

Title Placeholder

Load in Specific Packages

```
library(readr)
library(tidyr)
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(here)
```

```
## here() starts at C:/Users/romin/ToyRepo
```

```
library(lemon)
library(kableExtra)
```

```
##
## Attaching package: 'kableExtra'

## The following object is masked from 'package:dplyr':
##
##   group_rows
```

```
library(ggplot2)
library(reshape())
```

```
##
## Attaching package: 'reshape'

## The following object is masked from 'package:dplyr':
##
##   rename

## The following objects are masked from 'package:tidyr':
##
##   expand, smiths
```

```
library(hexbin)
library(data.table)
```

```
##
## Attaching package: 'data.table'

## The following object is masked from 'package:reshape':
```

```
##
##      melt
## The following objects are masked from 'package:dplyr':
##
##      between, first, last
library(GGally)

## Registered S3 method overwritten by 'GGally':
##      method from
##      +.gg      ggplot2
library(formattable)
library(viridis)

## Loading required package: viridisLite
library(TTR)
library(zoo)

##
## Attaching package: 'zoo'
## The following objects are masked from 'package:data.table':
##
##      yearmon, yearqtr
## The following objects are masked from 'package:base':
##
##      as.Date, as.Date.numeric
library(ggrepel)
library(grid)
```

Load in the data

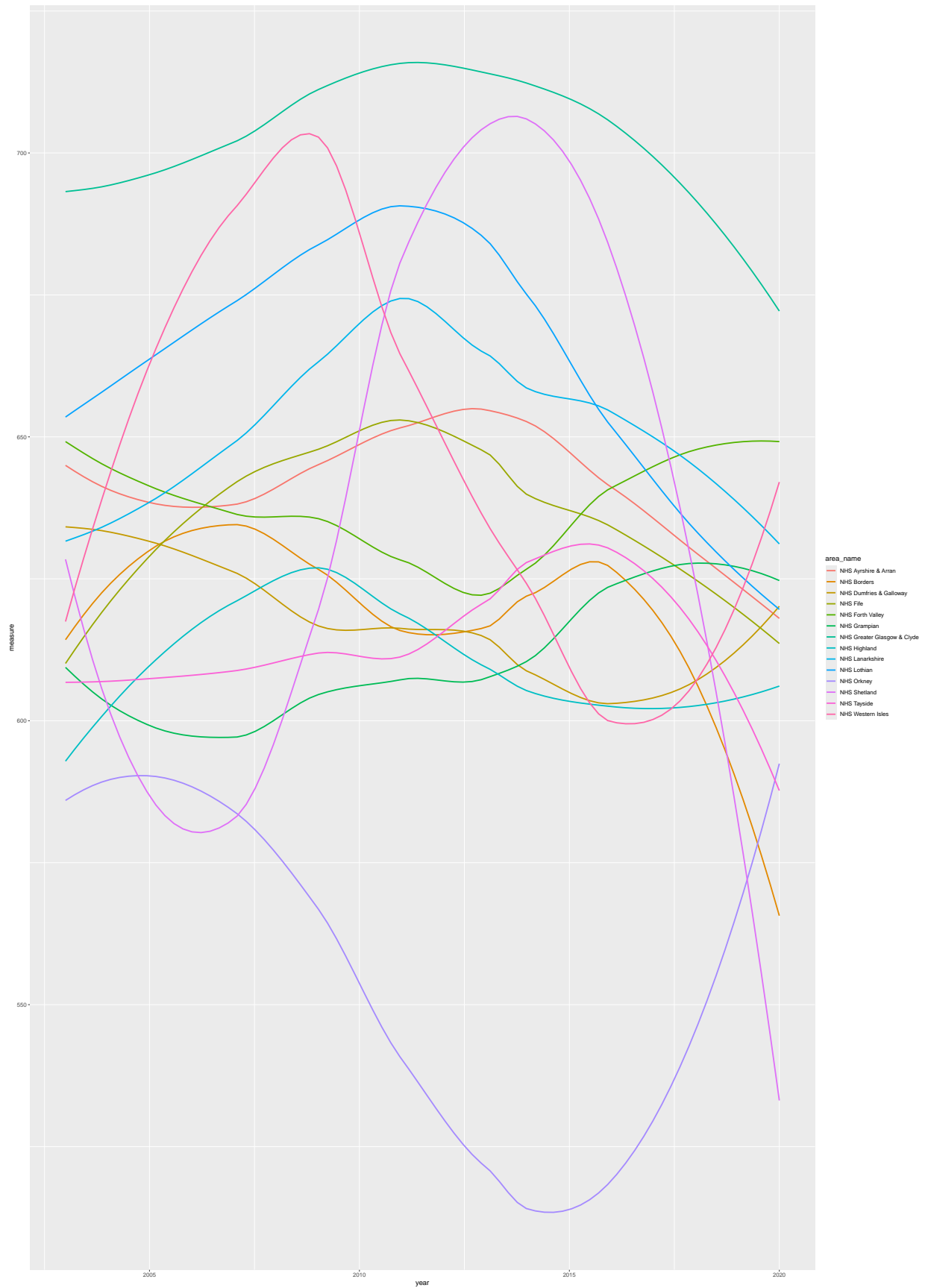
```
cancerReg <- read.csv("C:\\Users\\romin\\ToyRepo\\Models\\cancerReg.csv")
```

