Mortality Surveillance

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Background

40250 patients recorded as having died over a **5** year period.

169 deaths per week over **9 clinical systems**.

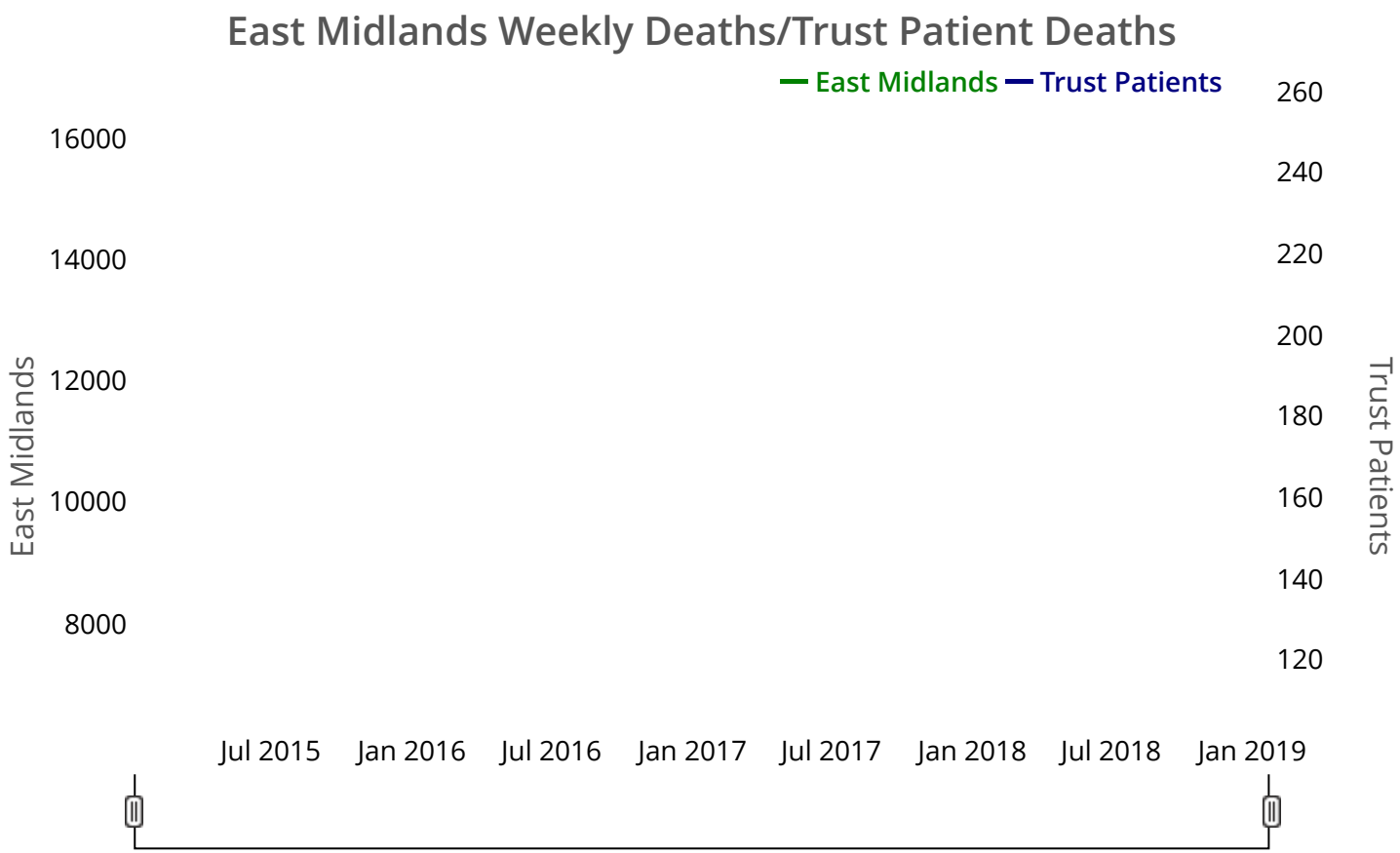
WHERE DO YOU START?

