Title Placeholder

Load in Specific Packages

```
suppressWarnings({
    library(readr)
    library(tidyr)
    library(dplyr)
    library(here)
    library(lemon)
    library(kableExtra)
    library(ggplot2)
    library(reshape())
    library(hexbin)
    library(data.table)
    library(GGally)
    library(formattable)
    library(viridis)
    library(TTR)
    library(zoo)
    library(ggrepel)
    library(grid)
})
```

```
##
## 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
## here() starts at C:/Users/romin/ToyRepo
##
## Attaching package: 'kableExtra'
## The following object is masked from 'package:dplyr':
##
##     group_rows
##
## Attaching package: 'reshape'
## The following object is masked from 'package:dplyr':
##
##     rename
## The following objects are masked from 'package:tidyr':
##
```

```
##     expand, smiths
```

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

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

```
## The following objects are masked from 'package:dplyr':
##
##     between, first, last
```

```
## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg   ggplot2
```

```
## Loading required package: viridisLite
```

```
##
## 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
```

Load in the data

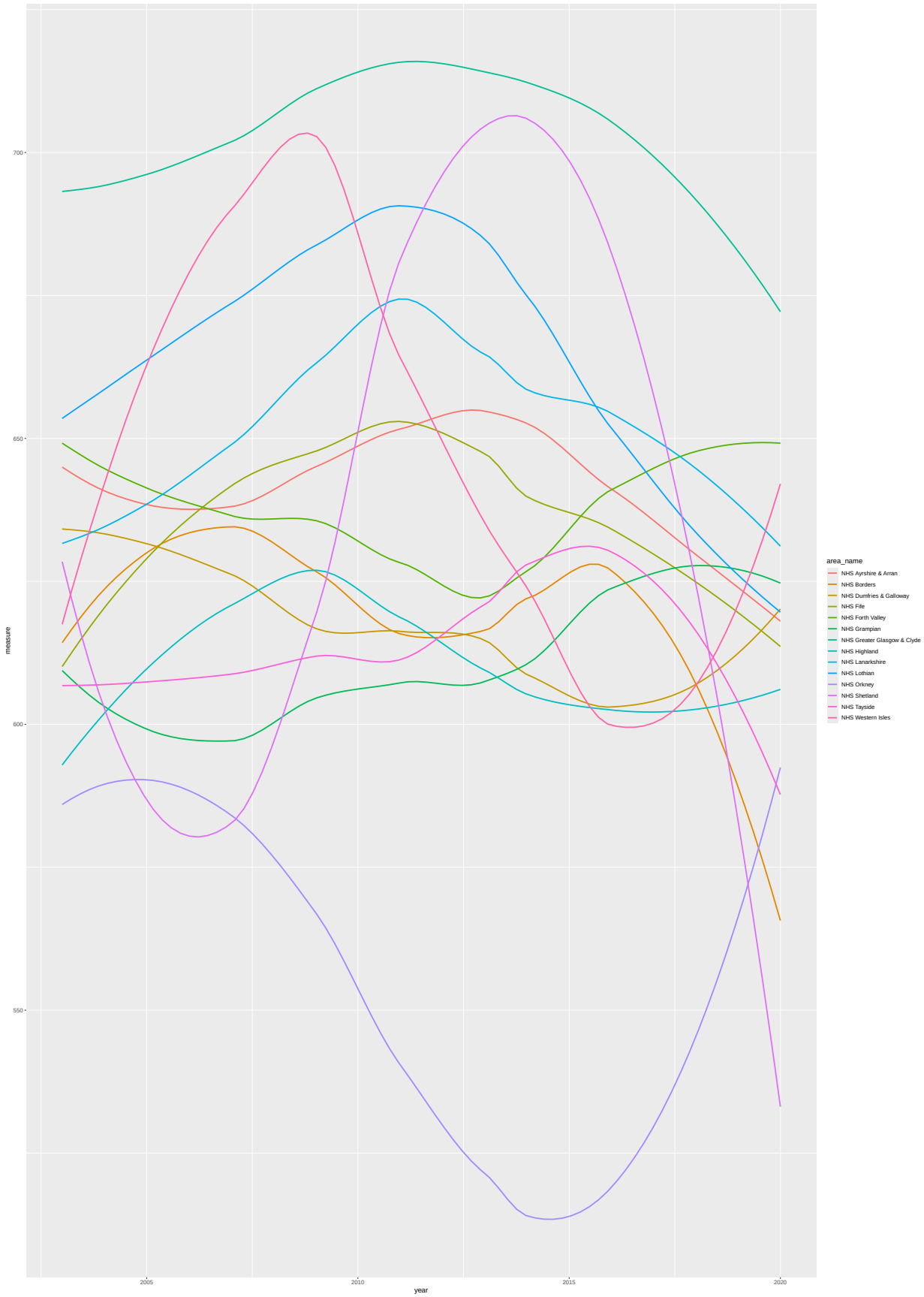
```
cancerReg <- read.csv("C:\\Users\\romin\\ToyRepo\\Models\\cancerReg.csv")
```