Remove Unnecessary Data for Analysis

```
cancerReg <- cancerReg %>% select(-period, -area_type, -type_definition, -indicator, -upper_confidence_int)
```

Display All Data Points

```
## `geom_smooth()` using formula = 'y ~ x'
```



Find Average of All Measures by Year

```
avgYearly <- cancerReg %>%  
  group_by(year) %>%  
  mutate(AvgYear = mean(measure, na.rm = TRUE)) %>%  
  select(-area_name, -measure, -area_code)
```

Calculate Moving Average for Each Health Board

```
movingAvg <- cancerReg %>%  
  group_by(area_name) %>%  
  arrange(year) %>%  
  mutate(MA = cumsum(measure) / row_number())
```

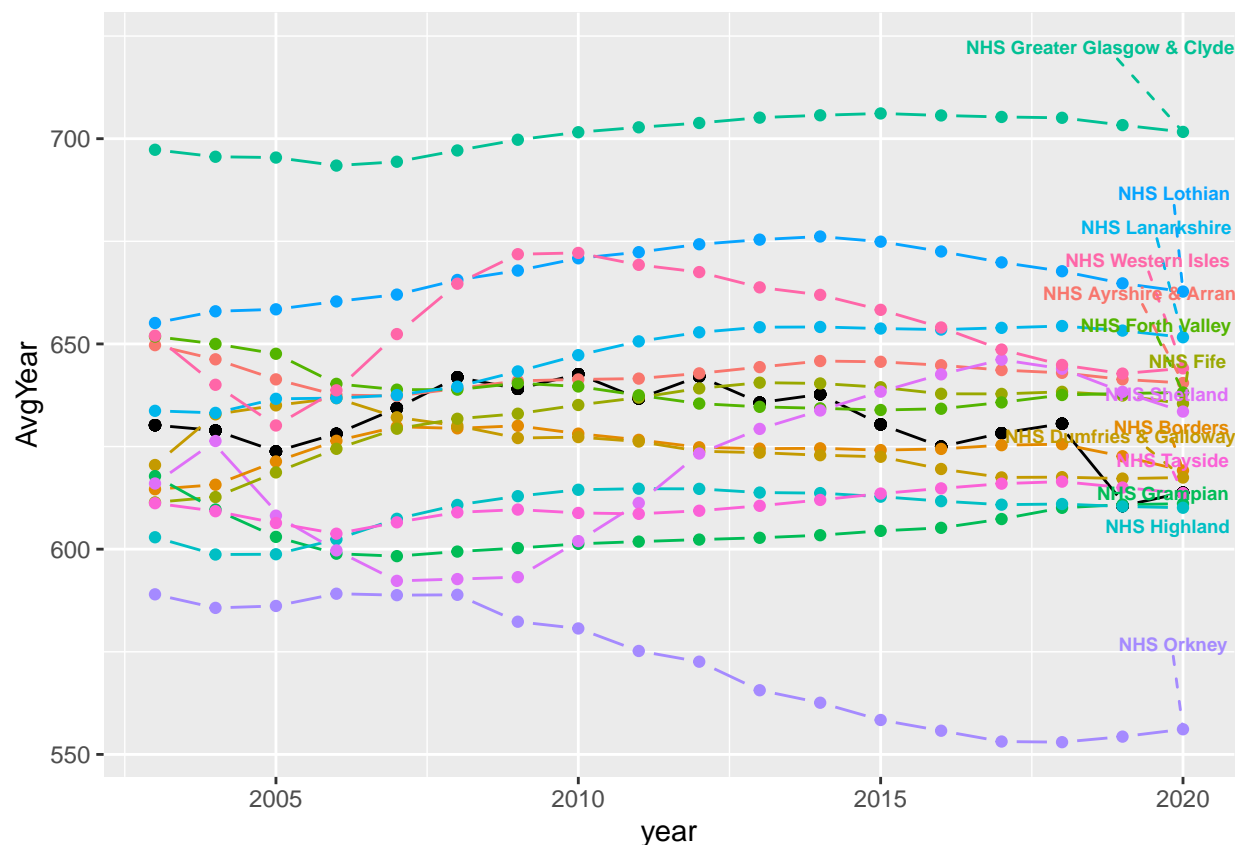
Find Last Data Points for Data

```
finalValues <- movingAvg %>%  
  group_by(area_name) %>%  
  summarise(  
    lastMA = dplyr::last(MA),  
    lastYear=dplyr::last(year)  
  )
```

Display Summary of All Data

```
ggplot(data=cancerReg, aes(x = year)) +  
  geom_pointline(data= avgYearly, aes(y = AvgYear)) +  
  geom_pointline(data=movingAvg, aes(y=MA, col=area_name)) +  
  geom_text_repel(data = finalValues, aes(  
    x = lastYear,  
    y = lastMA,  
    label = area_name,  
    color=area_name),  
    size = 2.5,  
    fontface = "bold",  
    nudge_y = 20.6,  
    direction = "y",  
    hjust= -0.7,  
    segment.linetype=2,  
    segment.size = 0.5,  
    segment.curvature=0  
  ) +  
  theme(legend.position = "none")
```

```
