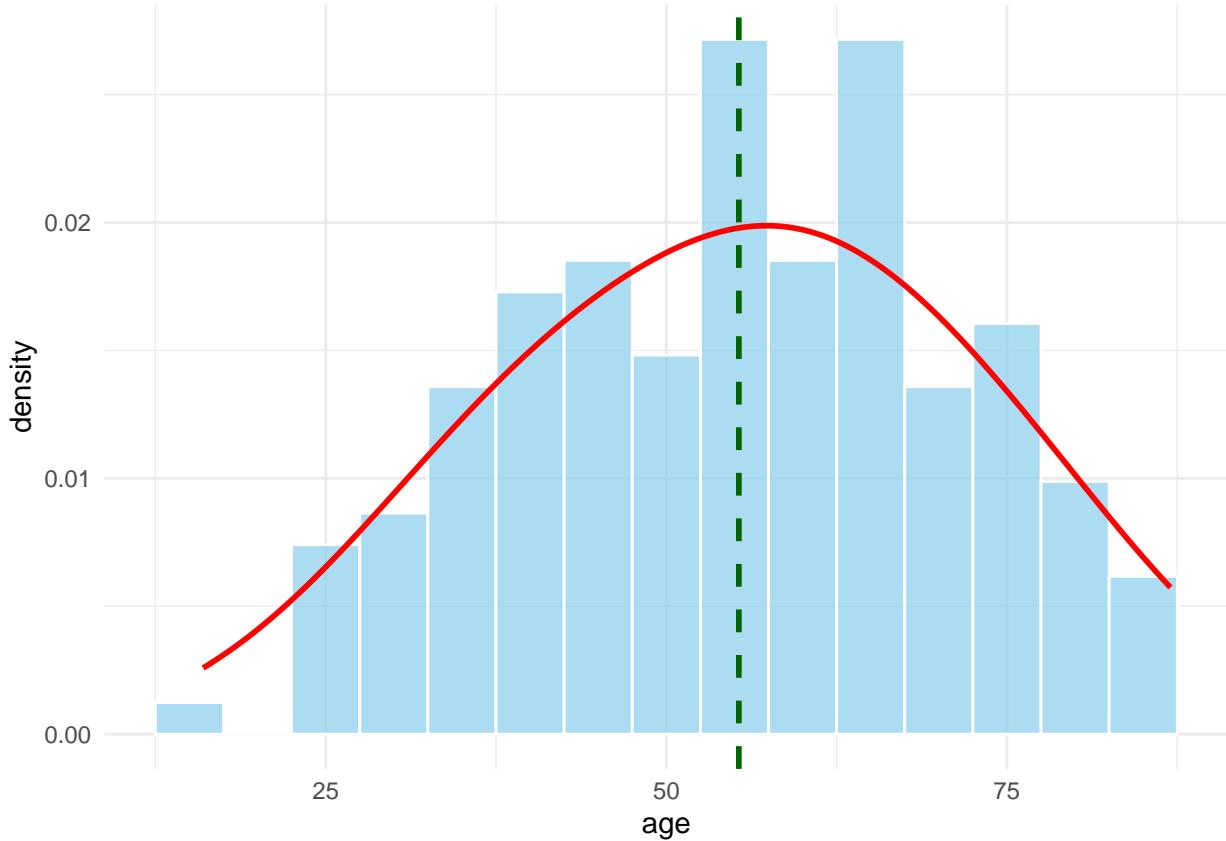
## # A tibble: 2 x 5
##   outcome count mean_age median_age sd_age
##   <fct>   <int>     <dbl>      <dbl>   <dbl>
## 1 Alive     143      53.6       55    15.8
## 2 Dead      19       68.1       68    8.90

# ggplot for the average age of the two populations
age_by_outcome <- ggplot(linelist) +
  geom_violin(aes(x=outcome, y=age, fill=outcome)) +
  theme_minimal() +
  labs(title="",
       x="Outcome", y="Age", fill="Outcome")
age_by_outcome

```



```
# Age histogram + normal distribution + mean age
ggplot(linelist) +
  geom_histogram(
    aes(x = age, y = after_stat(density)), # y = density for overlay
    binwidth = 5, fill = "skyblue", color = "white", alpha = 0.7 ) +
  geom_density(
    aes(x = age),
    color = "red",
    linewidth = 1,
    adjust = 2
  ) +
  geom_vline( # Average age as vertical line
    xintercept = age_stats$mean_age,
    color = "darkgreen",
    linetype = "dashed",
    linewidth = 1 ) +
  theme_minimal()
```



**Q:** Based on first impressions, does age seem to be a determinant of mortality in this outbreak? How might the social status of the elderly in South Korea contribute to exposure risks (e.g., care homes, hospital frequency)?

On first impressions, age seems to be a determinant of mortality in the 2015 MERS outbreak in South Korea. I am applying two statistical metrics for this analysis.

**Mean:** The average age of the dead group is higher than for the alive group (D: 68 yo; A: 53.6 yo). There is a gap of 14.4 years between both averages (68 vs 53.6).

**Standard Deviation:** The standard deviation is 56% lower in the Dead group with respect to the Alive group (D: 8.9; A: 15.8). This shows that the data points for the Dead group are closer to the mean.

**More context:** The deceased group represents 11.7% of the data set. It's also interesting that the 3 super spreaders are males with an average age of 35 yo (more on the super-spreader section).

Draft:

Elders are highly valued in Korea. “At the core of the Korean family system is respect for elders and filial piety. Elders are valued for their experience and wisdom; they are consulted for advice, support, and resolution of family conflicts.” (Lee YM, Holm K. Family Relationships and Depression among Elderly Korean Immigrants. ISRN Nurs. 2011;2011:429249. doi: 10.5402/2011/429249. Epub 2011 Jun 16. PMID: 22007321; PMCID: PMC3169852.)

**Q:** Name two social factors or behaviours you would expect from the sampled demographic that would increase the likelihood of exposure to MERS-CoV (particularly for the elderly population). An example could be “hospital hopping” where patients visit multiple hospitals to see different medical professionals.

Draft:

Too many cases in the same hospital (emergency rooms where beds are only separated by curtains) (PTSM)  
An emergency room visit for another medical condition might have exposed the cases.

