Asessment Rmd file

B209978

17/06/2022

R code to extract relevant data

https://github.com/B209978/B209978_assessment/tree/master/AssessmentFiles

Loading packages including NHSR dataset

```
# required packages are:
library(NHSRdatasets)
library(tidyverse)
library(knitr)
library(here)
library(scales)
library(caret)
library(dataMeta)
```

Load and explore NHS England A&E attendance data

Examining structure and completeness of dataset

```
## Rows: 12,765
## Columns: 6
## $ period      <date> 2017-03-01, 2017-03-01, 2017-03-01, 2017-03-01, 2017-03-0~
## $ org_code    <fct> RF4, RF4, RF4, R1H, R1H, R1H, AD913, RYX, RQM, RQM, RJ6, R~
## $ type        <fct> 1, 2, other, 1, 2, other, other, other, 1, other, 1, other~
## $ attendances <dbl> 21289, 813, 2850, 30210, 807, 11352, 4381, 19562, 17414, 7~
## $ breaches    <dbl> 2879, 22, 6, 5902, 11, 136, 2, 258, 2030, 86, 1322, 140, 0~
## $ admissions  <dbl> 5060, 0, 0, 6943, 0, 0, 0, 0, 3597, 0, 2202, 0, 0, 0, 3360~
```

```
## # A tibble: 12,765 x 6
##    period     org_code type  attendances breaches admissions
##    <date>     <fct>    <fct>       <dbl>    <dbl>      <dbl>
##  1 2017-03-01 RF4      1           21289     2879       5060
##  2 2017-03-01 RF4      2             813       22          0
##  3 2017-03-01 RF4      other        2850        6          0
##  4 2017-03-01 R1H      1           30210     5902       6943
##  5 2017-03-01 R1H      2             807       11          0
##  6 2017-03-01 R1H      other       11352      136          0
##  7 2017-03-01 AD913    other        4381        2          0
##  8 2017-03-01 RYX      other       19562      258          0
##  9 2017-03-01 RQM      1           17414     2030       3597
## 10 2017-03-01 RQM      other        7817       86          0
## # ... with 12,755 more rows
```

```
## $period
## [1] 0
##
## $org_code
## [1] 0
##
## $type
## [1] 0
##
## $attendances
## [1] 0
##
## $breaches
## [1] 0
##
## $admissions
## [1] 0
```

Adding index for later linkage

index	period	org_code	type	attendances	breaches	admissions
1	Mar-17	RF4	1	21,289.0	2,879.0	5,060.0
2	Mar-17	RF4	2	813.0	22.0	0.0
3	Mar-17	RF4	other	2,850.0	6.0	0.0
4	Mar-17	R1H	1	30,210.0	5,902.0	6,943.0
5	Mar-17	R1H	2	807.0	11.0	0.0
6	Mar-17	R1H	other	11,352.0	136.0	0.0
7	Mar-17	AD913	other	4,381.0	2.0	0.0
8	Mar-17	RYX	other	19,562.0	258.0	0.0
9	Mar-17	RQM	1	17,414.0	2,030.0	3,597.0
10	Mar-17	RQM	other	7,817.0	86.0	0.0