## Warning in geom_pointline(data = avgYearly, aes(y = AvgYear)): `geom_pointpath`  
## and `geom_pointline` have been soft-deprecated. A replacement can be found in  
## ggh4x::geom_pointpath.  
## Warning in geom_pointline(data = movingAvg, aes(y = MA, col = area_name)):  
## `geom_pointpath` and `geom_pointline` have been soft-deprecated. A replacement  
## can be found in ggh4x::geom_pointpath.
```



Calculate Differences

```
healthBoards <- cancerReg %>% filter(area_name %in% area_name)
print(healthBoards)
```

##	area_code	area_name	year	measure
## 1	S08000015	NHS Ayrshire & Arran	2003	649.7
## 2	S08000016	NHS Borders	2003	614.6
## 3	S08000017	NHS Dumfries & Galloway	2003	620.5
## 4	S08000019	NHS Forth Valley	2003	651.8
## 5	S08000020	NHS Grampian	2003	617.8
## 6	S08000022	NHS Highland	2003	602.9
## 7	S08000024	NHS Lothian	2003	655.1
## 8	S08000025	NHS Orkney	2003	589.0
## 9	S08000026	NHS Shetland	2003	616.0
## 10	S08000028	NHS Western Isles	2003	652.0
## 11	S08000029	NHS Fife	2003	611.4
## 12	S08000030	NHS Tayside	2003	611.2
## 13	S08000031	NHS Greater Glasgow & Clyde	2003	697.3
## 14	S08000032	NHS Lanarkshire	2003	633.7
## 15	S08000015	NHS Ayrshire & Arran	2004	642.8
## 16	S08000016	NHS Borders	2004	616.8
## 17	S08000017	NHS Dumfries & Galloway	2004	645.2
## 18	S08000019	NHS Forth Valley	2004	648.2
## 19	S08000020	NHS Grampian	2004	601.5
## 20	S08000022	NHS Highland	2004	594.5