Start by looking at the patterns in a public health context…

Introduce seasonality effects in deaths.

How? ...

Overall Trends in all deaths

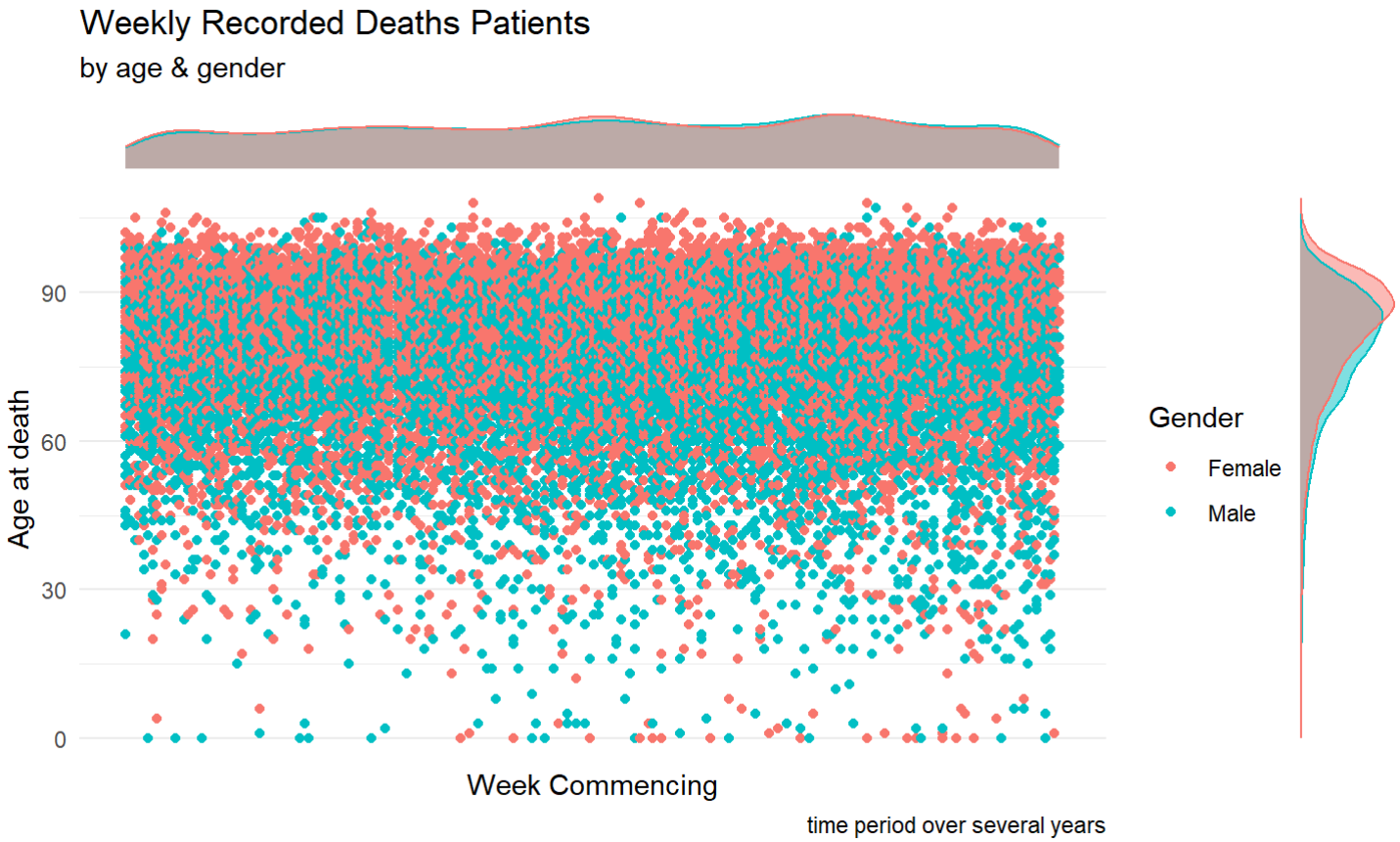


Although the deaths had peaks around January each year this is an expected seasonal trend.

