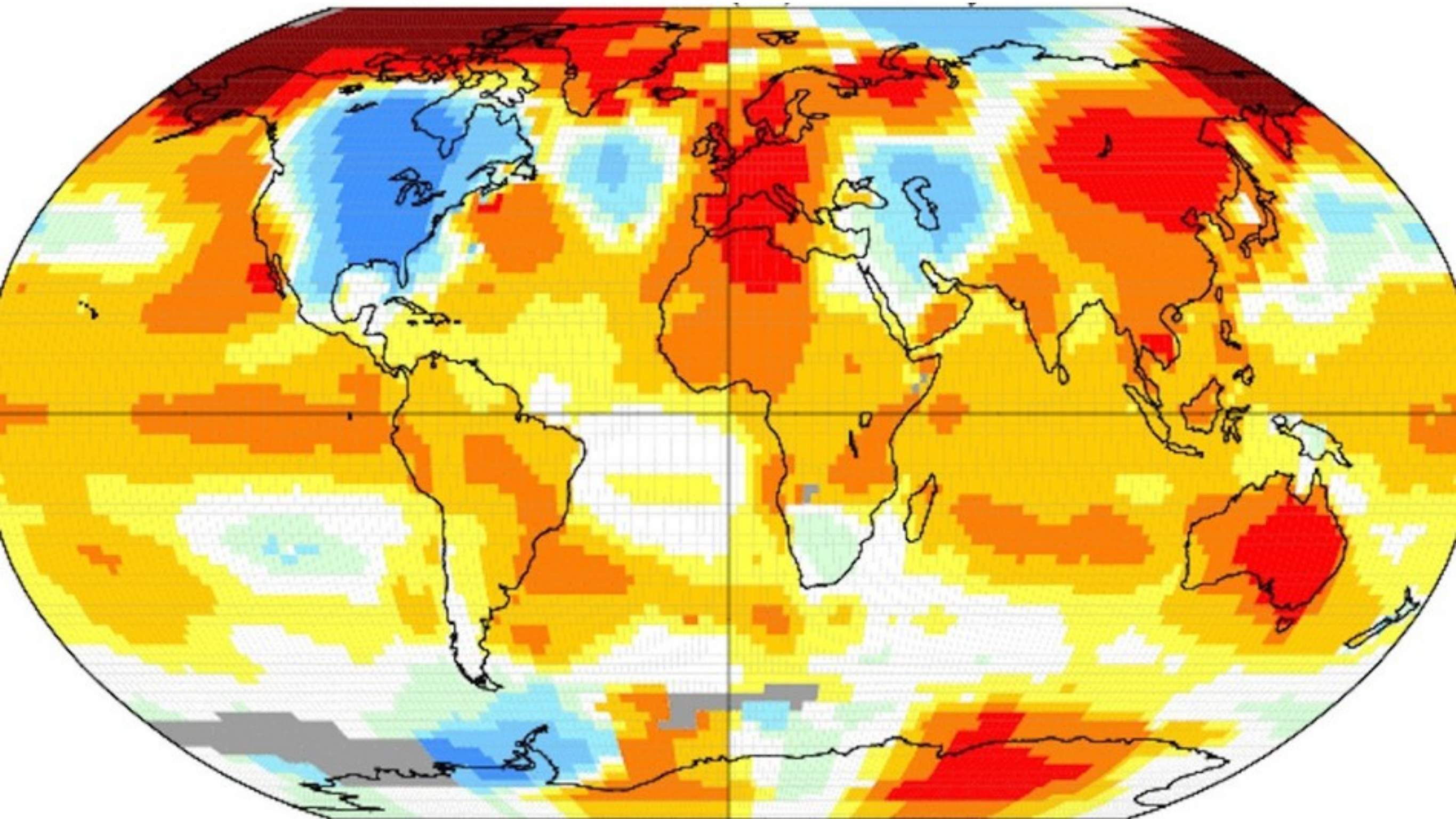


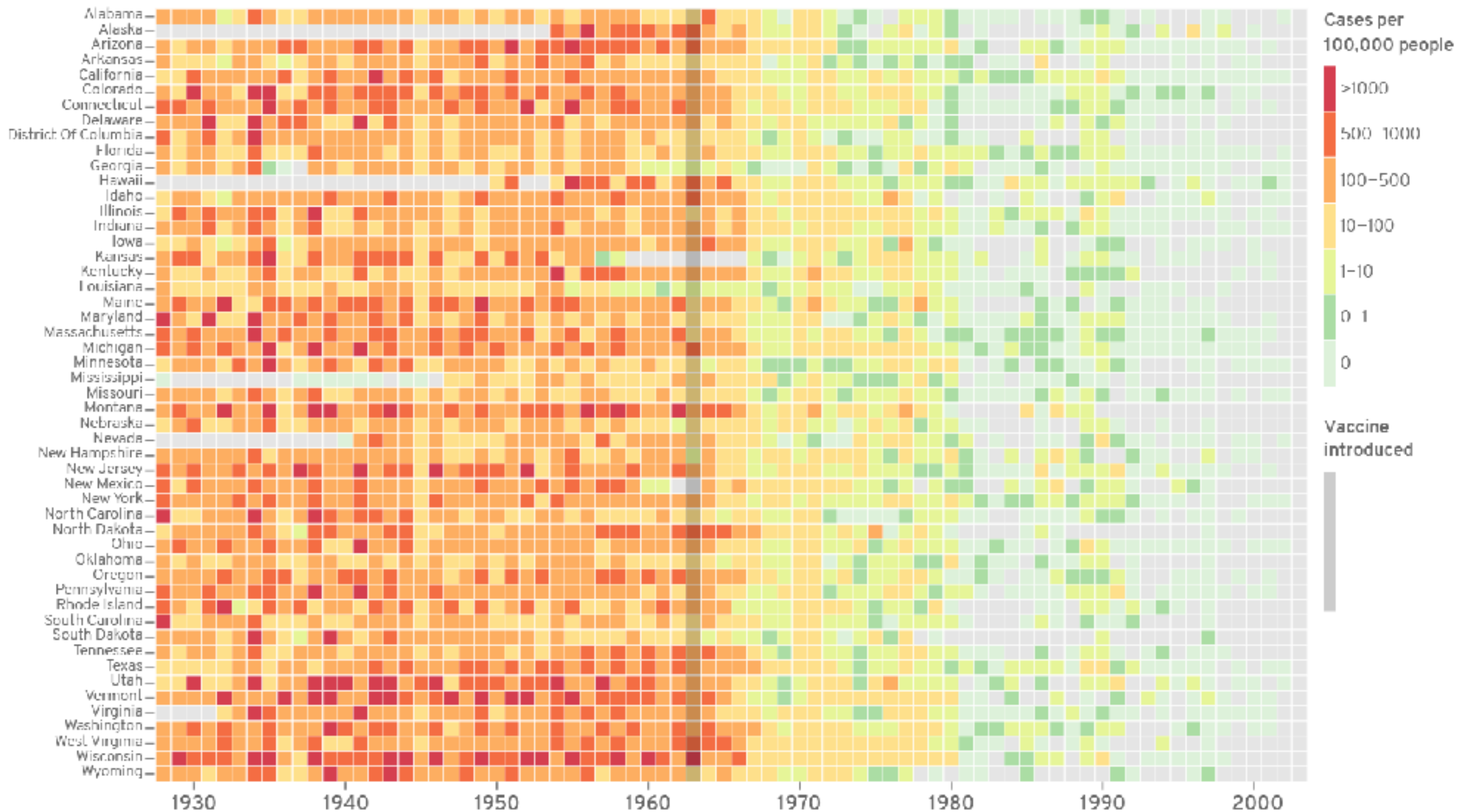
Heatmaps in R

R cafe showcase — Barbara Vreede (University Library Utrecht)
25 February 2019

It's getting hot in here...