## 21	S08000024	NHS Lothian	2004	660.8
## 22	S08000025	NHS Orkney	2004	582.4
## 23	S08000026	NHS Shetland	2004	636.7
## 24	S08000028	NHS Western Isles	2004	628.1
## 25	S08000029	NHS Fife	2004	614.0
## 26	S08000030	NHS Tayside	2004	607.3
## 27	S08000031	NHS Greater Glasgow & Clyde	2004	693.9
## 28	S08000032	NHS Lanarkshire	2004	632.7
## 29	S08000015	NHS Ayrshire & Arran	2005	631.6
## 30	S08000016	NHS Borders	2005	632.7
## 31	S08000017	NHS Dumfries & Galloway	2005	639.4
## 32	S08000019	NHS Forth Valley	2005	642.8
## 33	S08000020	NHS Grampian	2005	589.7
## 34	S08000022	NHS Highland	2005	598.9
## 35	S08000024	NHS Lothian	2005	659.4
## 36	S08000025	NHS Orkney	2005	587.1
## 37	S08000026	NHS Shetland	2005	571.8
## 38	S08000028	NHS Western Isles	2005	610.3
## 39	S08000029	NHS Fife	2005	630.7
## 40	S08000030	NHS Tayside	2005	600.6
## 41	S08000031	NHS Greater Glasgow & Clyde	2005	695.0
## 42	S08000032	NHS Lanarkshire	2005	643.5
## 43	S08000015	NHS Ayrshire & Arran	2006	626.1
## 44	S08000016	NHS Borders	2006	641.5
## 45	S08000017	NHS Dumfries & Galloway	2006	642.1
## 46	S08000019	NHS Forth Valley	2006	618.3
## 47	S08000020	NHS Grampian	2006	586.6
## 48	S08000022	NHS Highland	2006	613.3
## 49	S08000024	NHS Lothian	2006	666.1
## 50	S08000025	NHS Orkney	2006	598.1
## 51	S08000026	NHS Shetland	2006	574.3
## 52	S08000028	NHS Western Isles	2006	664.4
## 53	S08000029	NHS Fife	2006	641.7
## 54	S08000030	NHS Tayside	2006	596.0
## 55	S08000031	NHS Greater Glasgow & Clyde	2006	687.6
## 56	S08000032	NHS Lanarkshire	2006	637.3
## 57	S08000015	NHS Ayrshire & Arran	2007	636.4
## 58	S08000016	NHS Borders	2007	643.5
## 59	S08000017	NHS Dumfries & Galloway	2007	613.4
## 60	S08000019	NHS Forth Valley	2007	633.2
## 61	S08000020	NHS Grampian	2007	595.9
## 62	S08000022	NHS Highland	2007	627.4
## 63	S08000024	NHS Lothian	2007	668.7
## 64	S08000025	NHS Orkney	2007	587.4
## 65	S08000026	NHS Shetland	2007	562.6
## 66	S08000028	NHS Western Isles	2007	707.2
## 67	S08000029	NHS Fife	2007	648.9
## 68	S08000030	NHS Tayside	2007	617.6
## 69	S08000031	NHS Greater Glasgow & Clyde	2007	698.1
## 70	S08000032	NHS Lanarkshire	2007	640.5
## 71	S08000015	NHS Ayrshire & Arran	2008	648.2
## 72	S08000016	NHS Borders	2008	627.5
## 73	S08000017	NHS Dumfries & Galloway	2008	619.8
## 74	S08000019	NHS Forth Valley	2008	638.9