Difference in gender and longevity.

And…

Weekly recorded deaths of patients



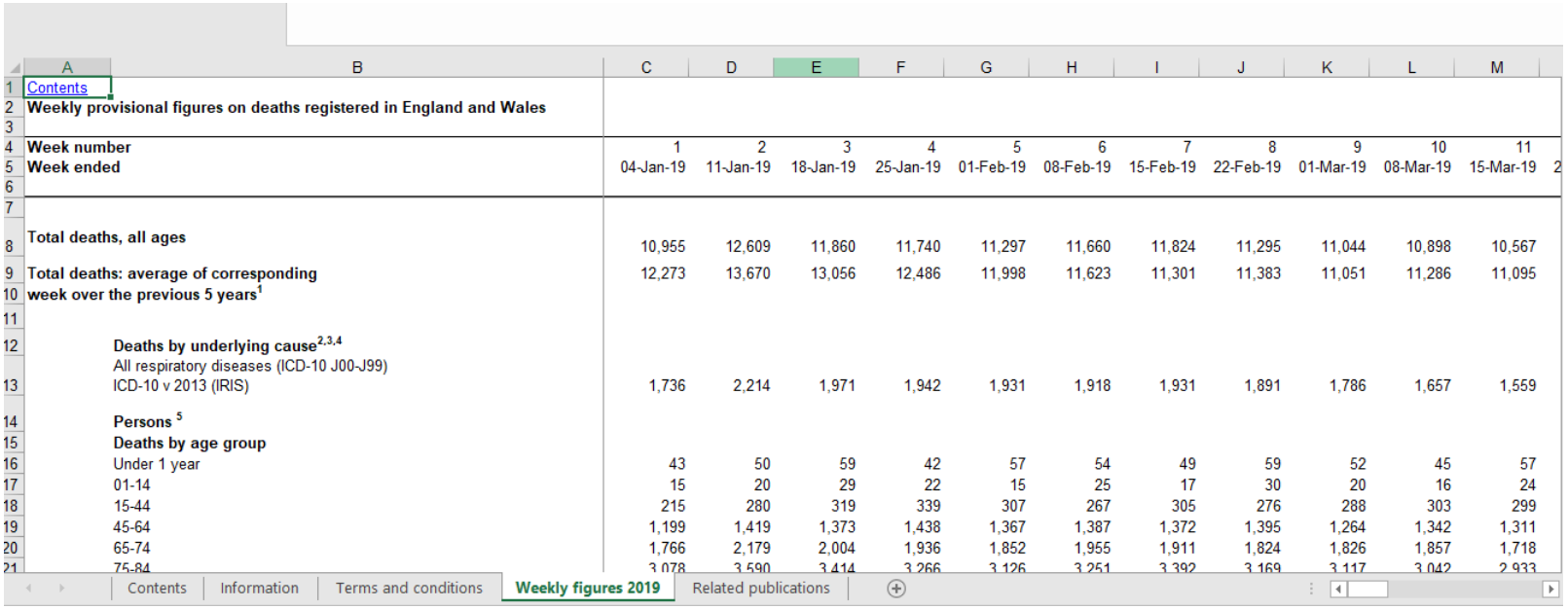
Females are more likely to die at a much older age. Deaths in under 30 year olds is less likely

ONS Provisionally Reported Weekly deaths

Key data issues:

- wide form data
- numerous blank rows and blank columns
- multiple sheets
- file name changes each week