Remove Uncessary 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'
```


700
650
600
550
measure
2005
2010
2015
2020
year
area_name
NHS Ayrshire & Arran
NHS Borders
NHS Dumfries & Galloway
NHS Fife
NHS Forth Valley
NHS Grampian
NHS Greater Glasgow & Clyde
NHS Highland
NHS Lanarkshire
NHS Lothian
NHS Orkney
NHS Shetland
NHS Tayside
NHS Western Isles

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

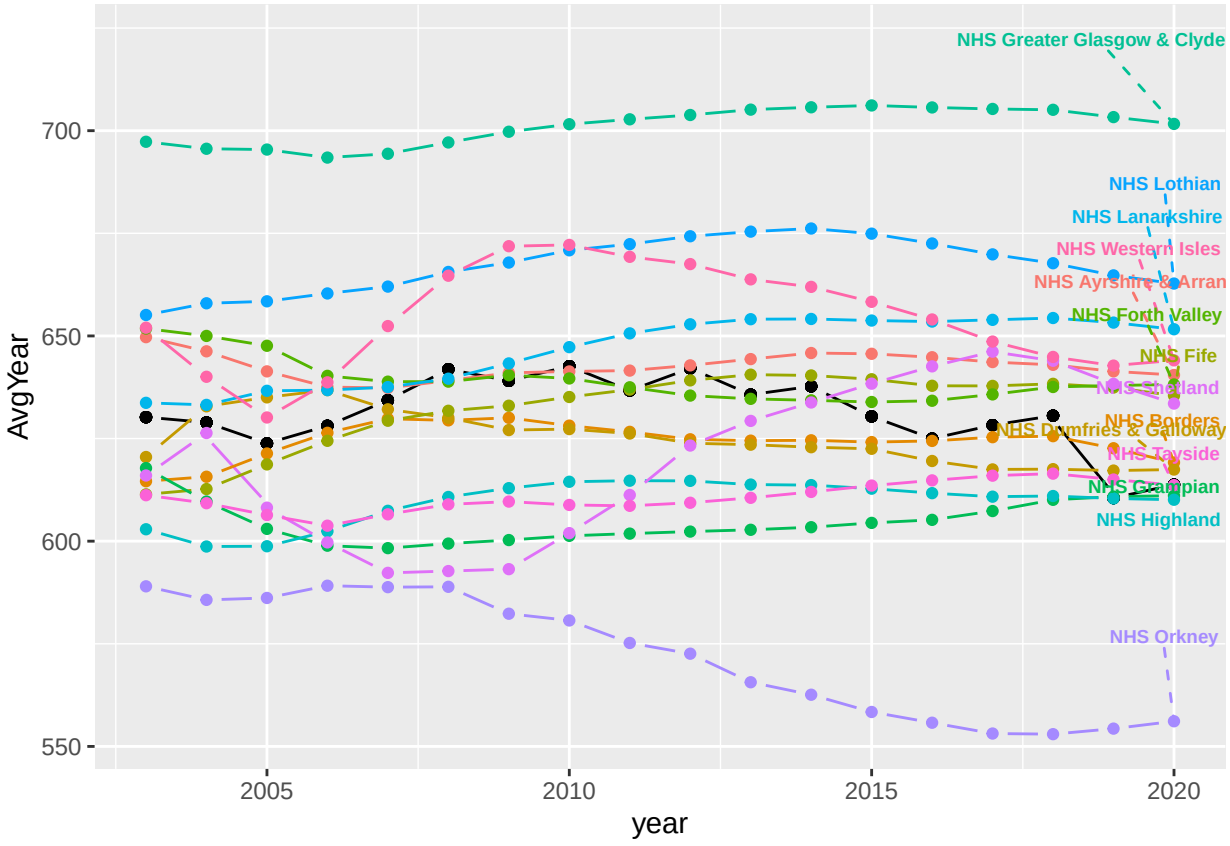
```
finalValues <- movingAvg %>%
    group_by(area_name) %>%
    summarise(
        lastMA = dplyr::last(MA),
        lastYear=dplyr::last(year)
    )
```

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 Function