## 75	S08000020	NHS Grampian	2008	605.0
## 76	S08000022	NHS Highland	2008	627.6
## 77	S08000024	NHS Lothian	2008	683.4
## 78	S08000025	NHS Orkney	2008	589.3
## 79	S08000026	NHS Shetland	2008	594.9
## 80	S08000028	NHS Western Isles	2008	726.0
## 81	S08000029	NHS Fife	2008	643.9
## 82	S08000030	NHS Tayside	2008	621.1
## 83	S08000031	NHS Greater Glasgow & Clyde	2008	710.9
## 84	S08000032	NHS Lanarkshire	2008	649.8
## 85	S08000015	NHS Ayrshire & Arran	2009	652.2
## 86	S08000016	NHS Borders	2009	633.8
## 87	S08000017	NHS Dumfries & Galloway	2009	609.1
## 88	S08000019	NHS Forth Valley	2009	649.8
## 89	S08000020	NHS Grampian	2009	605.4
## 90	S08000022	NHS Highland	2009	625.8
## 91	S08000024	NHS Lothian	2009	681.6
## 92	S08000025	NHS Orkney	2009	543.0
## 93	S08000026	NHS Shetland	2009	596.0
## 94	S08000028	NHS Western Isles	2009	715.0
## 95	S08000029	NHS Fife	2009	640.4
## 96	S08000030	NHS Tayside	2009	613.7
## 97	S08000031	NHS Greater Glasgow & Clyde	2009	715.4
## 98	S08000032	NHS Lanarkshire	2009	665.6
## 99	S08000015	NHS Ayrshire & Arran	2010	643.8
## 100	S08000016	NHS Borders	2010	614.8
## 101	S08000017	NHS Dumfries & Galloway	2010	628.9
## 102	S08000019	NHS Forth Valley	2010	634.1
## 103	S08000020	NHS Grampian	2010	608.5
## 104	S08000022	NHS Highland	2010	625.4
## 105	S08000024	NHS Lothian	2010	691.8
## 106	S08000025	NHS Orkney	2010	569.2
## 107	S08000026	NHS Shetland	2010	663.4
## 108	S08000028	NHS Western Isles	2010	674.4
## 109	S08000029	NHS Fife	2010	650.0
## 110	S08000030	NHS Tayside	2010	603.1
## 111	S08000031	NHS Greater Glasgow & Clyde	2010	714.4
## 112	S08000032	NHS Lanarkshire	2010	675.0
## 113	S08000015	NHS Ayrshire & Arran	2011	643.2
## 114	S08000016	NHS Borders	2011	614.5
## 115	S08000017	NHS Dumfries & Galloway	2011	617.6
## 116	S08000019	NHS Forth Valley	2011	620.3
## 117	S08000020	NHS Grampian	2011	606.2
## 118	S08000022	NHS Highland	2011	616.8
## 119	S08000024	NHS Lothian	2011	684.3
## 120	S08000025	NHS Orkney	2011	531.3
## 121	S08000026	NHS Shetland	2011	685.6
## 122	S08000028	NHS Western Isles	2011	646.0
## 123	S08000029	NHS Fife	2011	651.3
## 124	S08000030	NHS Tayside	2011	606.9
## 125	S08000031	NHS Greater Glasgow & Clyde	2011	712.3
## 126	S08000032	NHS Lanarkshire	2011	677.5
## 127	S08000015	NHS Ayrshire & Arran	2012	654.3
## 128	S08000016	NHS Borders	2012	608.5