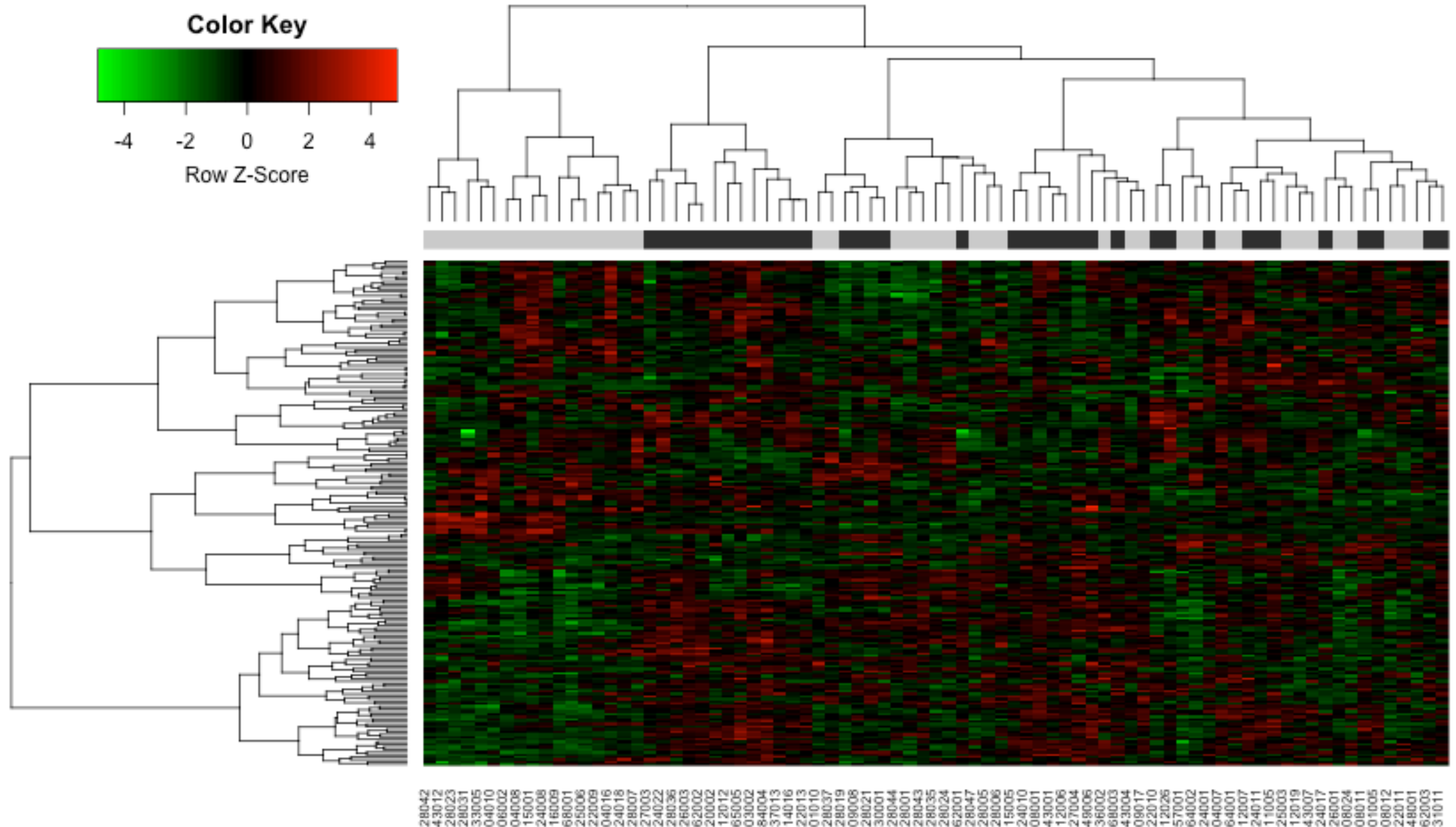


Measles cases in the US

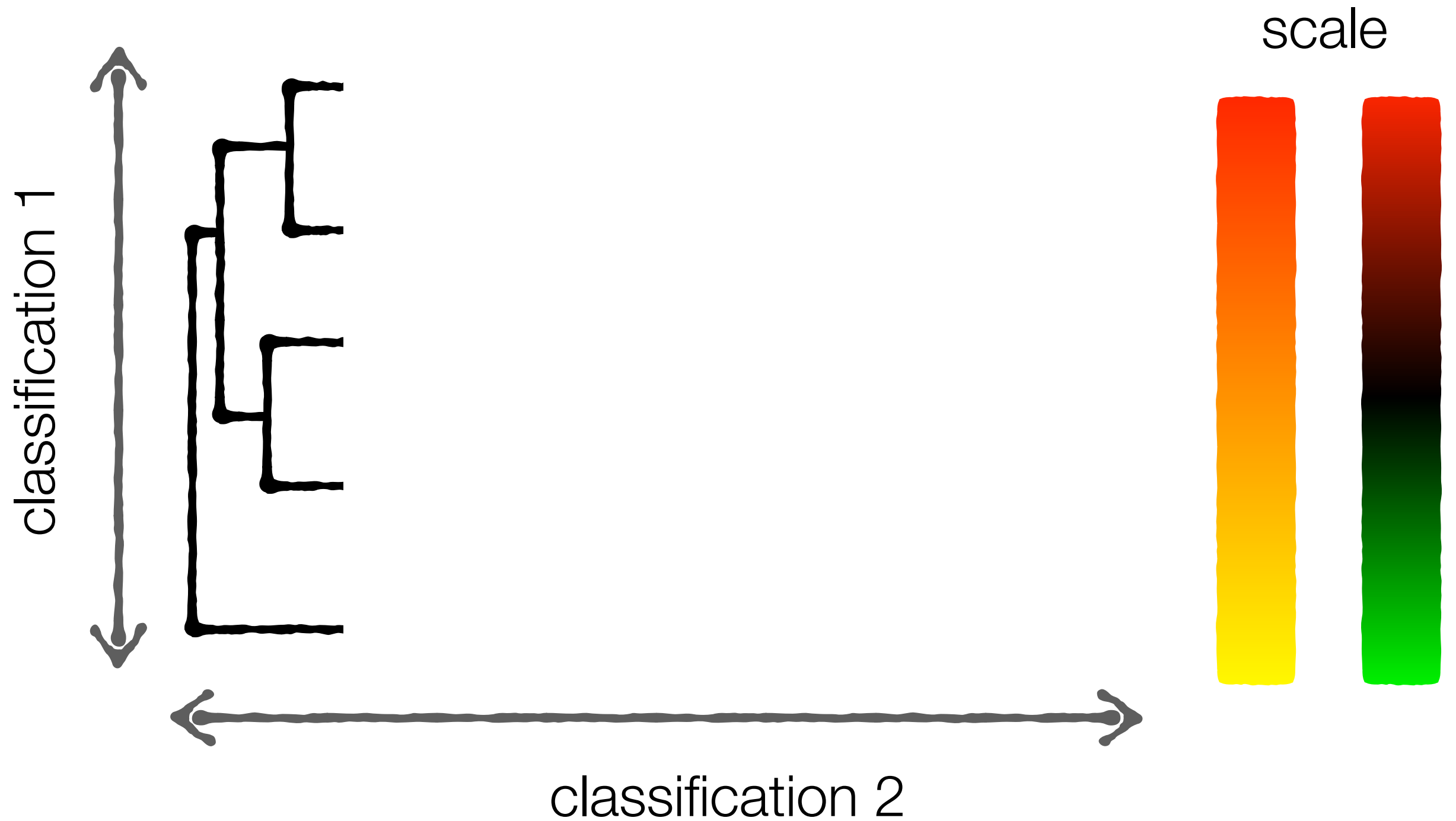


source: <http://www.roymfrancis.com/a-guide-to-elegant-tiled-heatmaps-in-r/>

Microarray data: samples and probes



Elements of a heatmap



Let's get started in R

```
# install and load heatmap package
```

```
install.packages("pheatmap")
```

```
library(pheatmap)
```

```
# load data: cellphone pickups in 26 individuals
```

```
library(readr)
```

```
cellphone <- read_delim("cellphone.csv", delim=",")
```

```
cellphone <- column_to_rownames(cellphone, "X1")
```

```
# check out the data
```