Transform this…



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Contents												
2	**Weekly provisional figures on deaths registered in England and Wales**												
3													
4	**Week number**		1	2	3	4	5	6	7	8	9	10	11
5	**Week ended**		04-Jan-19	11-Jan-19	18-Jan-19	25-Jan-19	01-Feb-19	08-Feb-19	15-Feb-19	22-Feb-19	01-Mar-19	08-Mar-19	15-Mar-19
6													
7													
8	**Total deaths, all ages**		10,955	12,609	11,860	11,740	11,297	11,660	11,824	11,295	11,044	10,898	10,567
9	**Total deaths: average of corresponding**		12,273	13,670	13,056	12,486	11,998	11,623	11,301	11,383	11,051	11,286	11,095
10	**week over the previous 5 years**[1]												
11													
12		**Deaths by underlying cause**[2,3,4]											
		All respiratory diseases (ICD-10 J00-J99)											
13		ICD-10 v 2013 (IRIS)	1,736	2,214	1,971	1,942	1,931	1,918	1,931	1,891	1,786	1,657	1,559
14		**Persons** [5]											
15		**Deaths by age group**											
16		Under 1 year	43	50	59	42	57	54	49	59	52	45	57
17		01-14	15	20	29	22	15	25	17	30	20	16	24
18		15-44	215	280	319	339	307	267	305	276	288	303	299