## 129	S08000017	NHS Dumfries & Galloway	2012	602.7
## 130	S08000019	NHS Forth Valley	2012	617.3
## 131	S08000020	NHS Grampian	2012	606.8
## 132	S08000022	NHS Highland	2012	614.3
## 133	S08000024	NHS Lothian	2012	691.6
## 134	S08000025	NHS Orkney	2012	549.1
## 135	S08000026	NHS Shetland	2012	731.7
## 136	S08000028	NHS Western Isles	2012	651.6
## 137	S08000029	NHS Fife	2012	659.4
## 138	S08000030	NHS Tayside	2012	616.1
## 139	S08000031	NHS Greater Glasgow & Clyde	2012	713.3
## 140	S08000032	NHS Lanarkshire	2012	672.7
## 141	S08000015	NHS Ayrshire & Arran	2013	659.6
## 142	S08000016	NHS Borders	2013	621.2
## 143	S08000017	NHS Dumfries & Galloway	2013	619.9
## 144	S08000019	NHS Forth Valley	2013	626.7
## 145	S08000020	NHS Grampian	2013	607.1
## 146	S08000022	NHS Highland	2013	604.8
## 147	S08000024	NHS Lothian	2013	686.7
## 148	S08000025	NHS Orkney	2013	496.1
## 149	S08000026	NHS Shetland	2013	689.3
## 150	S08000028	NHS Western Isles	2013	626.6
## 151	S08000029	NHS Fife	2013	654.5
## 152	S08000030	NHS Tayside	2013	622.6
## 153	S08000031	NHS Greater Glasgow & Clyde	2013	718.2
## 154	S08000032	NHS Lanarkshire	2013	666.5
## 155	S08000015	NHS Ayrshire & Arran	2014	662.1
## 156	S08000016	NHS Borders	2014	625.5
## 157	S08000017	NHS Dumfries & Galloway	2014	616.1
## 158	S08000019	NHS Forth Valley	2014	630.4
## 159	S08000020	NHS Grampian	2014	610.3
## 160	S08000022	NHS Highland	2014	612.2
## 161	S08000024	NHS Lothian	2014	684.5
## 162	S08000025	NHS Orkney	2014	529.1
## 163	S08000026	NHS Shetland	2014	683.1
## 164	S08000028	NHS Western Isles	2014	641.8
## 165	S08000029	NHS Fife	2014	638.3
## 166	S08000030	NHS Tayside	2014	627.8
## 167	S08000031	NHS Greater Glasgow & Clyde	2014	712.0
## 168	S08000032	NHS Lanarkshire	2014	654.8
## 169	S08000015	NHS Ayrshire & Arran	2015	643.4
## 170	S08000016	NHS Borders	2015	618.9
## 171	S08000017	NHS Dumfries & Galloway	2015	617.9
## 172	S08000019	NHS Forth Valley	2015	628.9
## 173	S08000020	NHS Grampian	2015	617.1
## 174	S08000022	NHS Highland	2015	602.4
## 175	S08000024	NHS Lothian	2015	659.9
## 176	S08000025	NHS Orkney	2015	508.0
## 177	S08000026	NHS Shetland	2015	693.4
## 178	S08000028	NHS Western Isles	2015	614.6
## 179	S08000029	NHS Fife	2015	628.3
## 180	S08000030	NHS Tayside	2015	632.1
## 181	S08000031	NHS Greater Glasgow & Clyde	2015	711.5
## 182	S08000032	NHS Lanarkshire	2015	649.1