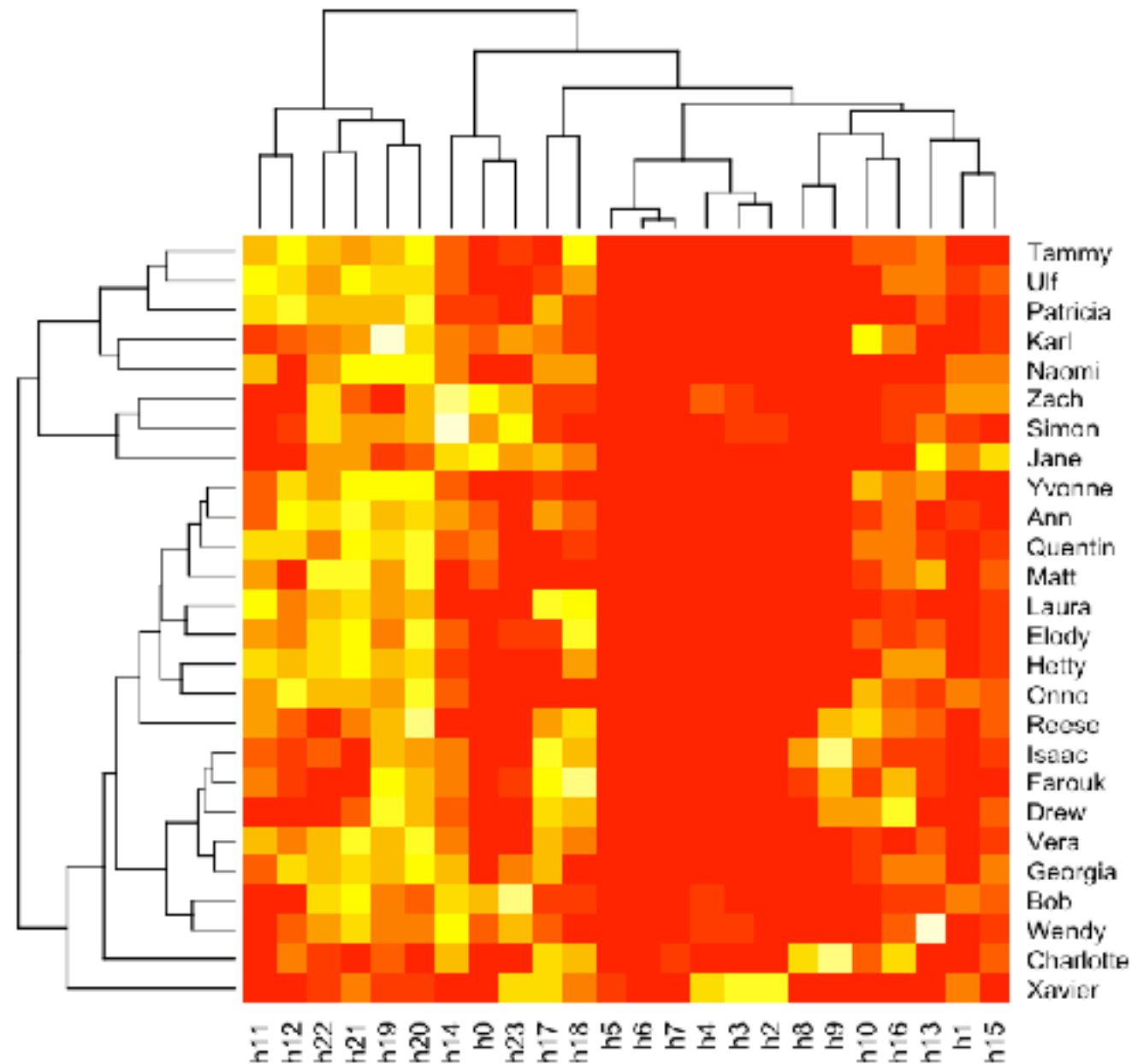
```
head(cellphone)
```

	h0	h1	h2	h3	h4	h5	h6	h7	h8	h9	h10	h11	h12	h13	h14	h15	h16	h17	h18	h19	h20	h21	h22	h23
Ann	6	5	1	0	0	0	0	0	0	1	4	7	17	3	10	2	9	10	7	12	16	20	14	1
Bob	15	11	2	3	5	2	0	0	0	0	0	0	2	6	19	7	4	5	5	11	7	21	17	26
Charlotte	0	1	0	0	1	1	3	8	31	47	12	3	18	2	29	16	31	30	27	16	2	3	11	7
Drew	0	0	0	0	0	0	0	1	0	8	7	0	1	1	5	5	14	10	9	14	9	5	1	1
Elody	5	2	2	0	0	0	0	1	1	2	10	18	15	10	12	8	9	9	32	13	31	26	24	8
Farouk	0	0	0	0	0	0	0	0	1	3	1	2	1	1	2	0	3	4	5	4	3	0	0	1