Filter data

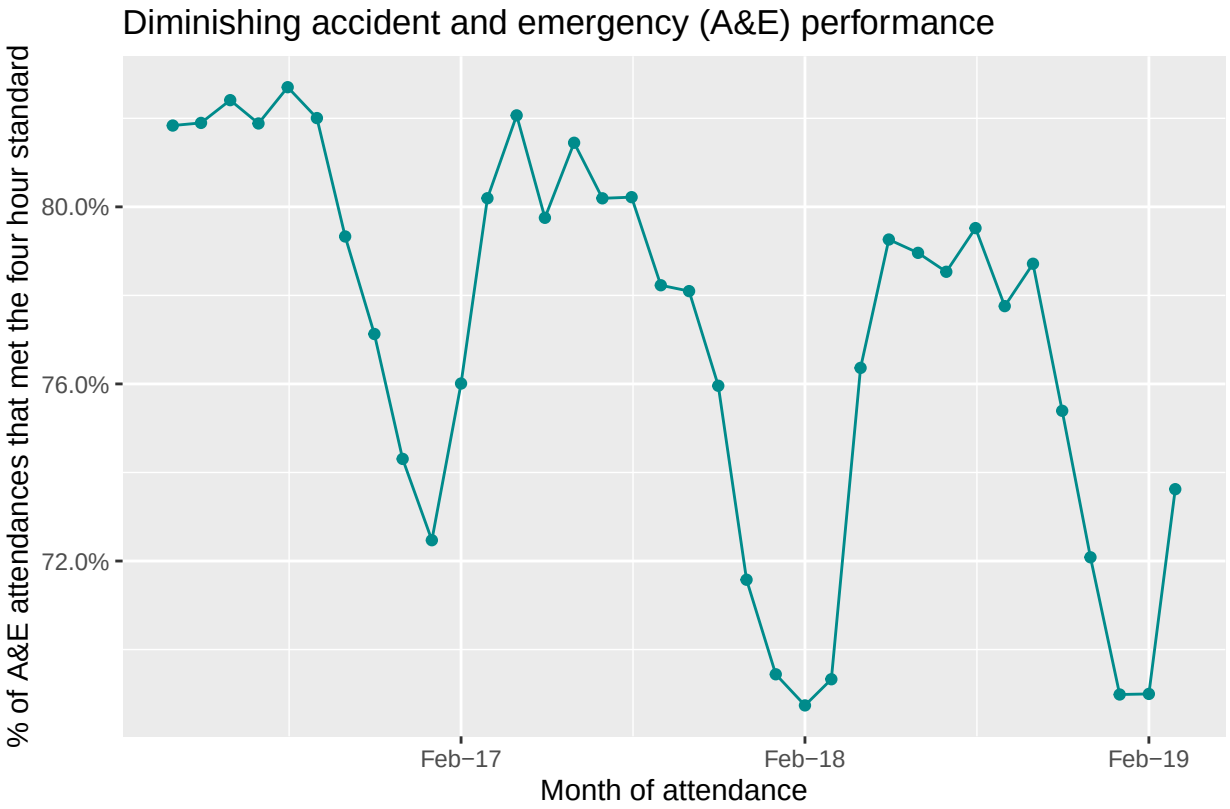
Removed all hospitals except consultant led Emergency Departments covered by selected ambulance service

```
## # A tibble: 468 x 6
##    index period     org_code attendances breaches admissions
##    <int> <date>     <fct>          <dbl>    <dbl>      <dbl>
##  1    77 2017-03-01 RLT             6726      799       1119
##  2   117 2017-03-01 RXK            14665     2828       3067
##  3   122 2017-03-01 RXW            10371     2217       2441
##  4   126 2017-03-01 RJC             5572      198       1806
##  5   131 2017-03-01 RNA             9006      679       2425
##  6   133 2017-03-01 RQW             8737     1935       1835
##  7   135 2017-03-01 RL4            11505     1651       2606
##  8   138 2017-03-01 RRK            10032     1543       2818
##  9   139 2017-03-01 RKB            11986     3213       4077
## 10   145 2017-03-01 RJE            15129     4019       4511
## # ... with 458 more rows
```