## 183	S08000015	NHS Ayrshire & Arran	2016	633.9
## 184	S08000016	NHS Borders	2016	628.1
## 185	S08000017	NHS Dumfries & Galloway	2016	580.9
## 186	S08000019	NHS Forth Valley	2016	638.2
## 187	S08000020	NHS Grampian	2016	614.8
## 188	S08000022	NHS Highland	2016	597.5
## 189	S08000024	NHS Lothian	2016	641.4
## 190	S08000025	NHS Orkney	2016	521.7
## 191	S08000026	NHS Shetland	2016	697.4
## 192	S08000028	NHS Western Isles	2016	598.1
## 193	S08000029	NHS Fife	2016	617.1
## 194	S08000030	NHS Tayside	2016	631.2
## 195	S08000031	NHS Greater Glasgow & Clyde	2016	699.3
## 196	S08000032	NHS Lanarkshire	2016	650.3
## 197	S08000015	NHS Ayrshire & Arran	2017	627.2
## 198	S08000016	NHS Borders	2017	638.1
## 199	S08000017	NHS Dumfries & Galloway	2017	588.7
## 200	S08000019	NHS Forth Valley	2017	657.4
## 201	S08000020	NHS Grampian	2017	637.4
## 202	S08000022	NHS Highland	2017	598.8
## 203	S08000024	NHS Lothian	2017	632.7
## 204	S08000025	NHS Orkney	2017	516.3
## 205	S08000026	NHS Shetland	2017	696.2
## 206	S08000028	NHS Western Isles	2017	573.3
## 207	S08000029	NHS Fife	2017	637.5
## 208	S08000030	NHS Tayside	2017	632.1
## 209	S08000031	NHS Greater Glasgow & Clyde	2017	700.2
## 210	S08000032	NHS Lanarkshire	2017	659.8
## 211	S08000015	NHS Ayrshire & Arran	2018	632.8
## 212	S08000016	NHS Borders	2018	629.3
## 213	S08000017	NHS Dumfries & Galloway	2018	618.5
## 214	S08000019	NHS Forth Valley	2018	664.7
## 215	S08000020	NHS Grampian	2018	651.1
## 216	S08000022	NHS Highland	2018	613.4
## 217	S08000024	NHS Lothian	2018	635.3
## 218	S08000025	NHS Orkney	2018	550.7
## 219	S08000026	NHS Shetland	2018	610.8
## 220	S08000028	NHS Western Isles	2018	588.7
## 221	S08000029	NHS Fife	2018	645.9
## 222	S08000030	NHS Tayside	2018	623.9
## 223	S08000031	NHS Greater Glasgow & Clyde	2018	702.0
## 224	S08000032	NHS Lanarkshire	2018	661.0
## 225	S08000015	NHS Ayrshire & Arran	2019	616.0
## 226	S08000016	NHS Borders	2019	575.6
## 227	S08000017	NHS Dumfries & Galloway	2019	611.7
## 228	S08000019	NHS Forth Valley	2019	643.7
## 229	S08000020	NHS Grampian	2019	623.3
## 230	S08000022	NHS Highland	2019	600.8
## 231	S08000024	NHS Lothian	2019	617.5
## 232	S08000025	NHS Orkney	2019	575.9
## 233	S08000026	NHS Shetland	2019	548.4
## 234	S08000028	NHS Western Isles	2019	609.0
## 235	S08000029	NHS Fife	2019	623.1
## 236	S08000030	NHS Tayside	2019	592.0

```
## 237 S08000031 NHS Greater Glasgow & Clyde 2019 674.8
## 238 S08000032 NHS Lanarkshire 2019 635.4
## 239 S08000015 NHS Ayrshire & Arran 2020 625.5
## 240 S08000016 NHS Borders 2020 560.1
## 241 S08000017 NHS Dumfries & Galloway 2020 621.7
## 242 S08000019 NHS Forth Valley 2020 642.4
## 243 S08000020 NHS Grampian 2020 614.9
## 244 S08000022 NHS Highland 2020 604.9
## 245 S08000024 NHS Lothian 2020 628.9
## 246 S08000025 NHS Orkney 2020 586.6
## 247 S08000026 NHS Shetland 2020 551.9
## 248 S08000028 NHS Western Isles 2020 665.8
## 249 S08000029 NHS Fife 2020 602.0
## 250 S08000030 NHS Tayside 2020 590.5
## 251 S08000031 NHS Greater Glasgow & Clyde 2020 673.5
## 252 S08000032 NHS Lanarkshire 2020 624.1
```

```
colourCells <- function(values, average){
  diffVal <- values - average
  if (diffVal>=0 & diffVal<=20){
    return(paste0("\\cellcolor{green!," ,round(diffVal/100), "}"))
  }
}
```