19		45-64	1,199	1,419	1,373	1,438	1,367	1,387	1,372	1,395	1,264	1,342	1,311
20		65-74	1,766	2,179	2,004	1,936	1,852	1,955	1,911	1,824	1,826	1,857	1,718
21		75-84	3,078	3,590	3,414	3,266	3,126	3,251	3,392	3,169	3,117	3,042	2,933

Contents | Information | Terms and conditions | **Weekly figures 2019** | Related publications

To this…

date	Total deaths, all ages
2018-01-05	12723
2018-01-12	15050
2018-01-19	14256
2018-01-26	13935
2018-02-02	13285

Using

amongst other packages, Janitor commands:

- clean names: removes spaces in column headers and replaces with the _ character
- remove_empty: gets rid of rows and columns – this dataset has a lot of those!

```
df <- DeathsImport %>%
  clean_names %>%
  remove_empty(c("rows","cols"))
```

Blog links

All the steps to transform the data:

https://nhsrcommunity.com/blog/format-ons-spreadsheet/

I used lots of steps, perhaps could be smarter

https://nhsrcommunity.com/blog/dygraphs/

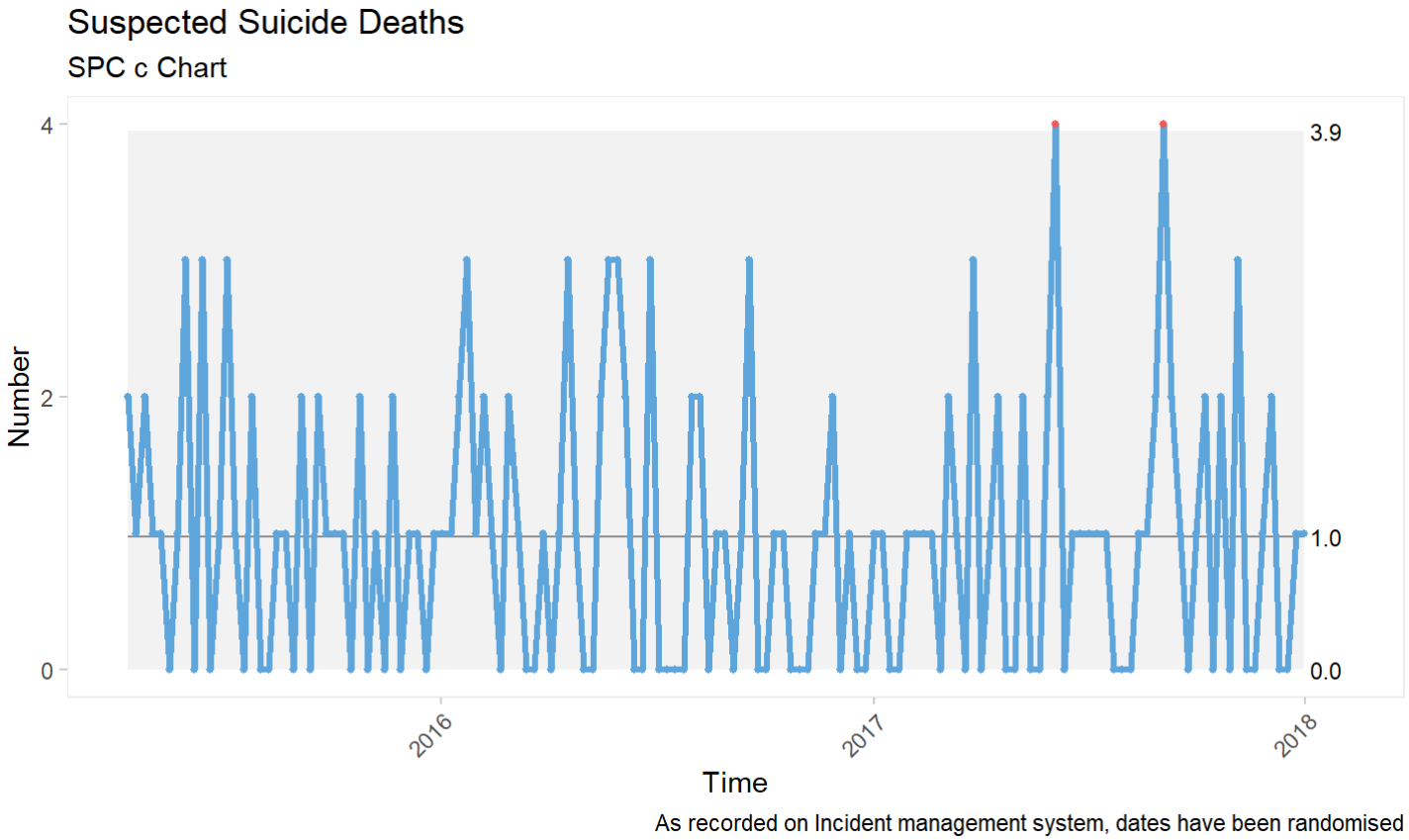
How to create the interactive dygraph chart using the ONS data and generating some random data for comparison.