```
sigPercent <- data.frame(
    area_name = character(),
    year = integer(),
    percentNum = numeric(),
    stringsAsFactors = FALSE
)
boardAvg <- function(currBoard, currVal, currYear) {
    currAvgYear <- filter(movingAvg, area_name == currBoard & year == currYear) %>% select(MA)
    numCurrAvgYear <- gsub("[^0-9.]", "", currAvgYear$MA)
    numCurrAvgYear <- as.numeric(numCurrAvgYear)
    diffVal <- currVal - numCurrAvgYear
    percentVal <- ((diffVal / numCurrAvgYear) * 100)

    if (percentVal >= 3 || percentVal <= -3) {
        sigPercent <- sigPercent %>% add_row(area_name = currBoard, year = currYear, percentNum = r
    }
    return(sigPercent)

    ## Turn these differences into a percentage of how different it is, and if its greatly differen
    # WHile the moving average does not provide a direct estimation of the predictied values it sti
}
```

Calculate Differences

```r
healthBoards <- unique(cancerReg$area_name)
totalYears <- unique(cancerReg$year)
for (currBoard in healthBoards) {
    for (currYear in totalYears) {
        currVal <- subset(cancerReg, year == currYear & area_name == currBoard)
        currVal <- select(currVal, -area_code, -area_name, -year)
        currVal <- as.numeric(currVal)
        sigPercent <- boardAvg(currBoard, currVal, currYear)
    }
}
```

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```

```r
sigPercent <- sigPercent %>% arrange(desc(year))
print(sigPercent)
```

```
##                      area_name year percentNum
## 1                  NHS Borders 2020      -9.54
```

```
## 2                  NHS Lothian 2020      -5.11
## 3                   NHS Orkney 2020       5.48
## 4                 NHS Shetland 2020     -12.88
## 5            NHS Western Isles 2020       3.38
## 6                     NHS Fife 2020      -5.27
## 7                  NHS Tayside 2020      -3.77
## 8  NHS Greater Glasgow & Clyde 2020      -4.01
## 9               NHS Lanarkshire 2020      -4.22
## 10        NHS Ayrshire & Arran 2019      -3.96
## 11                 NHS Borders 2019      -7.56
## 12                 NHS Lothian 2019      -7.11
## 13                  NHS Orkney 2019       3.89
## 14                NHS Shetland 2019     -14.09
## 15           NHS Western Isles 2019      -5.25
## 16                 NHS Tayside 2019      -3.74
## 17 NHS Greater Glasgow & Clyde 2019      -4.05
## 18            NHS Forth Valley 2018       4.26
## 19                NHS Grampian 2018       6.72
## 20                 NHS Lothian 2018      -4.85
## 21                NHS Shetland 2018      -5.15
## 22           NHS Western Isles 2018      -8.71
## 23     NHS Dumfries & Galloway 2017      -4.66
## 24            NHS Forth Valley 2017       3.40
## 25                NHS Grampian 2017       4.95
## 26                 NHS Lothian 2017      -5.55
## 27                  NHS Orkney 2017      -6.66
## 28                NHS Shetland 2017       7.74
## 29           NHS Western Isles 2017     -11.61
## 30     NHS Dumfries & Galloway 2016      -6.24
## 31                 NHS Lothian 2016      -4.63
## 32                  NHS Orkney 2016      -6.13
## 33                NHS Shetland 2016       8.53
## 34           NHS Western Isles 2016      -8.55
## 35                    NHS Fife 2016      -3.25
## 36                  NHS Orkney 2015      -9.02
## 37                NHS Shetland 2015       8.62
## 38           NHS Western Isles 2015      -6.64
## 39                 NHS Tayside 2015       3.02
## 40                  NHS Orkney 2014      -5.95
## 41                NHS Shetland 2014       7.78
## 42           NHS Western Isles 2014      -3.04
## 43                  NHS Orkney 2013     -12.29
## 44                NHS Shetland 2013       9.53
## 45           NHS Western Isles 2013      -5.60
## 46     NHS Dumfries & Galloway 2012      -3.39
## 47                  NHS Orkney 2012      -4.10
## 48                NHS Shetland 2012      17.39
## 49                    NHS Fife 2012       3.17
## 50              NHS Lanarkshire 2012       3.04
## 51                  NHS Orkney 2011      -7.63
## 52                NHS Shetland 2011      12.16
## 53           NHS Western Isles 2011      -3.48
## 54              NHS Lanarkshire 2011       4.13
## 55                 NHS Lothian 2010       3.12
```