Summary Table of Data Within Graph

```
inputFile <- "reportReg.pdf"
healthBoardData <- cancerReg %>%
  group_by(year) %>%
  mutate(Percent = measure / sum(measure) * 100)
healthBoardData <- cancerReg %>% pivot_wider(names_from = year, values_from = measure)
healthBoardData <- healthBoardData %>%
  mutate(
    Average = rowMeans(select(., `2003`:`2020`), na.rm = TRUE)
  )

kable(healthBoardData, format = "latex", booktabs = TRUE) %>%
  kable_styling(latex_options = c("striped", "hold_poistion")) %>%
  row_spec(0, bold = TRUE) %>%
  kableExtra::landscape()
```

area_code	area_name	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
S08000015	NHS Ayrshire & Arran	649.7	642.8	631.6	626.1	636.4	648.2	652.2	643.8	643.2	654.3	659.6	662.1	643.4	633.9	627.7
S08000016	NHS Borders	614.6	616.8	632.7	641.5	643.5	627.5	633.8	614.8	614.5	608.5	621.2	625.5	618.9	628.1	638.2
S08000017	NHS Dumfries & Galloway	620.5	645.2	639.4	642.1	613.4	619.8	609.1	628.9	617.6	602.7	619.9	616.1	617.9	580.9	588.2
S08000019	NHS Forth Valley	651.8	648.2	642.8	618.3	633.2	638.9	649.8	634.1	620.3	617.3	626.7	630.4	628.9	638.2	657.1
S08000020	NHS Grampian	617.8	601.5	589.7	586.6	595.9	605.0	605.4	608.5	606.2	606.8	607.1	610.3	617.1	614.8	637.2
S08000022	NHS Highland	602.9	594.5	598.9	613.3	627.4	627.6	625.8	625.4	616.8	614.3	604.8	612.2	602.4	597.5	598.2
S08000024	NHS Lothian	655.1	660.8	659.4	666.1	668.7	683.4	681.6	691.8	684.3	691.6	686.7	684.5	659.9	641.4	632.1
S08000025	NHS Orkney	589.0	582.4	587.1	598.1	587.4	589.3	543.0	569.2	531.3	549.1	496.1	529.1	508.0	521.7	516.2
S08000026	NHS Shetland	616.0	636.7	571.8	574.3	562.6	594.9	596.0	663.4	685.6	731.7	689.3	683.1	693.4	697.4	696.2
S08000028	NHS Western Isles	652.0	628.1	610.3	664.4	707.2	726.0	715.0	674.4	646.0	651.6	626.6	641.8	614.6	598.1	573.2
S08000029	NHS Fife	611.4	614.0	630.7	641.7	648.9	643.9	640.4	650.0	651.3	659.4	654.5	638.3	628.3	617.1	637.2
S08000030	NHS Tayside	611.2	607.3	600.6	596.0	617.6	621.1	613.7	603.1	606.9	616.1	622.6	627.8	632.1	631.2	632.1
S08000031	NHS Greater Glasgow & Clyde	697.3	693.9	695.0	687.6	698.1	710.9	715.4	714.4	712.3	713.3	718.2	712.0	711.5	699.3	700.2
S08000032	NHS Lanarkshire	633.7	632.7	643.5	637.3	640.5	649.8	665.6	675.0	677.5	672.7	666.5	654.8	649.1	650.3	659.2

```
qpdf::pdf_rotate_pages(inputFile, pages=4 , angle=90)
```

```
## [1] "C:\\Users\\romin\\ToyRepo\\Models\\reportReg_output.pdf"
```

#Note for next time: what I want to do at this point is to show the changing colours as a difference change if its only within a small amount of chaning values then ignore the calues and do not #colour the cell, otherwise red fir a rise and green for a fall