Suspected and confirmed Suicides - code

Using qicharts2 c chart (Poisson distribution)

```
#qicharts2 code

Suic_Plot <- qic(WeekRnd, n,
    data = Suic,
    chart = "c",
    title = "Suspected Suicide Deaths",
    subtitle = "SPC c Chart by week",
    caption = "As recorded on Ulysses",
    ylab = "Number",
    xlab = "Time",
    x.angle = 45) +
  scale_y_continuous(breaks = pretty_breaks(3))
```

Suspected and confirmed Suicides - plot



Finding the data behind the plot - code

Patients who died who are outside of the upper control limit from the previous chart.

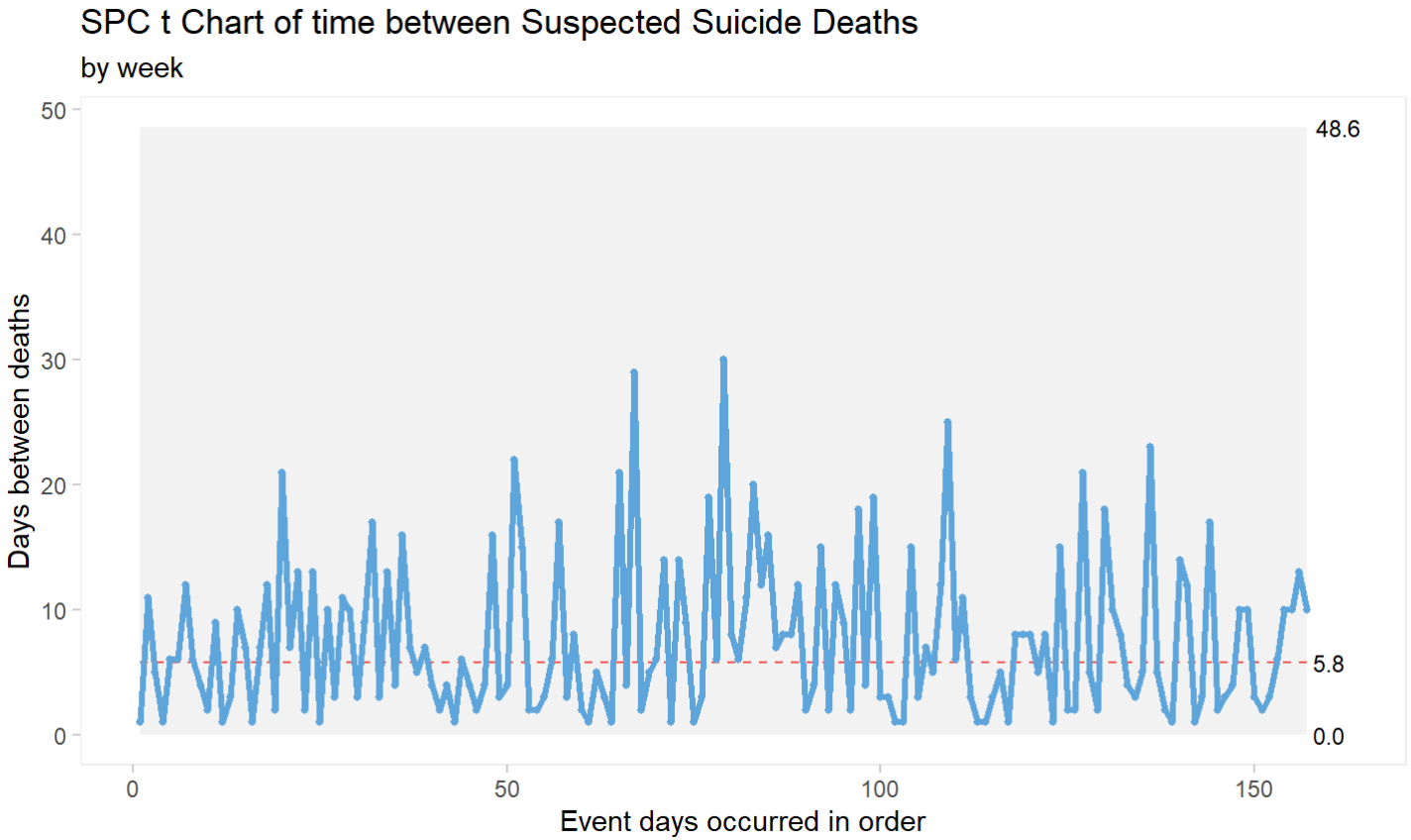
```
#Get the dates where the points are outside of the control limits
Suic_Sigma <- Suic_Plot$data %>%
  filter(sigma.signal == TRUE) %>%
   mutate(WeekRnd = as.Date(x))
  #mutate(Week = as.Date(x) %m-% weeks(1)) #for mR charts (Gaussian)

#Taking these dates join back to the data set to get patient details
Suicide_Pseudo <- Deaths_Services %>%
  filter(!is.na(Suicide)) %>%
  inner_join(Suic_Sigma) %>%
  select(MergedID, SI, CoronersVerdict, Suicide)  %>%
  group_by(MergedID, CoronersVerdict, Suicide) %>%
  slice(1) %>%
  ungroup() %>%
  mutate(ID = row_number(MergedID)) %>%
  select(ID, SI, CoronersVerdict, IncidentCategory = Suicide) %>%
  arrange(ID)
```