pheatmap use on cellphone data

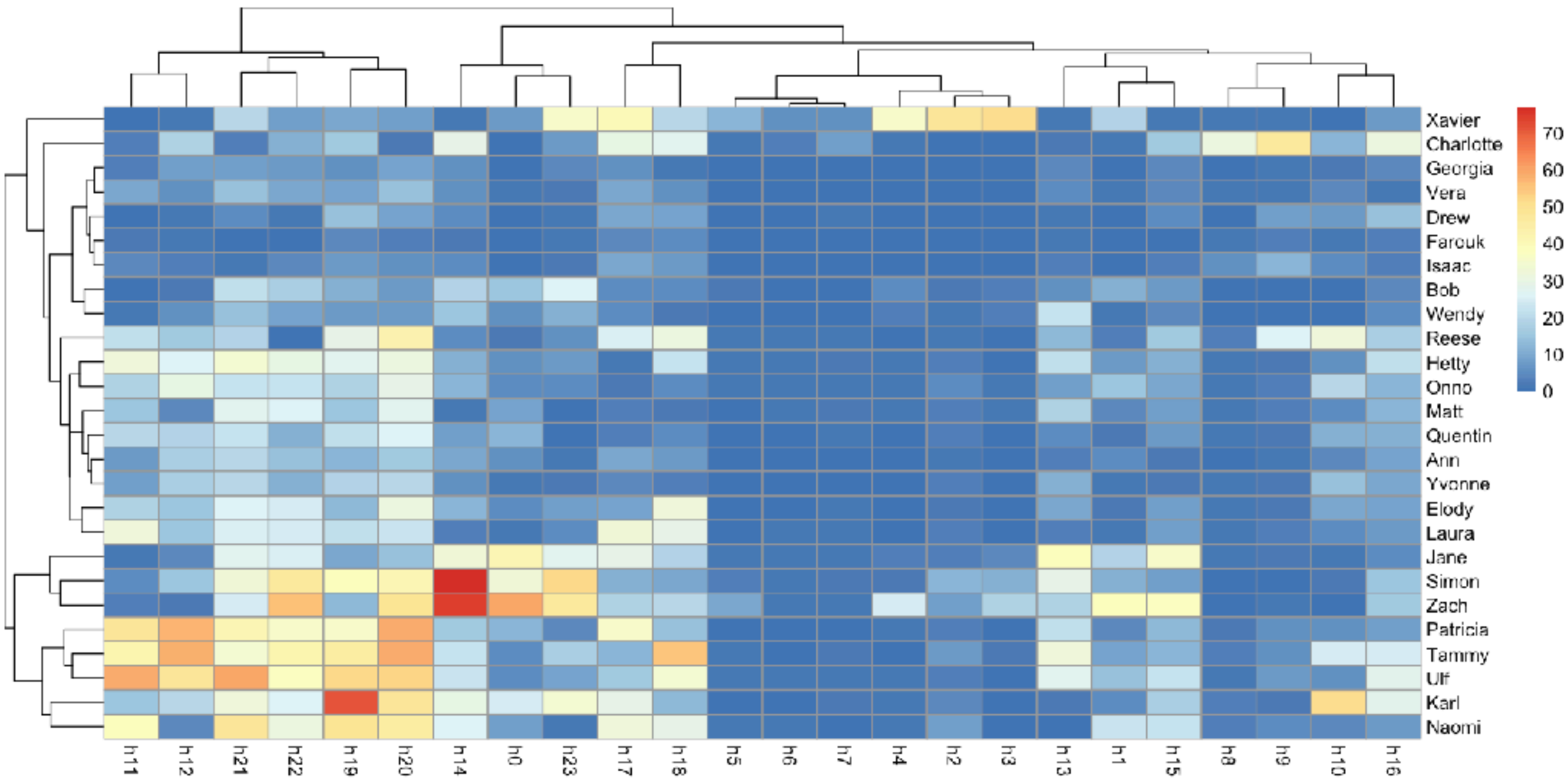
```
# make a heatmap
```

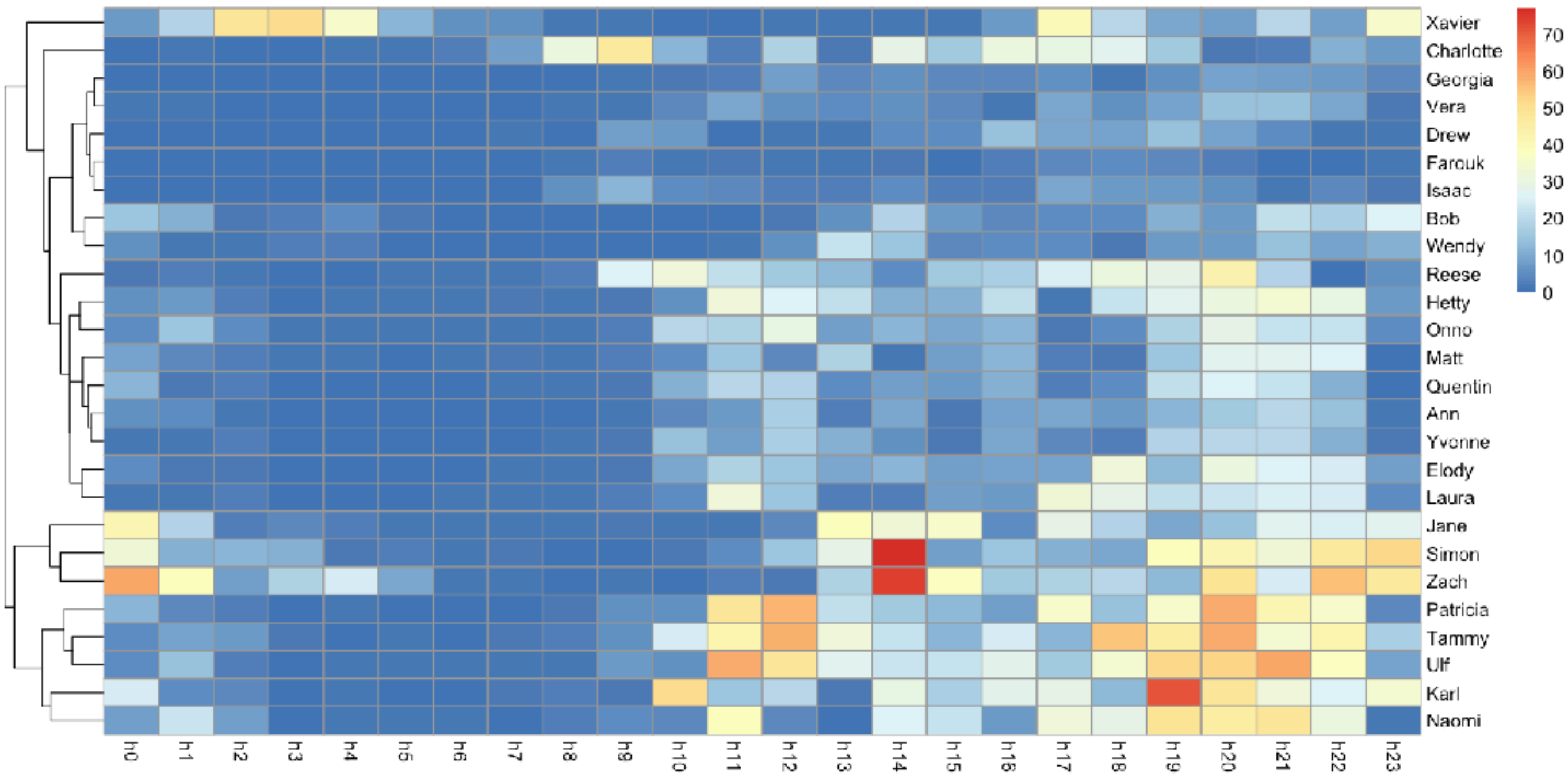
```
heatmap(as.matrix(cellphone))
```



```
# make a heatmap
```

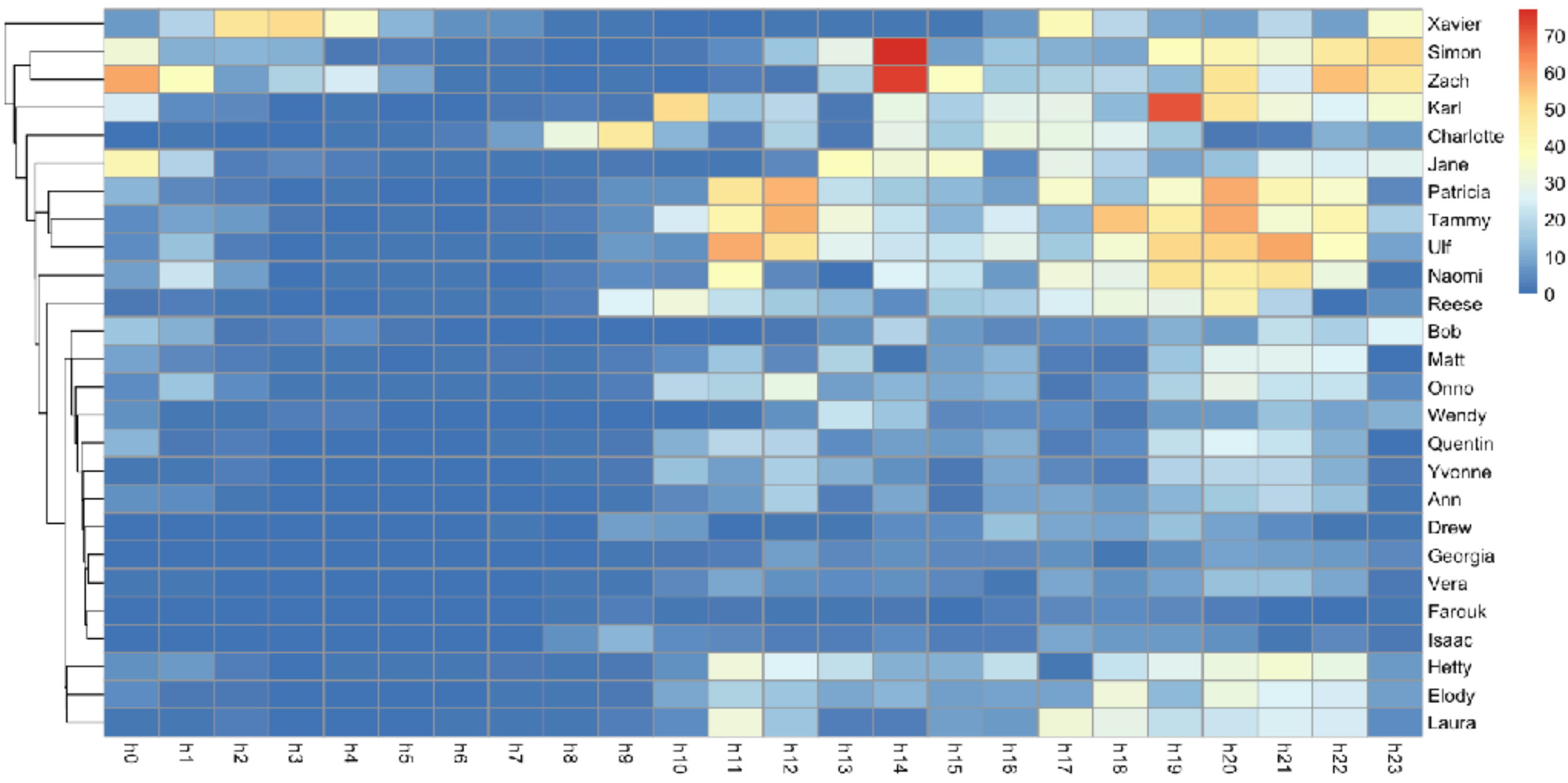
pheatmap(cellphone)