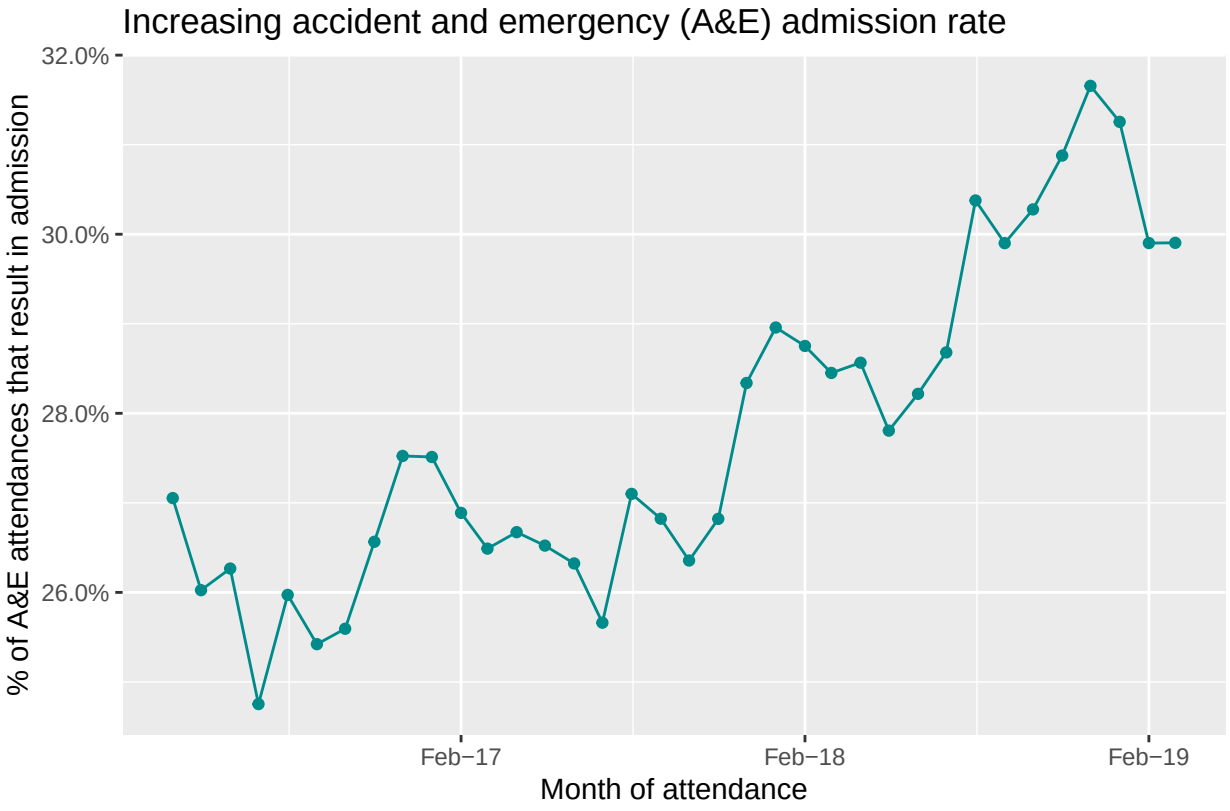
Calculate metrics

```
## Rows: 36
## Columns: 6
## $ period             <date> 2016-04-01, 2016-05-01, 2016-06-01, 2016-07-01, 20~
## $ attendances        <dbl> 115395, 127489, 120287, 127278, 117611, 119048, 124~
## $ breaches           <dbl> 20959, 23080, 21158, 23058, 20343, 21422, 25647, 27~
## $ admissions         <dbl> 31218, 33179, 31595, 31505, 30546, 30264, 31758, 31~
## $ breach_performance <dbl> 0.8183717, 0.8189648, 0.8241040, 0.8188375, 0.82703~
## $ admission_rate     <dbl> 0.2705317, 0.2602499, 0.2626635, 0.2475290, 0.25972~
```