```
# understanding the elderly population's behavior
elderly <- linelist %>%
  filter(age >= 65)
elderly
```

```
##      id age age_class sex      place_infect reporting_ctry
## 1   SK_1  68   60-69   M    Middle East    South Korea
## 2   SK_3  76   70-79   M Outside Middle East    South Korea
## 3   SK_6  71   70-79   M Outside Middle East    South Korea
## 4  SK_11  79   70-79   F Outside Middle East    South Korea
## 5  SK_18  77   70-79   F Outside Middle East    South Korea
## 6  SK_23  73   70-79   M Outside Middle East    South Korea
## 7  SK_24  78   70-79   M Outside Middle East    South Korea
## 8  SK_29  77   70-79   F Outside Middle East    South Korea
## 9  SK_31  69   60-69   M Outside Middle East    South Korea
## 10 SK_36  82   80-89   M Outside Middle East    South Korea
## 11 SK_41  70   70-79   F Outside Middle East    South Korea
## 12 SK_45  65   60-69   M Outside Middle East    South Korea
## 13 SK_47  68   60-69   F Outside Middle East    South Korea
## 14 SK_49  75   70-79   M Outside Middle East    South Korea
## 15 SK_50  81   80-89   F Outside Middle East    South Korea
## 16 SK_51  72   70-79   F Outside Middle East    South Korea
## 17 SK_64  75   70-79   M Outside Middle East    South Korea
## 18 SK_73  65   60-69   F Outside Middle East    South Korea
## 19 SK_74  71   70-79   M Outside Middle East    South Korea
## 20 SK_76  75   70-79   F Outside Middle East    South Korea
## 21 SK_82  83   80-89   F Outside Middle East    South Korea
## 22 SK_83  65   60-69   M Outside Middle East    South Korea
## 23 SK_84  80   80-89   M Outside Middle East    South Korea
## 24 SK_85  66   60-69   F Outside Middle East    South Korea
## 25 SK_86  76   70-79   F Outside Middle East    South Korea
## 26 SK_87  78   70-79   F Outside Middle East    South Korea
## 27 SK_94  71   70-79   M Outside Middle East    South Korea
## 28 SK_95  76   70-79   M Outside Middle East    South Korea
## 29 SK_101 84   80-89   M Outside Middle East    South Korea
## 30 SK_103 66   60-69   M Outside Middle East    South Korea
## 31 SK_115 77   70-79   M Outside Middle East    South Korea
## 32 SK_118 67   60-69   F Outside Middle East    South Korea
## 33 SK_120 75   70-79   M Outside Middle East    South Korea
## 34 SK_121 77   70-79   M Outside Middle East    South Korea
## 35 SK_123 65   60-69   M Outside Middle East    South Korea
## 36 SK_126 70   70-79   F Outside Middle East    South Korea
## 37 SK_127 76   70-79   F Outside Middle East    South Korea
## 38 SK_128 87   80-89   M Outside Middle East    South Korea
## 39 SK_129 86   80-89   M Outside Middle East    South Korea
## 40 SK_130 65   60-69   F Outside Middle East    South Korea
## 41 SK_133 70   70-79   M Outside Middle East    South Korea
## 42 SK_134 67   60-69   F Outside Middle East    South Korea
## 43 SK_136 67   60-69   M Outside Middle East    South Korea
## 44 SK_140 80   80-89   F Outside Middle East    South Korea
```

```

## 45 SK_144 71    70-79   M Outside Middle East   South Korea
## 46 SK_149 84    80-89   F Outside Middle East   South Korea
## 47 SK_152 66    60-69   M Outside Middle East   South Korea
## 48 SK_156 66    60-69   M Outside Middle East   South Korea
## 49 SK_161 79    70-79   F Outside Middle East   South Korea
##                                     loc_hosp  dt_onset  dt_report
## 1 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi 2015-05-11 2015-05-19
## 2 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi 2015-05-20 2015-05-20
## 3 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi 2015-05-24 2015-05-28
## 4 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi 2015-05-20 2015-05-29
## 5 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi 2015-05-20 2015-06-01
## 6 Konyang University Hospital, Daejeon 2015-05-31 2015-06-02
## 7 Konyang University Hospital, Daejeon 2015-05-31 2015-06-02
## 8 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi <NA> 2015-06-03
## 9 Konyang University Hospital, Daejeon 2015-06-01 2015-06-03
## 10 Konyang University Hospital, Daejeon <NA> 2015-06-04
## 11 Samsung Medical Center, Seoul 2015-05-31 2015-06-05
## 12 Konyang University Hospital, Daejeon 2015-06-01 2015-06-06
## 13 Samsung Medical Center, Seoul 2015-06-02 2015-06-06
## 14 Samsung Medical Center, Seoul <NA> 2015-06-06
## 15 Samsung Medical Center, Seoul <NA> 2015-06-06
## 16 Pyeongtaek St. Mary, Hospital, Pyeongtaek, Gyeonggi 2015-06-02 2015-06-06
## 17 Samsung Medical Center, Seoul 2015-06-04 2015-06-06
## 18 Samsung Medical Center, Seoul 2015-06-01 2015-06-07
## 19 Samsung Medical Center, Seoul 2015-06-01 2015-06-07
## 20 Samsung Medical Center, Seoul 2015-06-05 2015-06-07
## 21 Konyang University Hospital, Daejeon 2015-06-01 2015-06-07
## 22 Konyang University Hospital, Daejeon 2015-06-01 2015-06-07
## 23 Dae Cheong Hospital, Daejeon 2015-06-05 2015-06-07
## 24 Dae Cheong Hospital, Daejeon 2015-06-01 2015-06-07
## 25 Dae Cheong Hospital, Daejeon 2015-06-02 2015-06-07
## 26 Dae Cheong Hospital, Daejeon 2015-06-04 2015-06-07
## 27 Hallym University Medical Center 2015-06-02 2015-06-08
## 28 Konyang University Hospital, Daejeon <NA> 2015-06-08
## 29 Samsung Medical Center, Seoul 2015-06-01 2015-06-09
## 30 Samsung Medical Center, Seoul 2015-06-06 2015-06-09
## 31 Samsung Medical Center, Seoul 2015-06-05 2015-06-10
## 32 Pyeongtaek goodmorning hospital 2015-06-06 2015-06-10
## 33 Samsung Medical Center, Seoul 2015-06-03 2015-06-10
## 34 Pyeongtaek goodmorning hospital <NA> 2015-06-10
## 35 Samsung Medical Center, Seoul 2015-06-07 2015-06-11
## 36 Pyeongtaek goodmorning hospital 2015-06-07 2015-06-11
## 37 Konyang University Hospital, Daejeon 2015-06-06 2015-06-12
## 38 Dae Cheong Hospital, Daejeon 2015-06-03 2015-06-12
## 39 Dae Cheong Hospital, Daejeon 2015-06-10 2015-06-12
## 40 Dae Cheong Hospital, Daejeon 2015-06-11 2015-06-12
## 41 Samsung Medical Center, Seoul 2015-06-08 2015-06-12
## 42 Samsung Medical Center, Seoul 2015-06-04 2015-06-12
## 43 Samsung Medical Center, Seoul 2015-06-01 2015-06-12
## 44 Samsung Medical Center, Seoul 2015-06-10 2015-06-13
## 45 Hallym University Medical Center <NA> 2015-06-13
## 46 Samsung Medical Center, Seoul 2015-06-04 2015-06-14
## 47 Samsung Medical Center, Seoul 2015-06-06 2015-06-15
## 48 Samsung Medical Center, Emergency room,Seoul <NA> 2015-06-16

```