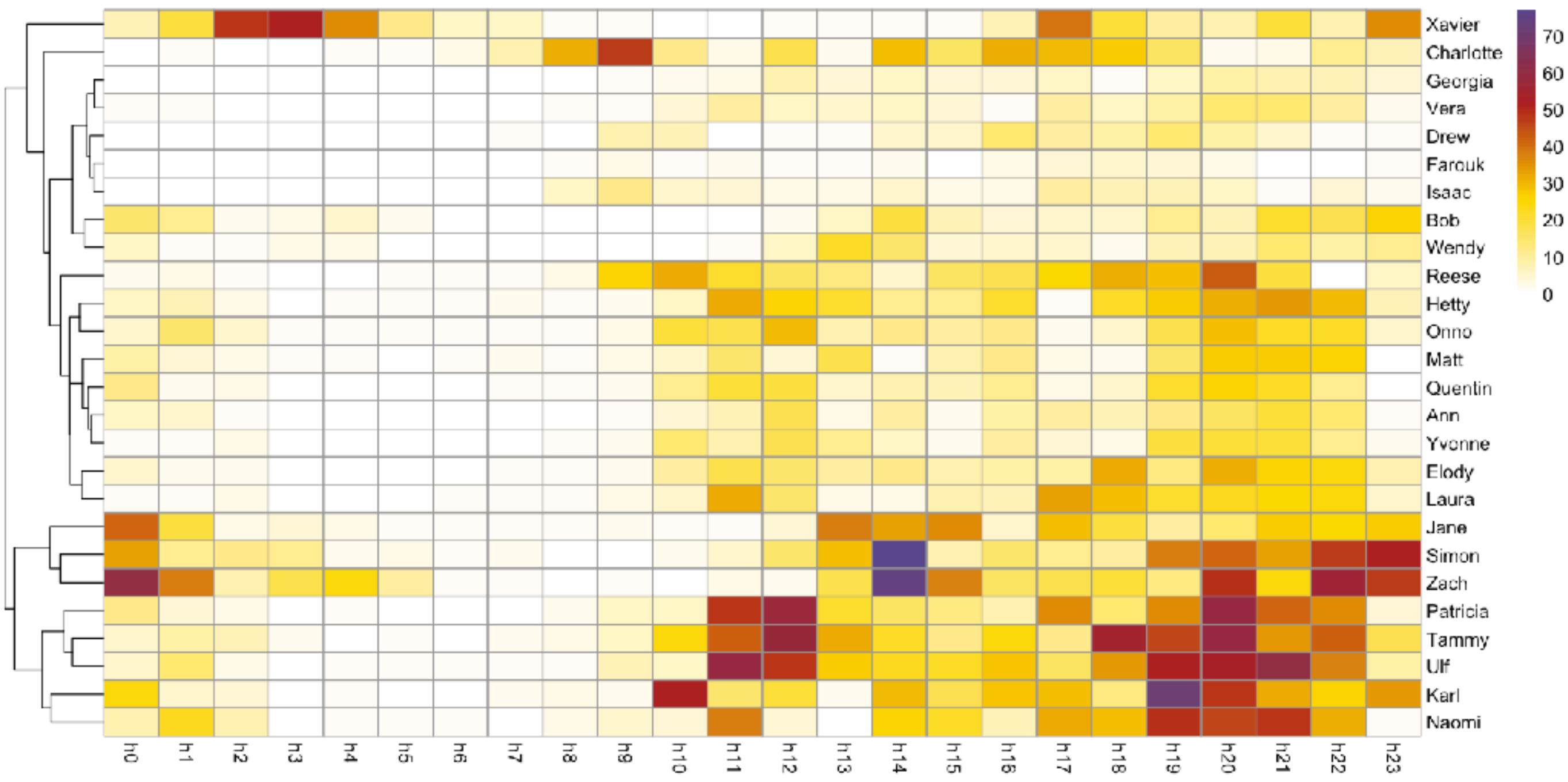
pheatmap use on cellphone data

```
# try a different clustering strategy  
pheatmap(cellphone, cluster_cols=F, clustering_method="single")
```



Adjusting the aesthetics: custom colours

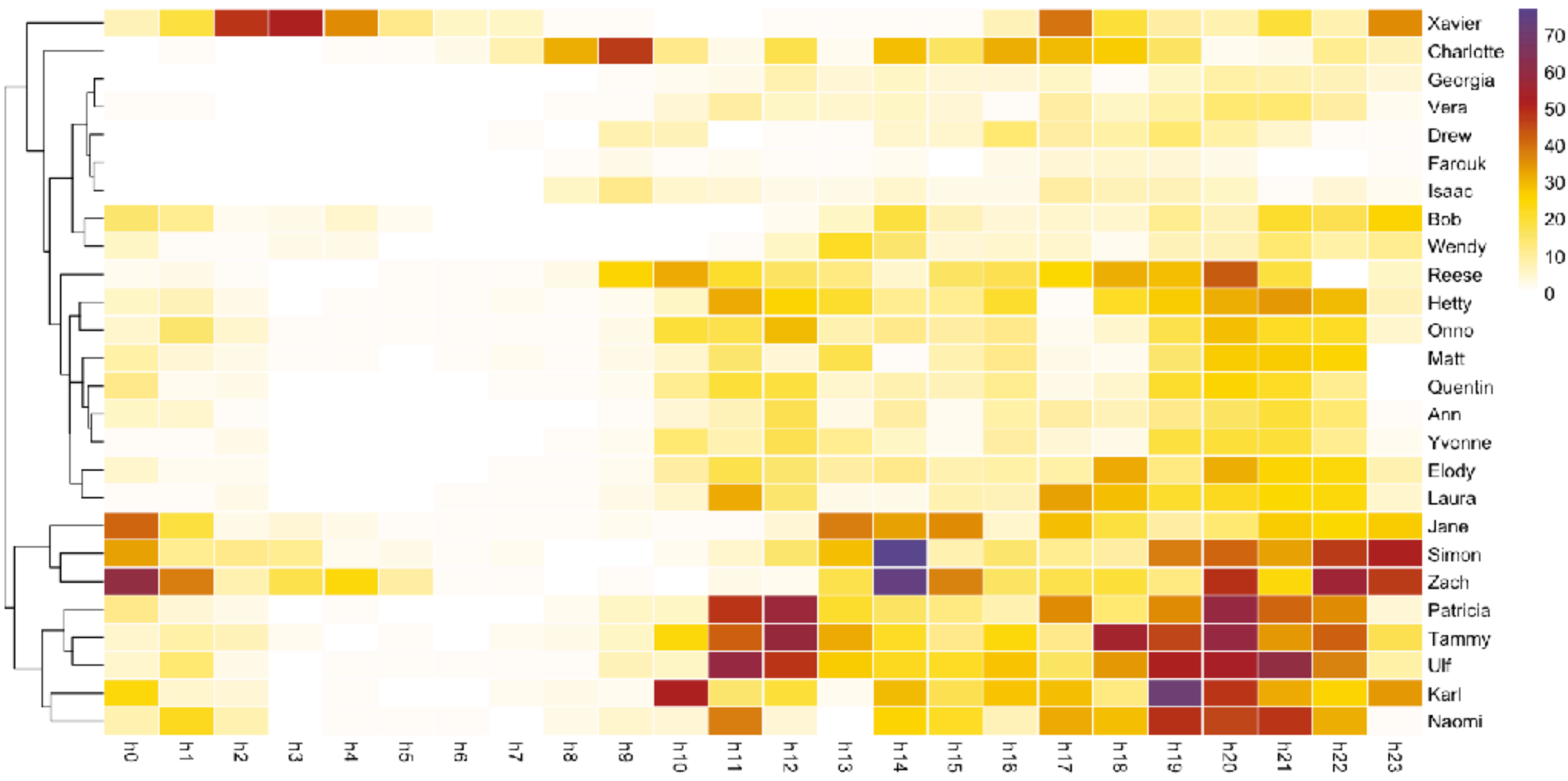
```
k <- colorRampPalette(c("white","gold","firebrick","mediumpurple4"))(100)
pheatmap(cellphone, cluster_cols=F, color=k)
```