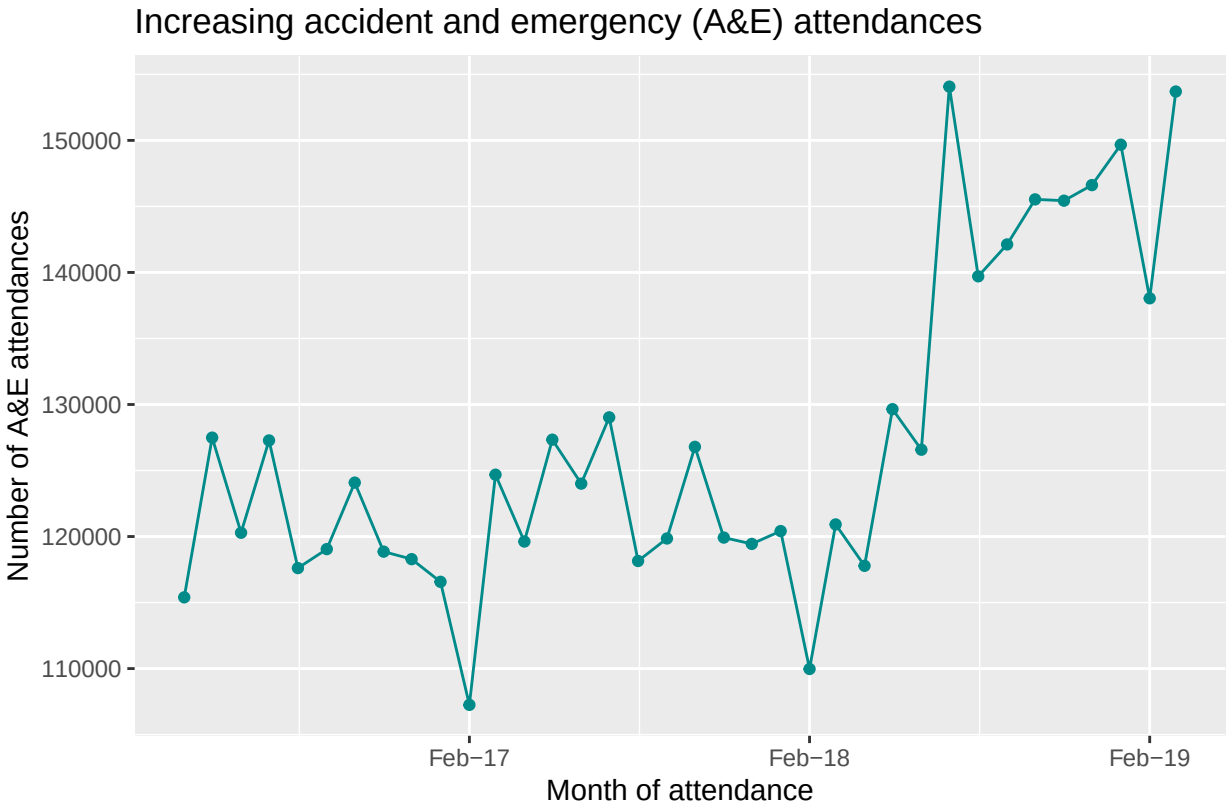
Brief visualisation of regional patterns



Source: NHSRdatasets



Source: NHSRdatasets



Save data subset

```
## Rows: 468
## Columns: 6
## $ index       <int> 77, 117, 122, 126, 131, 133, 135, 138, 139, 145, 148, 154,~
## $ period      <date> 2017-03-01, 2017-03-01, 2017-03-01, 2017-03-01, 2017-03-0~
## $ org_code    <fct> RLT, RXK, RXW, RJC, RNA, RQW, RL4, RRK, RKB, RJE, RBK, RWP~
## $ attendances <dbl> 6726, 14665, 10371, 5572, 9006, 8737, 11505, 10032, 11986,~
## $ breaches    <dbl> 799, 2828, 2217, 198, 679, 1935, 1651, 1543, 3213, 4019, 1~
## $ admissions  <dbl> 1119, 3067, 2441, 1806, 2425, 1835, 2606, 2818, 4077, 4511~
```

Divide dataset into training, marker and test

index	period	org_code	attendances	breaches	admissions
77	Mar-17	RLT	6,726.0	799.0	1119
117	Mar-17	RXK	14,665.0	2,828.0	3067
122	Mar-17	RXW	10,371.0	2,217.0	2441
126	Mar-17	RJC	5,572.0	198.0	1806
131	Mar-17	RNA	9,006.0	679.0	2425
133	Mar-17	RQW	8,737.0	1,935.0	1835
135	Mar-17	RL4	11,505.0	1,651.0	2606
138	Mar-17	RRK	10,032.0	1,543.0	2818
139	Mar-17	RKB	11,986.0	3,213.0	4077
145	Mar-17	RJE	15,129.0	4,019.0	4511