```

## 49                  Pyeongtaek goodmorning hospital      <NA> 2015-06-16
##   week_report dt_start_exp dt_end_exp    dt_diag outcome dt_death
## 1 2015_21     2015-04-18 2015-05-04 2015-05-20 Alive   <NA>
## 2 2015_21     2015-05-16 2015-05-16 2015-05-21 Dead   2015-06-04
## 3 2015_22     2015-05-15 2015-05-17 2015-05-28 Dead   2015-06-01
## 4 2015_22     2015-05-15 2015-05-17 2015-05-29 Alive   <NA>
## 5 2015_23     2015-05-15 2015-05-16 2015-05-31 Alive   <NA>
## 6 2015_23     2015-05-28 2015-05-30 2015-06-01 Dead   <NA>
## 7 2015_23     2015-05-28 2015-05-30 2015-06-01 Dead   <NA>
## 8 2015_23     2015-05-15 2015-05-17 2015-06-02 Alive   <NA>
## 9 2015_23     2015-05-28 2015-05-30 2015-06-04 Alive   <NA>
## 10 2015_23    2015-05-28 2015-05-28 2015-06-04 Dead   2015-06-03
## 11 2015_23    2015-05-27 2015-05-27 2015-06-05 Alive   <NA>
## 12 2015_23    2015-05-28 2015-05-30 2015-06-06 Alive   <NA>
## 13 2015_23    2015-05-27 2015-05-27 2015-06-06 Dead   2015-06-08
## 14 2015_23    2015-05-27 2015-05-27 2015-06-06 Alive   <NA>
## 15 2015_23    2015-05-27 2015-05-27 2015-06-06 Alive   <NA>
## 16 2015_23    2015-05-12 2015-05-21 2015-06-06 Dead   <NA>
## 17 2015_23    2015-05-27 2015-05-29 2015-06-06 Dead   2015-06-05
## 18 2015_24    2015-05-27 2015-05-27 2015-06-07 Alive   <NA>
## 19 2015_24    2015-05-27 2015-05-27 2015-06-07 Alive   <NA>
## 20 2015_24    2015-05-27 2015-05-28 2015-06-07 Dead   2015-06-10
## 21 2015_24    2015-05-28 2015-05-30 2015-06-07 Alive   <NA>
## 22 2015_24    2015-05-28 2015-05-30 2015-06-07 Dead   2015-06-11
## 23 2015_24    2015-05-25 2015-05-28 2015-06-07 Dead   2015-06-08
## 24 2015_24    2015-05-25 2015-05-28 2015-06-07 Alive   <NA>
## 25 2015_24    2015-05-25 2015-05-28 2015-06-07 Alive   <NA>
## 26 2015_24    2015-05-25 2015-05-28 2015-06-07 Alive   <NA>
## 27 2015_24    2015-05-27 2015-05-28 2015-06-08 Alive   <NA>
## 28 2015_24          <NA>      <NA> 2015-06-08 Alive   <NA>
## 29 2015_24    2015-05-27 2015-05-27 2015-06-09 Alive   <NA>
## 30 2015_24    2015-05-27 2015-05-27 2015-06-09 Alive   <NA>
## 31 2015_24    2015-05-27 2015-05-27 2015-06-10 Alive   <NA>
## 32 2015_24    2015-05-25 2015-05-27 2015-06-10 Dead   <NA>
## 33 2015_24    2015-05-27 2015-05-29 2015-06-10 Alive   <NA>
## 34 2015_24    2015-05-25 2015-05-27 2015-06-10 Alive   <NA>
## 35 2015_24    2015-05-27 2015-05-29 2015-06-11 Dead   <NA>
## 36 2015_24    2015-05-27 2015-05-27 2015-06-11 Alive   <NA>
## 37 2015_24    2015-05-28 2015-05-30 2015-06-12 Alive   <NA>
## 38 2015_24    2015-05-22 2015-05-28 2015-06-12 Alive   <NA>
## 39 2015_24    2015-05-22 2015-05-28 2015-06-12 Alive   <NA>
## 40 2015_24    2015-05-22 2015-05-28 2015-06-12 Alive   <NA>
## 41 2015_24    2015-06-05 2015-06-06 2015-06-12 Alive   <NA>
## 42 2015_24    2015-05-27 2015-05-28 2015-06-12 Alive   <NA>
## 43 2015_24    2015-05-27 2015-05-27 2015-06-12 Alive   <NA>
## 44 2015_24    2015-05-27 2015-05-28 2015-06-13 Alive   <NA>
## 45 2015_24    2015-05-27 2015-05-29 2015-06-13 Alive   <NA>
## 46 2015_25    2015-05-22 2015-05-28 2015-06-14 Alive   <NA>
## 47 2015_25    2015-05-27 2015-05-27 2015-06-15 Alive   <NA>
## 48 2015_25    2015-05-27 2015-05-27 2015-06-16 Alive   <NA>
## 49 2015_25    2015-05-27 2015-05-27 2015-06-16 Alive   <NA>

```

```

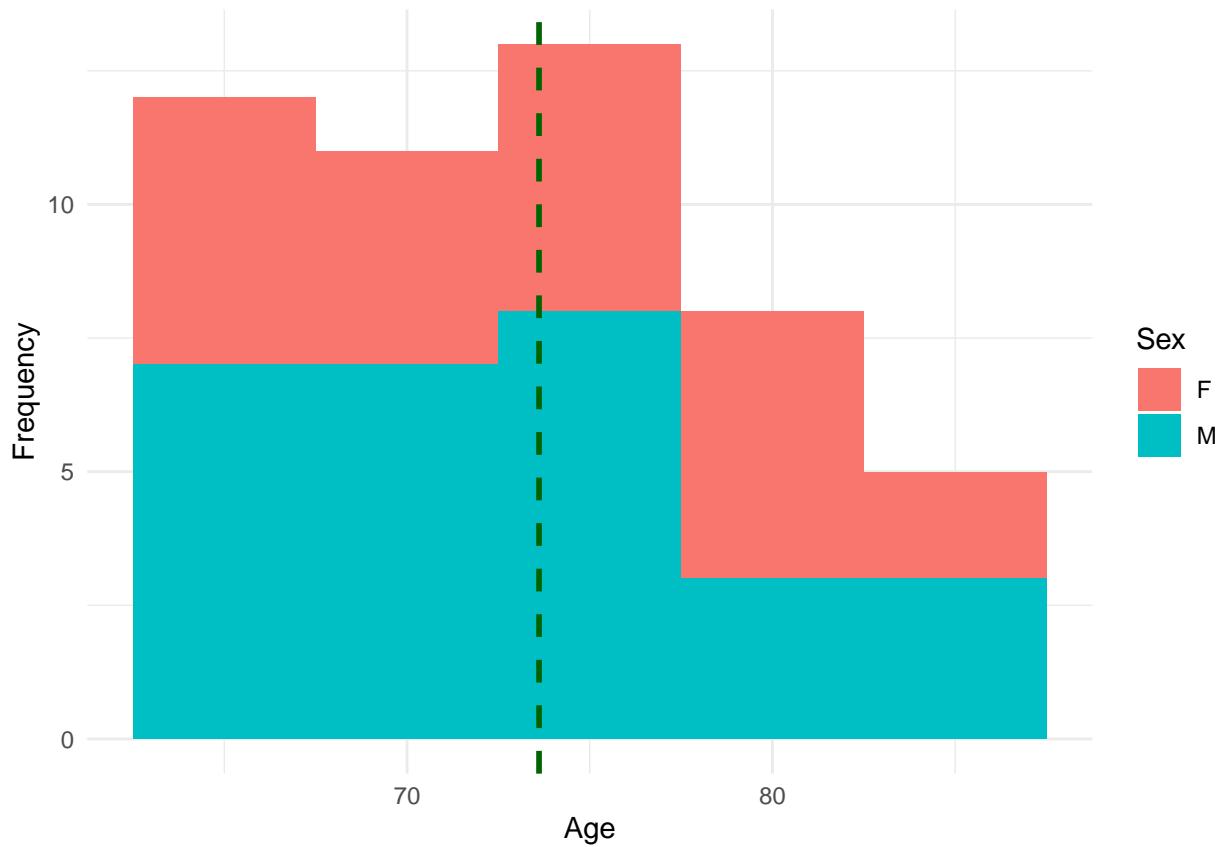
elderly_dist <- ggplot(elderly) +
  geom_histogram(aes(x=age, fill=sex), binwidth=5) +

```