Adjusting the aesthetics: custom colours

```
# adjusting the border
```

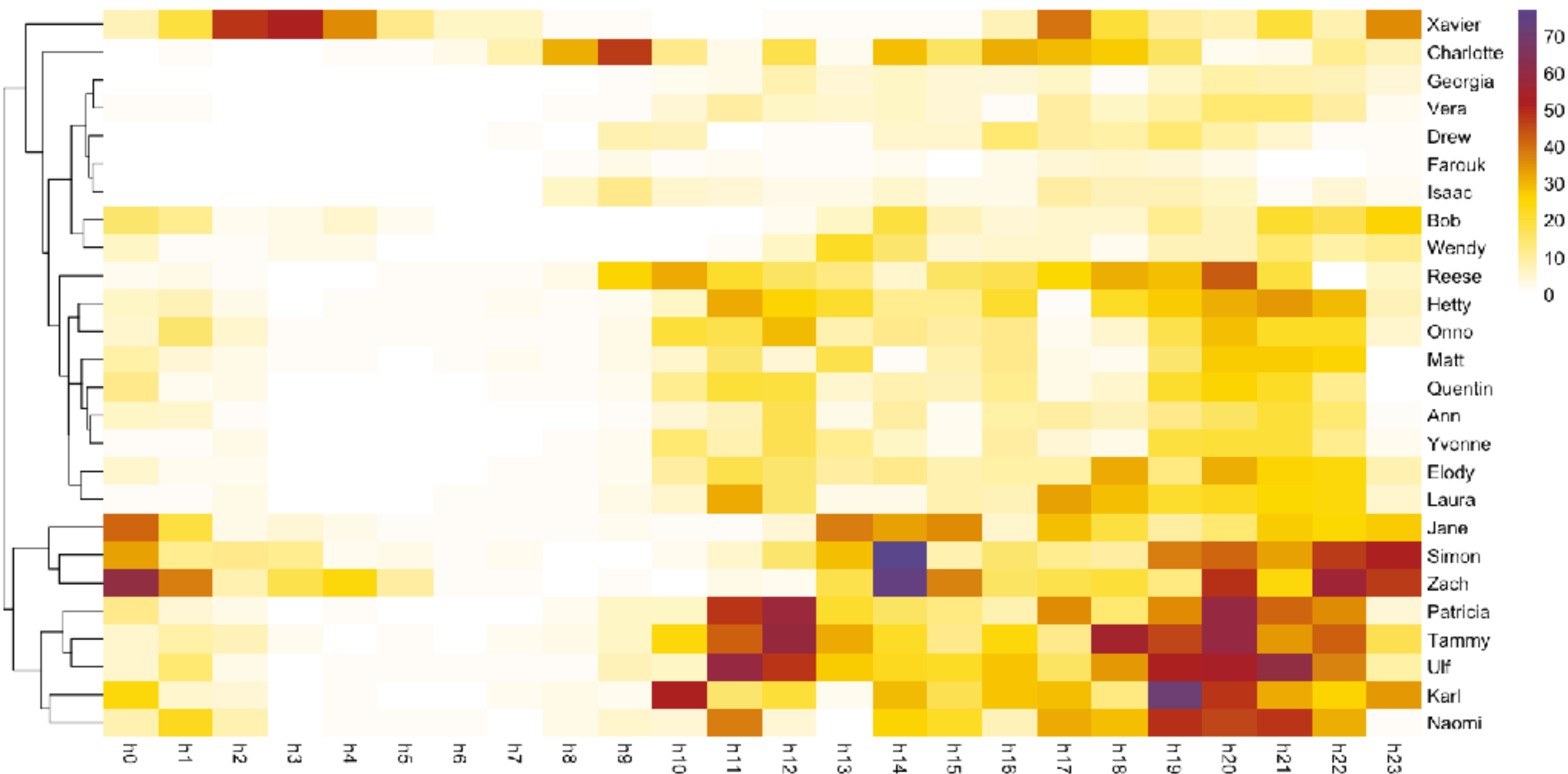
```
heatmap(cellphone, cluster_cols=F, color=k, border_color="white")
```



Adjusting the aesthetics: custom colours

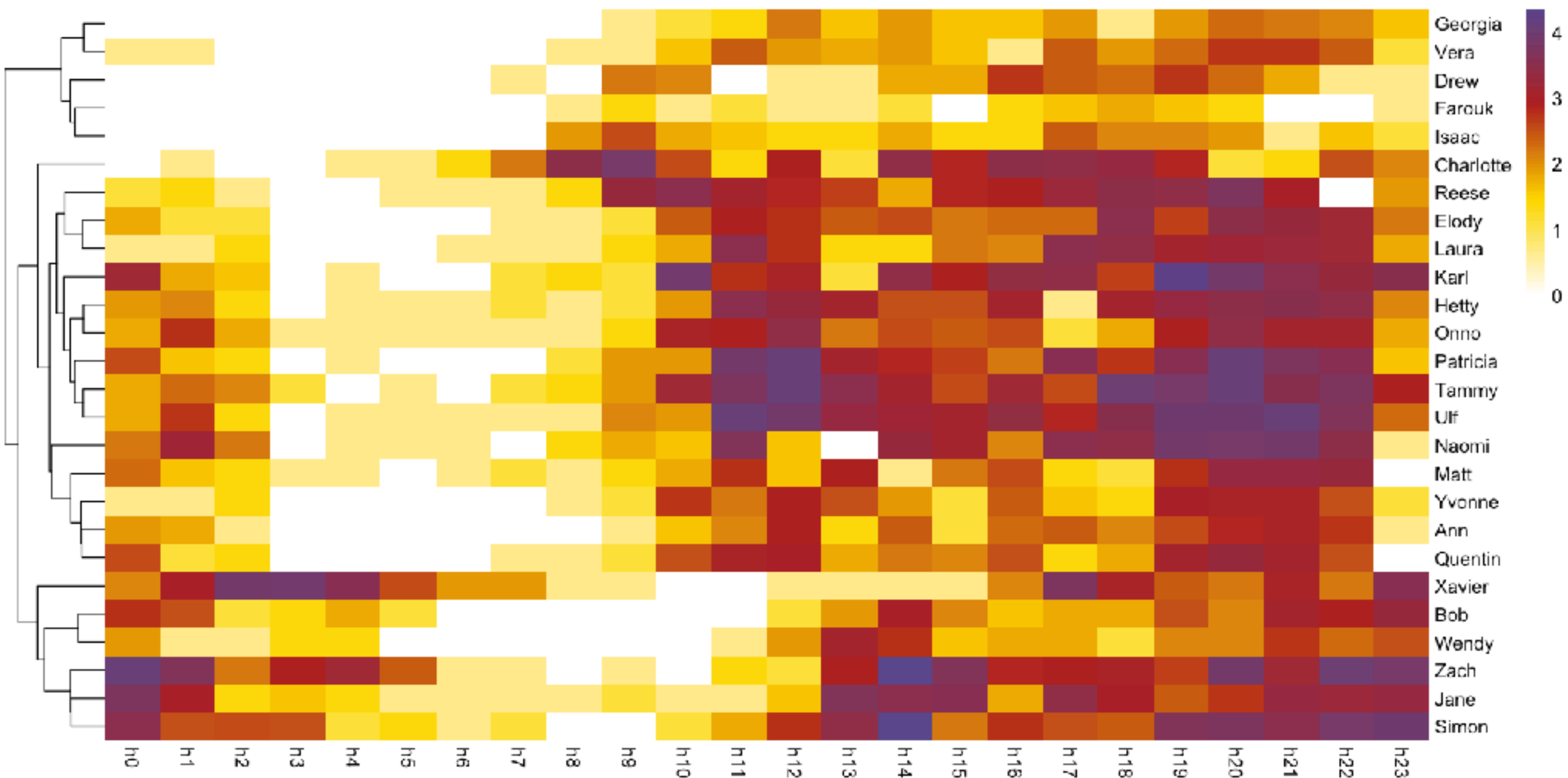
```
# removing the border
```

```
heatmap(cellphone, cluster_cols=F, color=k, border_color=NA)
```