Finding the data behind the plot - data

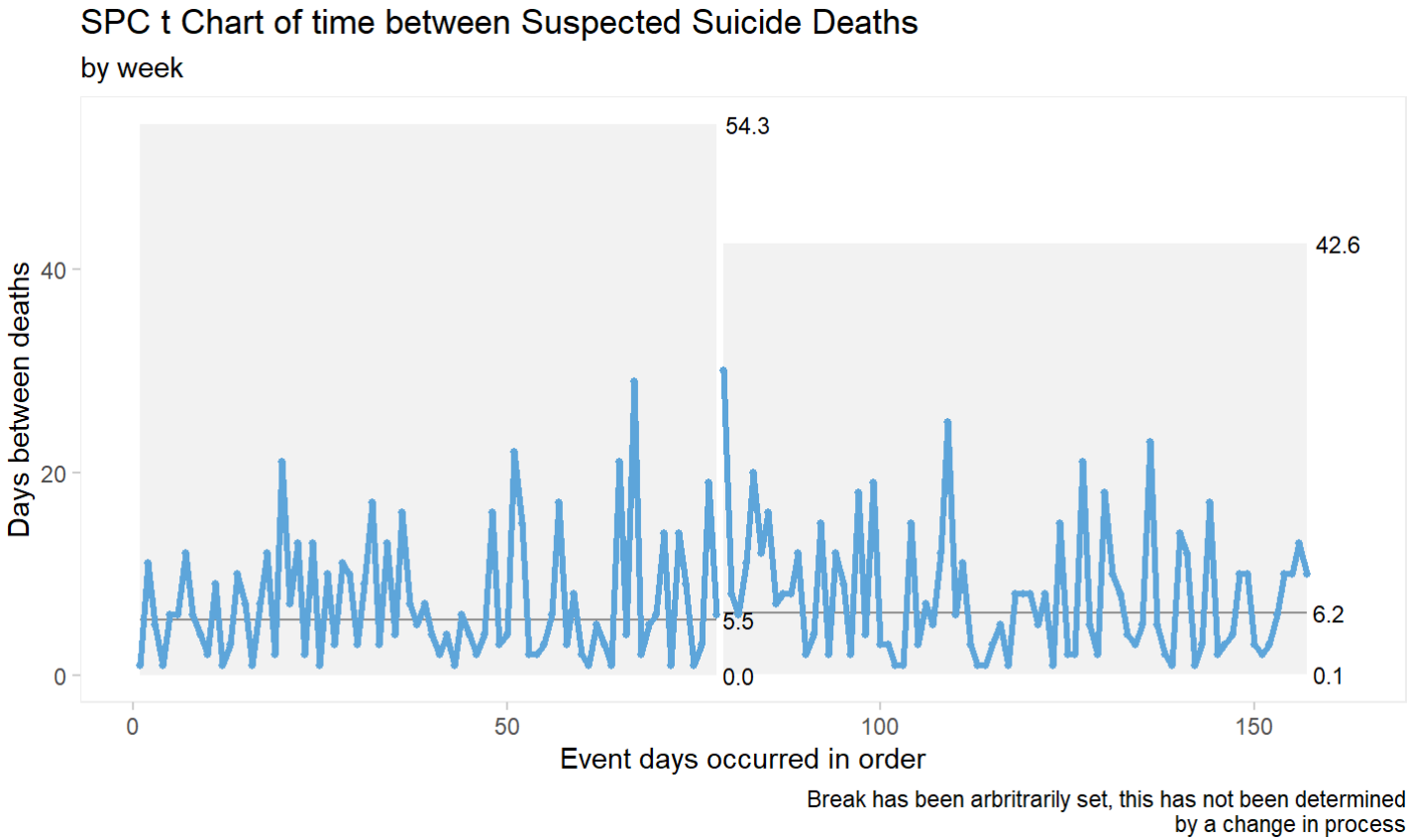
ID	SI	CoronersVerdict	IncidentCategory
1	Y	Narrative	Suicide - Apparent
2	Y	Narrative	Suicide - Apparent
3	N	Drug Related	Suicide - Apparent
4	Y	NA	Suicide - Apparent
5	Y	Open	Suicide - Apparent
6	Y	Suicide	Suicide - Apparent
7	Y	NA	Suicide - Apparent
8	N	NA	Suicide - Confirmed

Time between SPC

T charts are used for rare events (exponential distribution)