```

  labs(
    x="Age",
    y="Frequency",
    fill="Sex"
  ) +
  geom_vline( # Average age as vertical line
    xintercept = mean(elderly$age),
    color = "darkgreen",
    linetype = "dashed",
    linewidth = 1 ) +
  theme_minimal()
elderly_dist

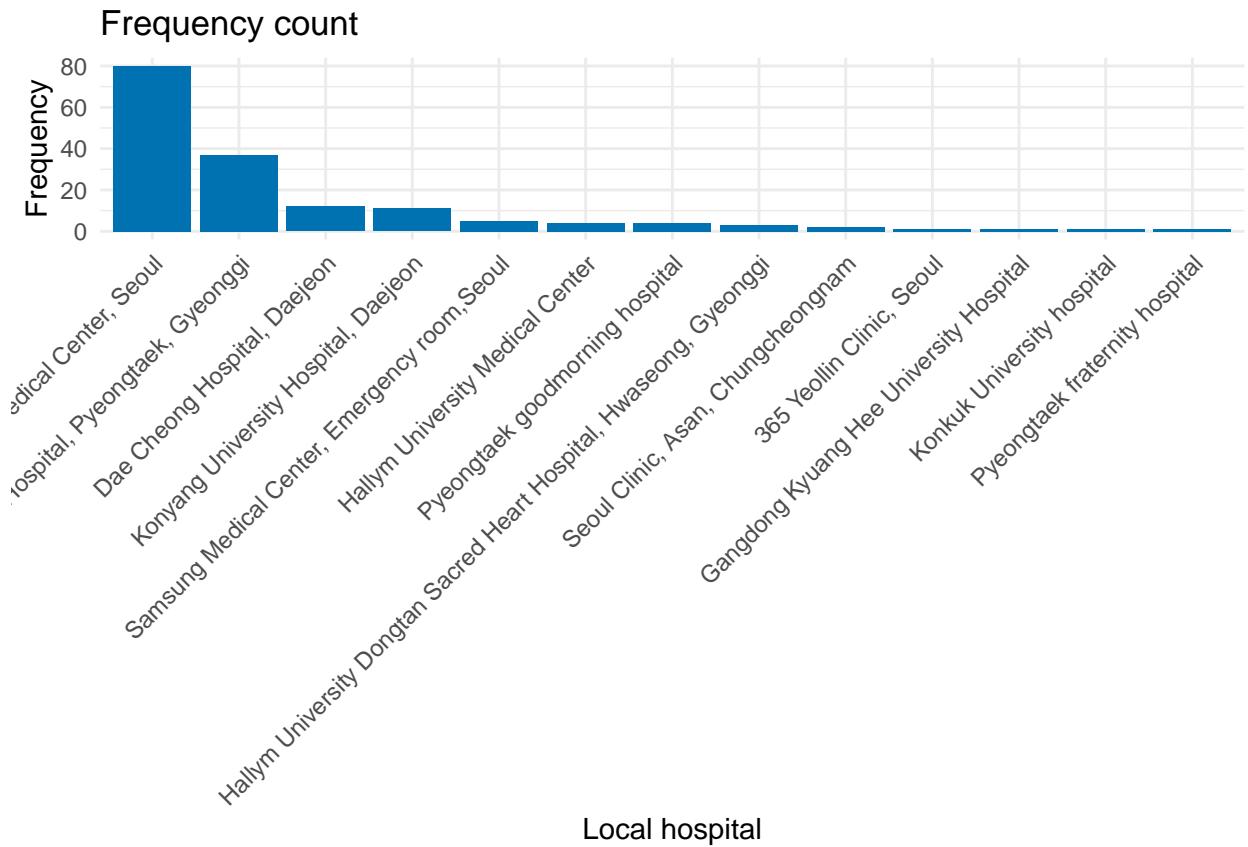
```



```

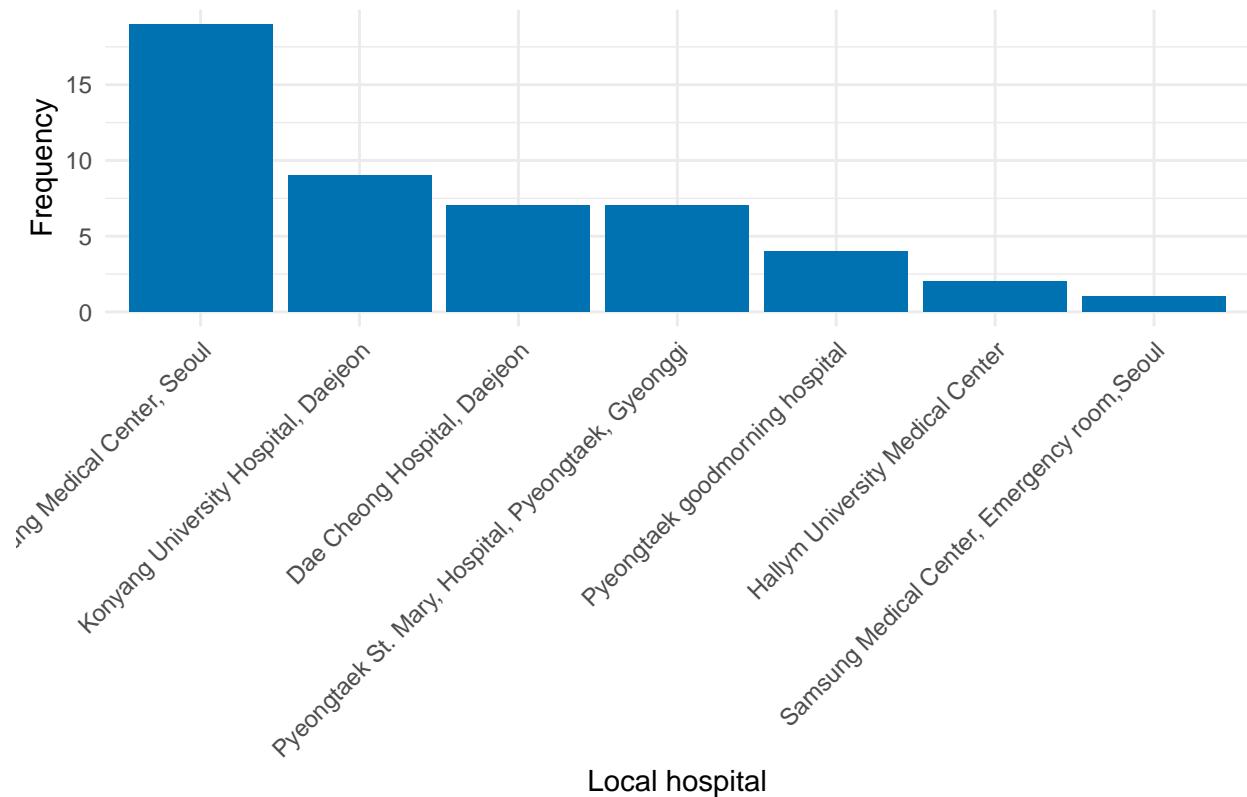
# distribution across hospitals
ggplot(linelist) +
  geom_bar(
    aes(x = fct_infreq(loc_hosp) ),
    fill = "#0072B2" ) +
  labs(
    title = "Frequency count",
    x = "Local hospital",
    y = "Frequency"
  ) +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1)) # changing the text's angle

```