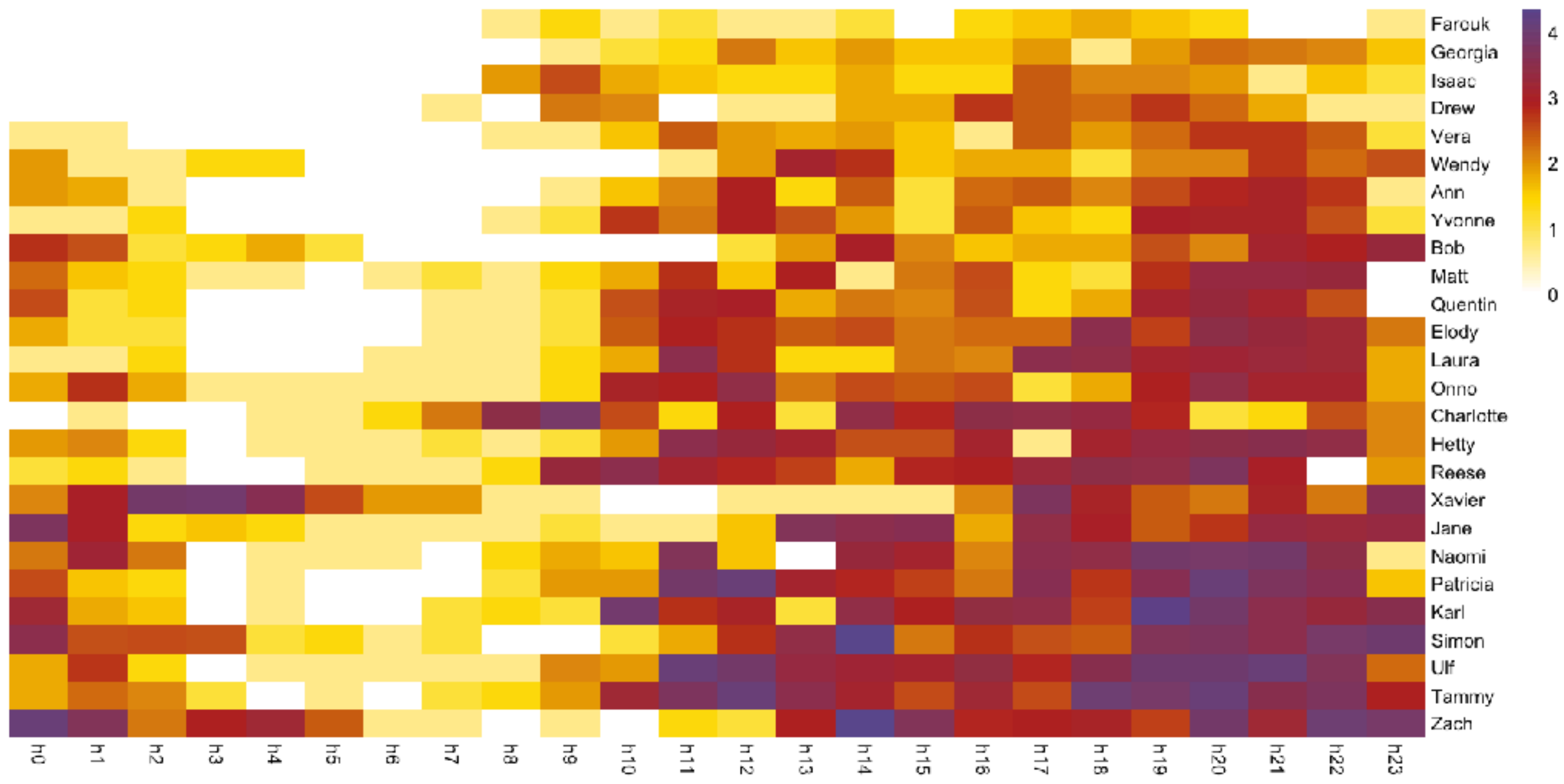
Modifying data can clarify contrasts

```
cellphone_log <- log(cellphone+1)
pheatmap(cellphone_log, cluster_cols=F, color=k, border_color=NA)
```



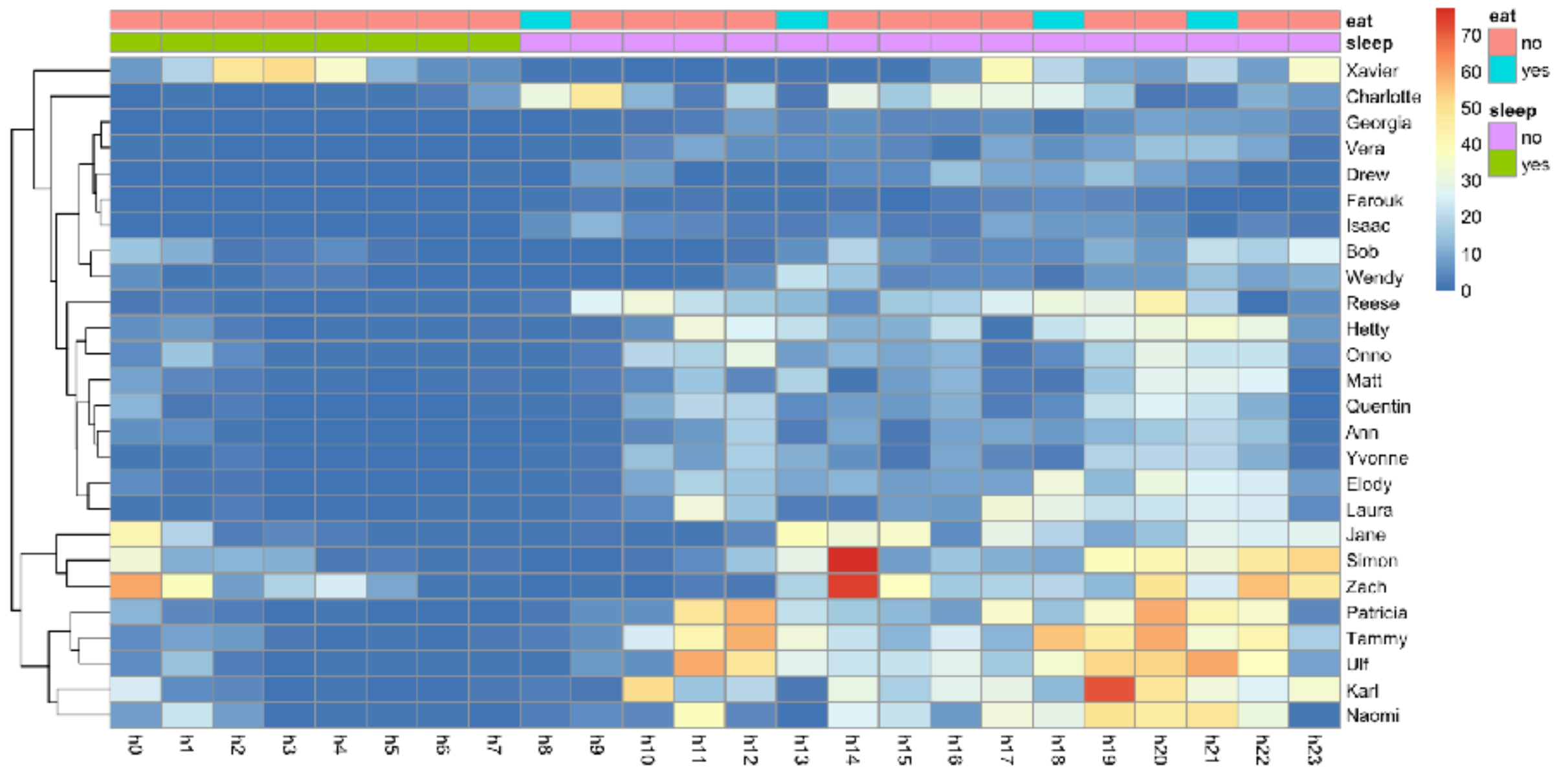
Sorting data instead of clustering

```
db <- cellphone_log[sort(rowMeans(cellphone),index.return=T)$ix,]  
pheatmap(db, cluster_cols=F, color=k, border_color=NA)
```



Labeling the data with categories

```
# Generate a data frame that labels time blocks with 'sleep' and 'eat'
df <- data.frame(sleep = c(rep("yes",8),rep("no",16)),
                 eat = c(rep("no",8),"yes",rep("no",4),"yes" (...))
rownames(df) <- colnames(cellphone)
pheatmap(cellphone, cluster_cols=F, annotation_col=df)
```