```
## 56                NHS Shetland 2010      10.21
## 57             NHS Lanarkshire 2010       4.29
## 58                  NHS Orkney 2009      -6.75
## 59           NHS Western Isles 2009       6.42
## 60             NHS Lanarkshire 2009       3.47
## 61           NHS Western Isles 2008       9.23
## 62                NHS Highland 2007       3.29
## 63                NHS Shetland 2007      -5.01
## 64           NHS Western Isles 2007       8.40
## 65                     NHS Fife 2007       3.11
## 66            NHS Forth Valley 2006      -3.43
## 67                NHS Shetland 2006      -4.24
## 68           NHS Western Isles 2006       4.02
## 69                NHS Shetland 2005      -5.98
## 70           NHS Western Isles 2005      -3.15
```

```
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"
# sigPercentWide_colored <- sigPercentWide %>%
#     mutate(across(everything(), ~ cell_spec(.,
#                                             color = ifelse(. < 0, "red", "black"),
#                                             background = ifelse(. < 0, "lightpink", "white"))))


sigPercentWide <- sigPercent %>% pivot_wider(
    names_from = year,
    values_from = percentNum
)







sigPercentWide <- sigPercentWide %>% mutate(
  across(-1,

      ~ cell_spec(., color = ifelse(is.na(.), "black", ifelse(. < 0, "green", "red")))
  )
  )
print(colnames(sigPercentWide))
```

```
##  [1] "area_name" "2020"      "2019"      "2018"      "2017"      "2016"
##  [7] "2015"      "2014"      "2013"      "2012"      "2011"      "2010"
## [13] "2009"      "2008"      "2007"      "2006"      "2005"
```

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

area_name	2020	2019	2018	2017	2016
NHS Borders	\textcolor{green}{-9.54}	\textcolor{green}{-7.56}	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{black
NHS Lothian	\textcolor{green}{-5.11}	\textcolor{green}{-7.11}	\textcolor{green}{-4.85}	\textcolor{green}{-5.55}	\textcolor{green
NHS Orkney	\textcolor{red}{5.48}	\textcolor{red}{3.89}	\textcolor{black}{NA}	\textcolor{green}{-6.66}	\textcolor{green
NHS Shetland	\textcolor{green}{-12.88}	\textcolor{green}{-14.09}	\textcolor{green}{-5.15}	\textcolor{red}{7.74}	\textcolor{red}{
NHS Western Isles	\textcolor{red}{3.38}	\textcolor{green}{-5.25}	\textcolor{green}{-8.71}	\textcolor{green}{-11.61}	\textcolor{green
NHS Fife	\textcolor{green}{-5.27}	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{green
NHS Tayside	\textcolor{green}{-3.77}	\textcolor{green}{-3.74}	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{black
NHS Greater Glasgow & Clyde	\textcolor{green}{-4.01}	\textcolor{green}{-4.05}	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{black
NHS Lanarkshire	\textcolor{green}{-4.22}	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{black
NHS Ayrshire & Arran	\textcolor{black}{NA}	\textcolor{green}{-3.96}	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{black
NHS Forth Valley	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{red}{4.26}	\textcolor{red}{3.4}	\textcolor{black
NHS Grampian	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{red}{6.72}	\textcolor{red}{4.95}	\textcolor{black
NHS Dumfries & Galloway	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{green}{-4.66}	\textcolor{green
NHS Highland	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{black}{NA}	\textcolor{black

```
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