```
# distribution across hospitals (elderly)
ggplot(elderly) +
  geom_bar(
    aes(x = fct_infreq(loc_hosp) ),
    fill = "#0072B2" ) +
  labs(
    title = "Frequency count of elderly",
    x = "Local hospital",
    y = "Frequency"
  ) +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1)) # changing the text's angle
```

## Frequency count of elderly



d. Synthesize your statistical finding with your identified social factors and behaviours to explain how **social status and norms** acted as an **amplifier** of the biological risk posed by age. Maybe it's a good time to look into Korean culture too!

e. Repeat task (d) but with the following points: saturated emergency rooms and family caregiving, common in Korea, where there is a cultural expectation for family members (usually younger women or older teens) to stay in the patient's room providing simple emotional and practical support.

```
exposures <- contacts %>%
  group_by(exposure) %>%
  summarise (
    count = n() ) %>%
  arrange(desc(count))
exposures
```

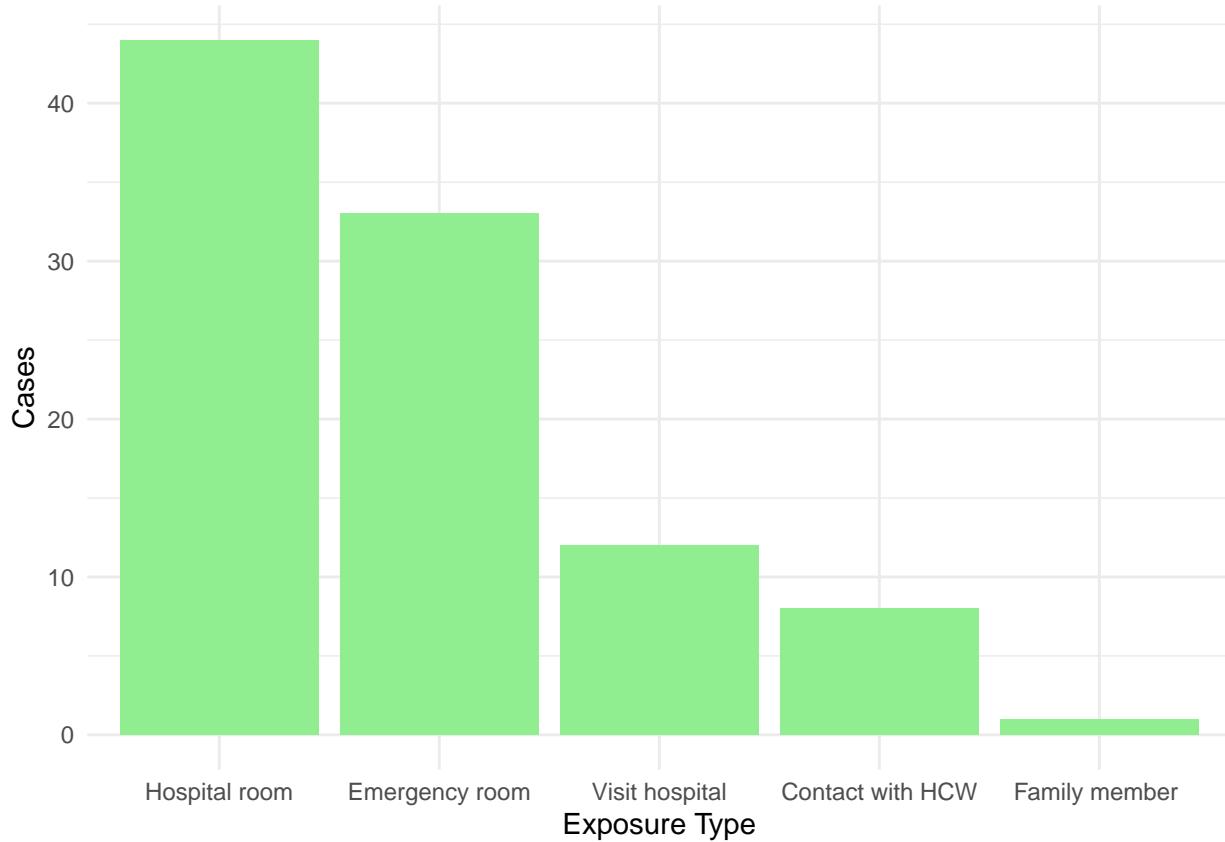
```
## # A tibble: 5 x 2
##   exposure      count
##   <fct>        <int>
## 1 "Hospital room"     44
## 2 "Emergency room"    33
## 3 "Visit hospital"    12
## 4 "Contact with HCW"    8
## 5 "Family member "     1
```

```
ggplot(contacts) +
  geom_bar(aes(x = fct_infreq(exposure)), fill="lightgreen") +
```

```

  labs(
    x="Exposure Type",
    y="Cases" ) +
  theme_minimal()

```



## 2. Institutional Analysis

**Q:** Calculate the median reporting lag from the original variables provided. On average, how many days were people sick and potentially interacting with their social networks before the institution ‘captured’ them?

**A:** The median reporting between the date of onset and the date of reporting is 5 days. For 5 days, cases were interacting with other people, potentially transmitting MERS. SK\_1 (one of the super-spreaders and responsible for 26 infections, had a lag of 16 days between the onset of symptoms and their report.