Time between SPC with break

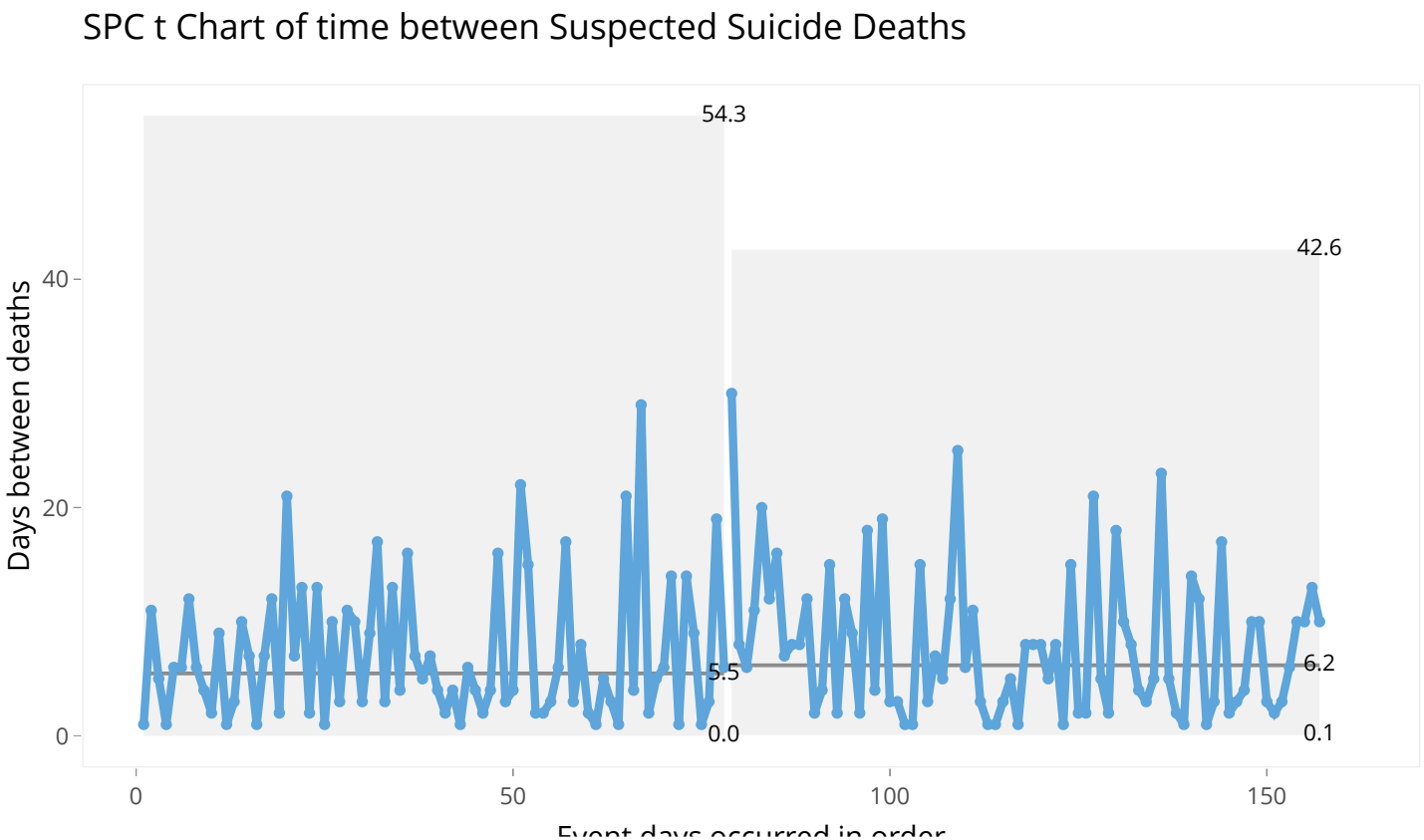


Interactive Chart

Using ggplotly the charts can be made interactive.

Downsides: - caption and subtitle doesn't work

```
ggplotly(tChart_Suicide)
```



Conclusions

- Patient Safety Managers do a great job of verifying and spotting patterns
- No untoward patterns found
- Areas of potential hidden risk need more data: hospice care, end of life

Thanks to…

@IantheBee - the Public Health Consultant who built this report in R before he retired and I took it on

@_JohnMackintosh - who blogged about how to access the data behind the qicharts2 charts

@ChrisBeeley - leading open use of R in the NHS through example

https://nhsrcommunity.com/

https://www.aphanalysts.org

https://improvement.nhs.uk/resources/making-data-count/ - SPC campaign #plotthedots

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