index	period	org_code	attendances	breaches	admissions
2550	Aug-16	RNA	8,575	603	2657

index	period	org_code	attendances	breaches	admissions
2881	Jul-16	RXK	14,488	2,128	3141
2896	Jul-16	RNA	8,947	596	2599
4258	Mar-18	RXK	13,805	3,556	3429
4281	Mar-18	RRK	9,936	2,154	3896
5043	Jan-18	RLQ	4,532	1,263	1437
6471	Sep-17	RWP	9,817	2,716	2921
7137	Jul-17	RJC	5,811	297	1617
7509	Jun-17	RWP	10,313	2,824	3174
9577	Dec-18	RXK	13,604	4,432	3744
10327	Oct-18	RKB	12,519	1,937	4407

Data dictionary

Read in data collected in Python

```
## Rows: 11
## Columns: 9
## $ index              <dbl> 2881, 2896, 4258, 4281, 5043, 6471, 7137, 7509, 957~
## $ period             <date> 2016-07-01, 2016-07-01, 2018-03-01, 2018-03-01, 20~
## $ org_code           <chr> "RXK", "RNA", "RXK", "RRK", "RLQ", "RWP", "RJC", "R~
## $ attendances        <dbl> 1488, 8947, 13805, 9936, 4532, 9817, 5811, 10313, 1~
## $ breaches           <dbl> 2128, 596, 3556, 2154, 1263, 2716, 297, 2824, 4432,~
## $ admissions         <dbl> 3141, 2599, 3429, 3896, 1437, 2921, 1617, 3174, 374~
## $ breach_performance <dbl> -0.4301075, 0.9333855, 0.7424122, 0.7832126, 0.3170~
## $ admission_rate     <dbl> 2.1108871, 0.2904884, 0.2483883, 0.3921095, 0.31707~
## $ consent            <lgl> TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRU~
```

Build linker data frame with variable descriptions and types

```
## [1] "The index column that allows us to link the data collected to the original ae_attendances data i
## [2] "The month that this activity relates to, stored as a date (1st of each month)."
## [3] "The Organisation data service (ODS) code for the organisation. If you want to know the organisat
## [4] "The number of attendances for this department type at this organisation for this month."
## [5] "The number of attendances that breached the four-hour target."
## [6] "The number of attendances that resulted in an admission to the hospital."
## [7] "The performance ([1 - breaches]/attendances)"
## [8] "The rate of admission (admissions/attendances)"
## [9] "The consent from the end-user to process and share the data collected with the data capture tool
```

```
## [1] 0 1 1 0 0 0 0 0 1
```

```
##             var_name
## 1              index
## 2             period
## 3           org_code
## 4         attendances
## 5           breaches
## 6          admissions
```

```
## 7 breach_performance
## 8     admission_rate
## 9            consent
##
## 1
## 2
## 3 The Organisation data service (ODS) code for the organisation. If you want to know the organisatio
## 4
## 5
## 6
## 7
## 8
## 9
##   var_type
## 1        0
## 2        1
## 3        1
## 4        0
## 5        0
## 6        0
## 7        0
## 8        0
## 9        1
```

Use linker dataframe to create data dictionary

```
##        variable name
## 1     admission_rate
## 2         admissions
## 3        attendances
## 4 breach_performance
## 5           breaches
## 6            consent
##                                                                                 variable description
## 1                                                    The rate of admission (admissions/attendances)
## 2                           The number of attendances that resulted in an admission to the hospital.
## 3          The number of attendances for this department type at this organisation for this month.
## 4                                                      The performance ([1 - breaches]/attendances)
## 5                                    The number of attendances that breached the four-hour target.
## 6 The consent from the end-user to process and share the data collected with the data capture tool.
##                          variable options notes
## 1  0.237557194882809 to 2.11088709677419
## 2                           1437 to 4407
## 3                          1488 to 13805
## 4 -0.43010752688172 to 0.933385492343802
## 5                            297 to 4432
## 6                                   TRUE
```