```

median_reporting <- linelist %>%
  mutate (
    lag_report = dt_report - dt_onset,
    lag_exposures = dt_end_exp - dt_start_exp,
    lag_diagnosis = dt_diag - dt_onset,
    week_report = week(dt_report)) %>%
  filter(
    !is.na(lag_report),
    !is.na(lag_exposures),
    !is.na(lag_diagnosis)) %>%

```

```

group_by(week_report) %>%
summarise(
  week_report,
  lag_report = lag_report,
  lag_exposures = lag_exposures,
  lag_diagnosis = lag_diagnosis,
  median_report = median(lag_report, na.rm = TRUE),
  median_exposures = median(lag_exposures, na.rm = TRUE),
  median_diagnosis = median(lag_diagnosis, na.rm = TRUE)
)

## Warning: Returning more (or less) than 1 row per 'summarise()' group was deprecated in
## dplyr 1.1.0.
## i Please use 'reframe()' instead.
## i When switching from 'summarise()' to 'reframe()', remember that 'reframe()'
##   always returns an ungrouped data frame and adjust accordingly.
## Call 'lifecycle::last_lifecycle_warnings()' to see where this warning was
## generated.

## 'summarise()' has grouped output by 'week_report'. You can override using the
## '.groups' argument.

median_reporting

## # A tibble: 133 x 7
## # Groups:   week_report [5]
##   week_report lag_report lag_exposures lag_diagnosis median_report
##       <dbl>     <drttn>      <drttn>      <drttn>      <drttn>
## 1 20 8 days    16 days     9 days     2.0 days
## 2 20 2 days    5 days     2 days     2.0 days
## 3 20 0 days    0 days     1 days     2.0 days
## 4 21 1 days    4 days     1 days     1.5 days
## 5 21 2 days    0 days     1 days     1.5 days
## 6 22 4 days    2 days     4 days     8.0 days
## 7 22 7 days    1 days     7 days     8.0 days
## 8 22 3 days    0 days     3 days     8.0 days
## 9 22 8 days    0 days     8 days     8.0 days
## 10 22 9 days   2 days     9 days     8.0 days
## # i 123 more rows
## # i 2 more variables: median_exposures <drttn>, median_diagnosis <drttn>

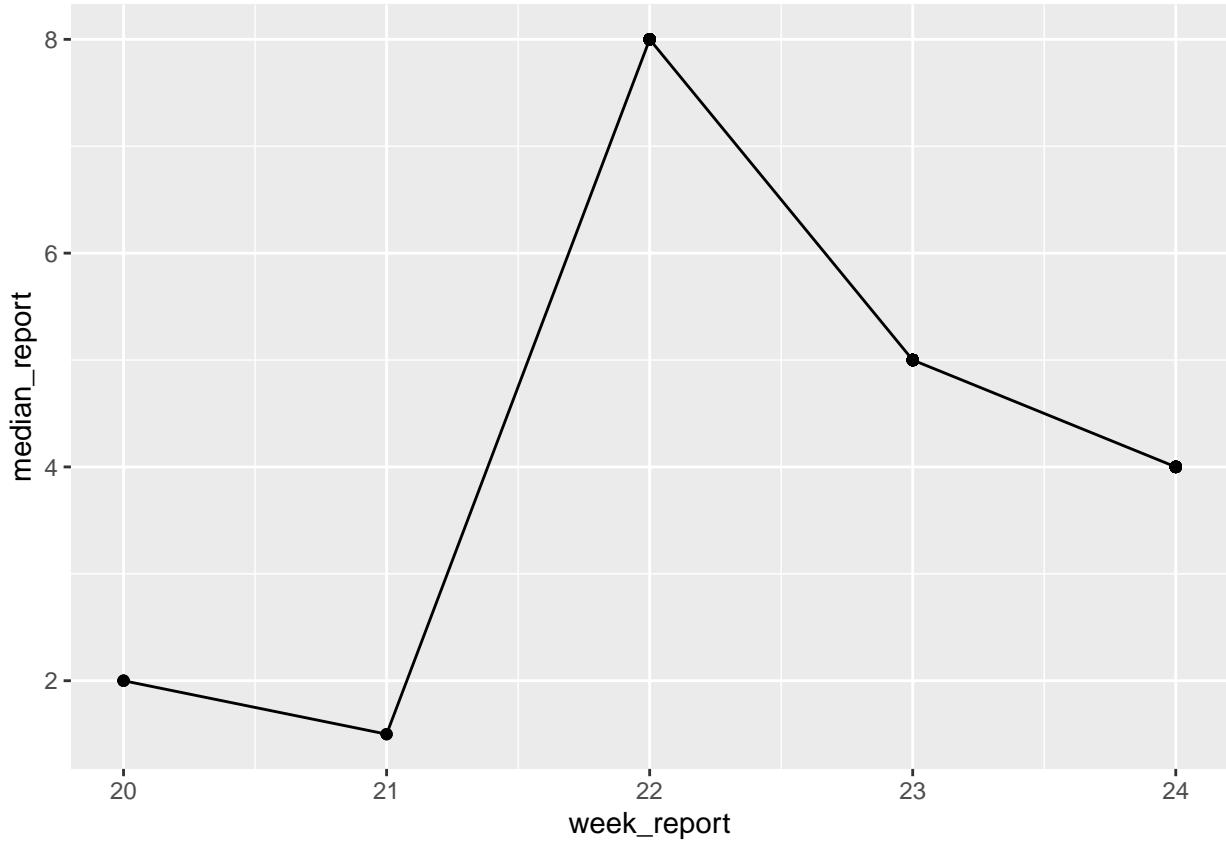
nrow(median_reporting) / nrow(linelist) # 135 out of 162. 82% of the original data set

## [1] 0.8209877

# median lag across time
ggplot(median_reporting, aes(x=week_report, y=median_report)) + geom_line() + geom_point()

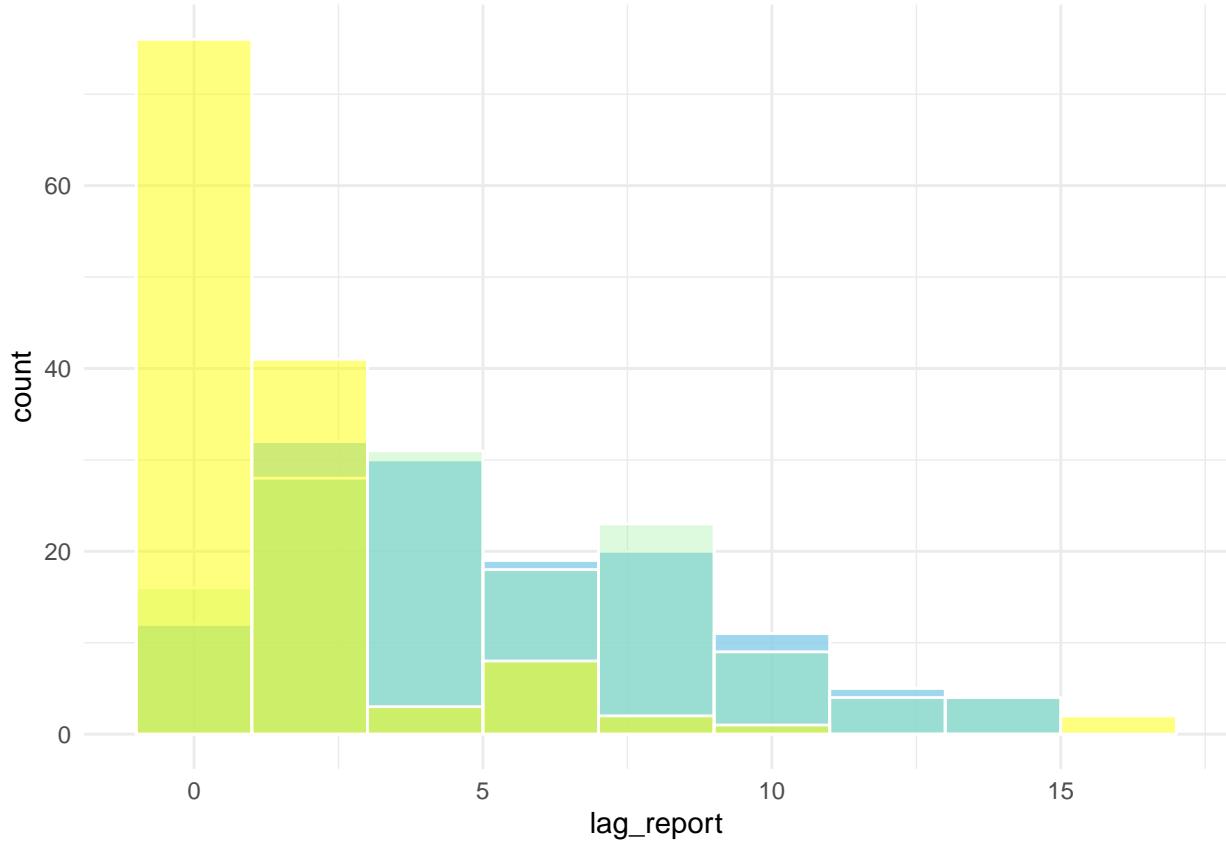
## Don't know how to automatically pick scale for object of type <difftime>.
## Defaulting to continuous.

```



```
ggplot(median_reporting) +
  geom_histogram(
    aes(x=lag_report),
    binwidth = 2, fill = "skyblue", color = "white", alpha = 0.8 ) + theme_minimal() +
  geom_histogram(
    aes(x=lag_diagnosis),
    binwidth = 2, fill = "lightgreen", color = "white", alpha = 0.3 ) + theme_minimal() +
  geom_histogram(
    aes(x=lag_exposures),
    binwidth = 2, fill = "yellow", color = "white", alpha = 0.5 ) + theme_minimal()

## Don't know how to automatically pick scale for object of type <difftime>.
## Defaulting to continuous.
```



- b) Analyse your new variable as a function of time. What does the trend tell you about the institution's ability to 'learn' and mobilize resources over time?

```
# pivots
lag_by_week_long <- median_reporting %>%
  pivot_longer(
    cols = starts_with("median"),
    names_to = "lag_type",
    values_to = "median_lag" )
lag_by_week_long

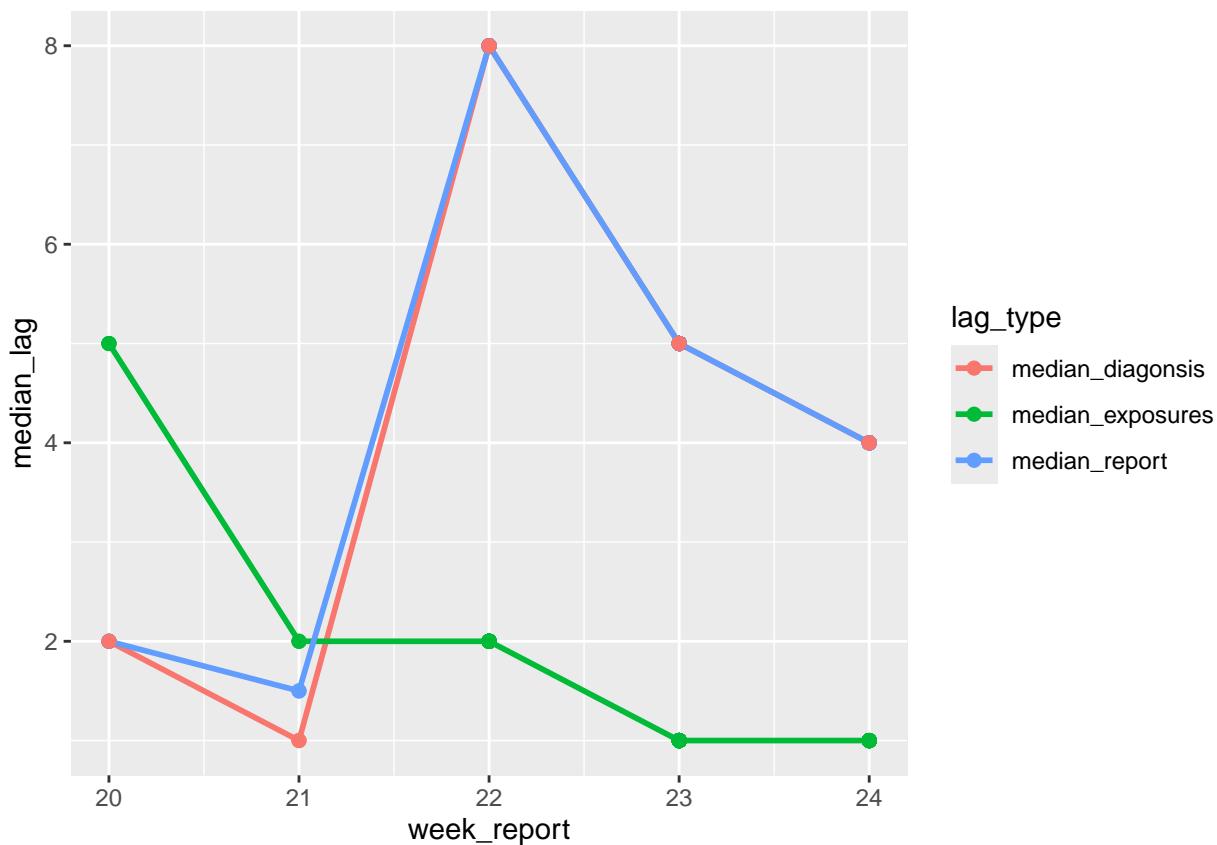
## # A tibble: 399 x 6
## # Groups:   week_report [5]
##   week_report lag_report lag_exposures lag_diagnosis lag_type      median_lag
##   <dbl> <drttn>     <drttn>       <drttn>      <chr>        <drttn>
## 1 20     8 days     16 days      9 days      median_report  2.0 days
## 2 20     8 days     16 days      9 days      median_exposur~ 5.0 days
## 3 20     8 days     16 days      9 days      median_diagnos~ 2.0 days
## 4 20     2 days     5 days      2 days      median_report   2.0 days
## 5 20     2 days     5 days      2 days      median_exposur~ 5.0 days
## 6 20     2 days     5 days      2 days      median_diagnos~ 2.0 days
## 7 20     0 days     0 days      1 days      median_report   2.0 days
## 8 20     0 days     0 days      1 days      median_exposur~ 5.0 days
## 9 20     0 days     0 days      1 days      median_diagnos~ 2.0 days
## 10 21    1 days     4 days      1 days      median_report   1.5 days
## # i 389 more rows
```