Appending data dictionary to collected data

```
## [1] "This data describes accident and emergency (A&E) metrics for hospital trusts within the chosen a
```

```
## # A tibble: 11 x 9
##    index period     org_code attendances breaches admissions breach_performance
##  * <dbl> <date>     <chr>          <dbl>    <dbl>      <dbl>              <dbl>
```

```
##  1  2881 2016-07-01 RXK             1488     2128       3141             -0.430
##  2  2896 2016-07-01 RNA             8947      596       2599              0.933
##  3  4258 2018-03-01 RXK            13805     3556       3429              0.742
##  4  4281 2018-03-01 RRK             9936     2154       3896              0.783
##  5  5043 2018-01-01 RLQ             4532     1263       1437              0.317
##  6  6471 2017-09-01 RWP             9817     2716       2921              0.298
##  7  7137 2017-07-01 RJC             5811      297       1617              0.278
##  8  7509 2017-06-01 RWP            10313     2824       3174              0.308
##  9  9577 2018-12-01 RXK            13604     4432       3744              0.275
## 10 10327 2018-10-01 RKB            12519     1937       4407              0.352
## 11 12530 2018-04-01 RL4            10709     1704       2544              0.238
## # ... with 2 more variables: admission_rate <dbl>, consent <lgl>
```

```
## $row.names
##  [1]  1  2  3  4  5  6  7  8  9 10 11
##
## $names
## [1] "index"              "period"             "org_code"
## [4] "attendances"        "breaches"           "admissions"
## [7] "breach_performance" "admission_rate"     "consent"
##
## $spec
## cols(
##   index = col_double(),
##   period = col_date(format = ""),
##   org_code = col_character(),
##   attendances = col_double(),
##   breaches = col_double(),
##   admissions = col_double(),
##   breach_performance = col_double(),
##   admission_rate = col_double(),
##   consent = col_logical()
## )
##
## $problems
## <pointer: 0x55a9a0a5fb10>
##
## $class
## [1] "spec_tbl_df" "tbl_df"      "tbl"         "data.frame"
##
## $main
## [1] "This data describes accident and emergency (A&E) metrics for hospital trusts within the chosen a
##
## $dictionary
##         variable name
## 1      admission_rate
## 2          admissions
## 3         attendances
## 4  breach_performance
## 5            breaches
## 6             consent
## 7               index
## 8            org_code
## 9
```

```
## 10
## 11
## 12
## 13
## 14
## 15
## 16             period
## 17
## 18
## 19
## 20
## 21
## 22
## 23
## 24
##
## 1
## 2
## 3
## 4
## 5
## 6
## 7
## 8  The Organisation data service (ODS) code for the organisation. If you want to know the organisatio
## 9
## 10
## 11
## 12
## 13
## 14
## 15
## 16
## 17
## 18
## 19
## 20
## 21
## 22
## 23
## 24
##                           variable options notes
## 1   0.237557194882809 to 2.11088709677419
## 2                          1437 to 4407
## 3                         1488 to 13805
## 4  -0.43010752688172 to 0.933385492343802
## 5                           297 to 4432
## 6                                  TRUE
## 7                         2881 to 12530
## 8                                   RXK
## 9                                   RNA
## 10                                  RRK
## 11                                  RLQ
## 12                                  RWP
## 13                                  RJC
```

```
## 14                                    RKB
## 15                                    RL4
## 16                                  16983
## 17                                  17591
## 18                                  17532
## 19                                  17410
## 20                                  17348
## 21                                  17318
## 22                                  17866
## 23                                  17805
## 24                                  17622
##
## $last_edit_date
## [1] "2022-06-24 15:55:39 UTC"
##
## $author
## [1] "B209978"
```

Data capture tool (Python)

Perfomed in Python. Jupyter widgets designed to capture data from relevant hospitals. Performance and admission rate metrics calculated and inputted using simple block of Python code.

Please find here: *https://github.com/B209978/B209978_assessment/tree/master/AssessmentFiles*