```

ggplot(lag_by_week_long,
       aes(x = week_report,
           y = median_lag,
           color = lag_type,
           group = lag_type) ) +
  geom_line(linewidth = 1) +
  geom_point(size = 2)

```

## Don't know how to automatically pick scale for object of type <difftime>.## Defaulting to continuous.



- c) In MERS outbreaks in the Middle East, men were infected much more often. In this South Korean outbreak, is there a gender imbalance? What could this imply about the gender demographics of caregiving in Korean hospitals?

*Bonus* - investigate why there were more male than female cases in the middle east spread of MERS. Why would this not apply in Korea?

### 3. The Super-Spreader

- a) Using the appropriate data set, calculate the number of infections attributed to each case. Calculate the mean and the maximum of this variable. What is the ratio between the maximum “infector” and the average?

For this analysis, I will categorize the super-spreader as those cases that infected 5 or more other cases.

Based on the Contacts data set and the previous assumption, we can identify 10 spreaders in this outbreak, and 3 of those are super-spreaders: SK\_14, SK\_1, and SK\_16. These 3 super-spreaders are males with an average age of 35 years old and located in the Pyeongtaek St. Mary Hospital (PTSM).

The 3 super-spreaders were responsible for 85 infections (52%).

```
# count of infections caused by each spreader
all_cases <- nrow(linelist)

spreader_count <- contacts %>%
  group_by(from) %>%
  summarise(
    infections = n(),
    percentage_of_infections = infections / all_cases * 100,
    .groups = 'drop' ) %>%
  arrange(desc(infections))
spreader_count

## # A tibble: 11 x 3
##   from     infections percentage_of_infections
##   <chr>     <int>                  <dbl>
## 1 SK_14      38                  23.5
## 2 SK_1       26                  16.0
## 3 SK_16      21                  13.0
## 4 SK_15       4                  2.47
## 5 SK_6        2                  1.23
## 6 SK_76       2                  1.23
## 7 SK_11       1                  0.617
## 8 SK_118      1                  0.617
## 9 SK_12       1                  0.617
## 10 SK_123     1                  0.617
## 11 SK_87      1                  0.617

# how did these spreaders infect the other cases?
superspreaders <- contacts %>%
  group_by(from,
           exposure) %>%
  summarise(
    infections = n(),
    percentage_of_infections = infections / all_cases * 100,
    .groups = 'drop' ) %>%
  arrange(desc(infections))
superspreaders

## # A tibble: 20 x 4
##   from     exposure     infections percentage_of_infections
##   <chr>   <fct>       <int>                  <dbl>
## 1 SK_14  "Emergency room" 30                  18.5
## 2 SK_16  "Hospital room"  20                  12.3
## 3 SK_1   "Visit hospital" 12                  7.41
## 4 SK_1   "Hospital room"   9                  5.56
## 5 SK_14  "Hospital room"   6                  3.70
```

```

##   6 SK_1    "Contact with HCW"          4           2.47
##   7 SK_15   "Hospital room"            3           1.85
##   8 SK_14   "Contact with HCW"          2           1.23
##   9 SK_1    "Family member "           1           0.617
##  10 SK_11   "Hospital room"            1           0.617
##  11 SK_118  "Hospital room"            1           0.617
##  12 SK_12   "Hospital room"            1           0.617
##  13 SK_123  "Hospital room"            1           0.617
##  14 SK_15   "Contact with HCW"          1           0.617
##  15 SK_16   "Emergency room"           1           0.617
##  16 SK_6    "Emergency room"           1           0.617
##  17 SK_6    "Hospital room"            1           0.617
##  18 SK_76   "Contact with HCW"          1           0.617
##  19 SK_76   "Hospital room"            1           0.617
##  20 SK_87   "Emergency room"           1           0.617

superspreaders_pivot <- superspreaders %>%
  filter(infections >= 5) %>%
  pivot_wider(
    id_cols = from,
    names_from = exposure,
    values_from = infections
  )
superspreaders_pivot

## # A tibble: 3 x 4
##   from   'Emergency room' 'Hospital room' 'Visit hospital'
##   <chr>     <int>          <int>          <int>
## 1 SK_14      30             6             NA
## 2 SK_16      NA            20             NA
## 3 SK_1       NA            9              12

# What is the ratio between the maximum "infector" and the average?
# formula for a ratio = max / average

# calculating the max
max_infector_count <- max(spreader_count$infections, na.rm = TRUE)
max_infector_count

## [1] 38

# calculating the average
avg_spreader_count <- mean(spreader_count$infections, na.rm = TRUE) # 8.9 cases in average
avg_spreader_count

## [1] 8.909091

# calculating the ratio
ratio <- max_infector_count / avg_spreader_count
ratio

## [1] 4.265306

```

- b) Visualise the distribution of secondary cases. What does the shape of your plot imply about how “democratic” or “equal” disease transmission was in this specific sample?
- c) Summarise the demographic profile of the “super spreader” using both datasets. Based on where they were infected and their demographic profile, hypothesize a social reason why this specific individual had such a high number of secondary cases.

```
# left join to dig deeper into the superspreaders' details
superspreaders_deep <- superspreaders %>%
  rename(id = from) %>% # rename 'from' to 'id'
  left_join(linelist, by = "id") %>%
  select(id,
         age,
         age_class,
         sex,
         infections,
         percentage_of_infections,
         place_infect,
         reporting_ctry,
         exposure,
         loc_hosp,
         outcome) %>%
  filter(infections >= 5)
superspreaders_deep
```

	id	age	age_class	sex	infections	percentage_of_infections	place_infect	reporting_ctry	exposure	loc_hosp
## 1	SK_14	35	30-39	M	30	18.5	Outside Middle East			
## 2	SK_16	40	40-49	M	20	12.3	Outside Middle East			
## 3	SK_1	68	60-69	M	12	7.41	Middle East			
## 4	SK_1	68	60-69	M	9	5.56	Middle East			
## 5	SK_14	35	30-39	M	6	3.70	Outside Middle East			
## # i 4 more variables:							reporting_ctry	exposure	loc_hosp	
## #										outcome

*Bonus* - Test the “Pareto Principle” (the 20/80 rule) on this data. Calculate what percentage of the total infections were caused by the top 20% of infectors. Does this outbreak fit the rule?

## Appendix

### Attempting to graph a transmission chain