Heatmaps in ggplot

```
# add a column with names (instead of row names)
cellphone_tidy <- cellphone
cellphone_tidy$names <- row.names(cellphone)
# time slots as a factor, order the factor levels to the same order as the column
names
cellphone_tidy$timepoint <- factor(
  cellphone_tidy$timepoint,
  levels=colnames(cellphone))

# transform the data to long data
cellphone_tidy <- gather(
  cellphone_tidy, key="timepoint", value="pickups", -names)

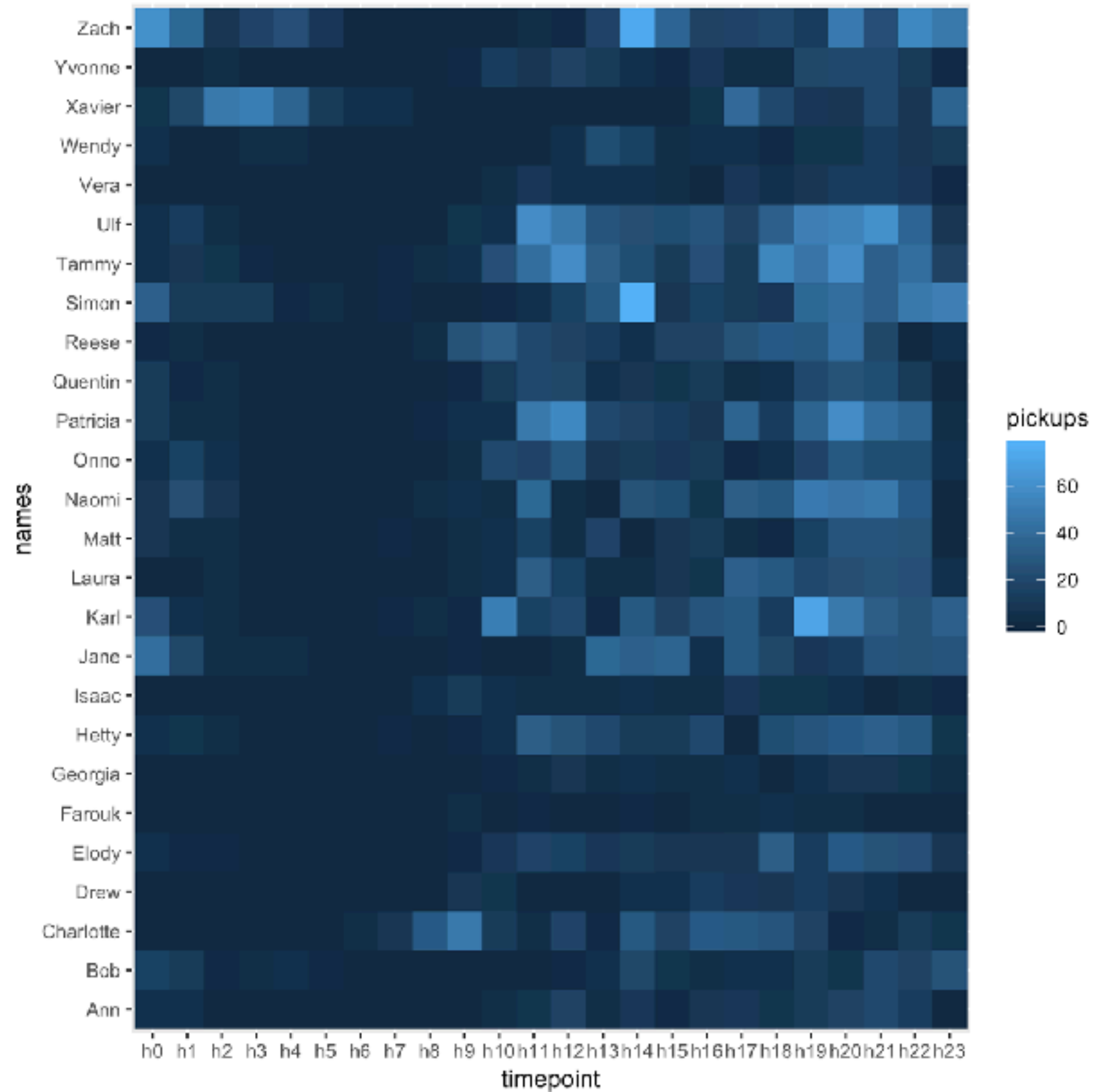
# what does this data look like?
head(cellphone_tidy)
```

	names	timepoint	pickups
1	Ann	h0	6
2	Bob	h0	15
3	Charlotte	h0	0
4	Drew	h0	0
5	Elody	h0	5
6	Farouk	h0	0

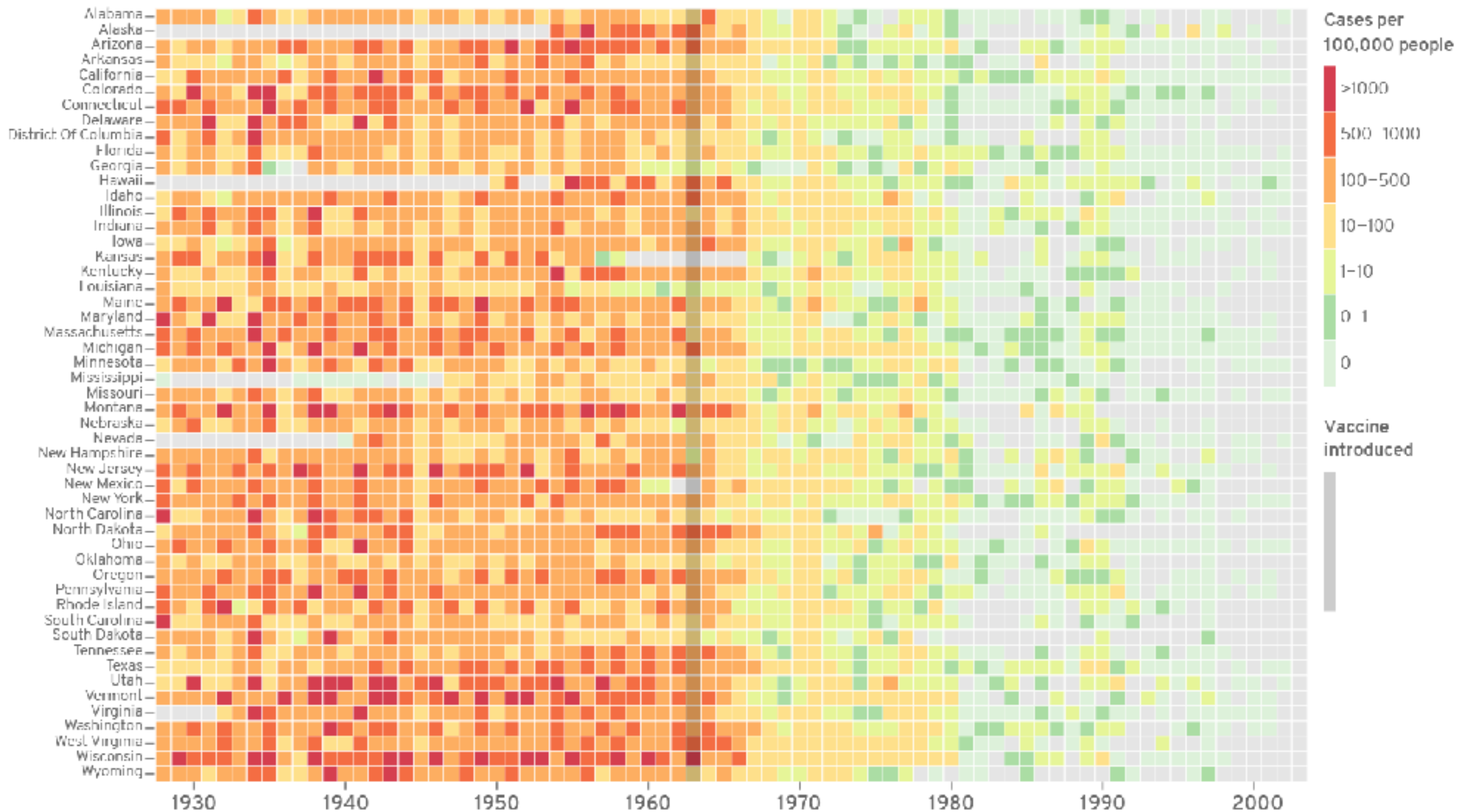
Heatmaps in ggplot

```
#load ggplot
library(ggplot2)

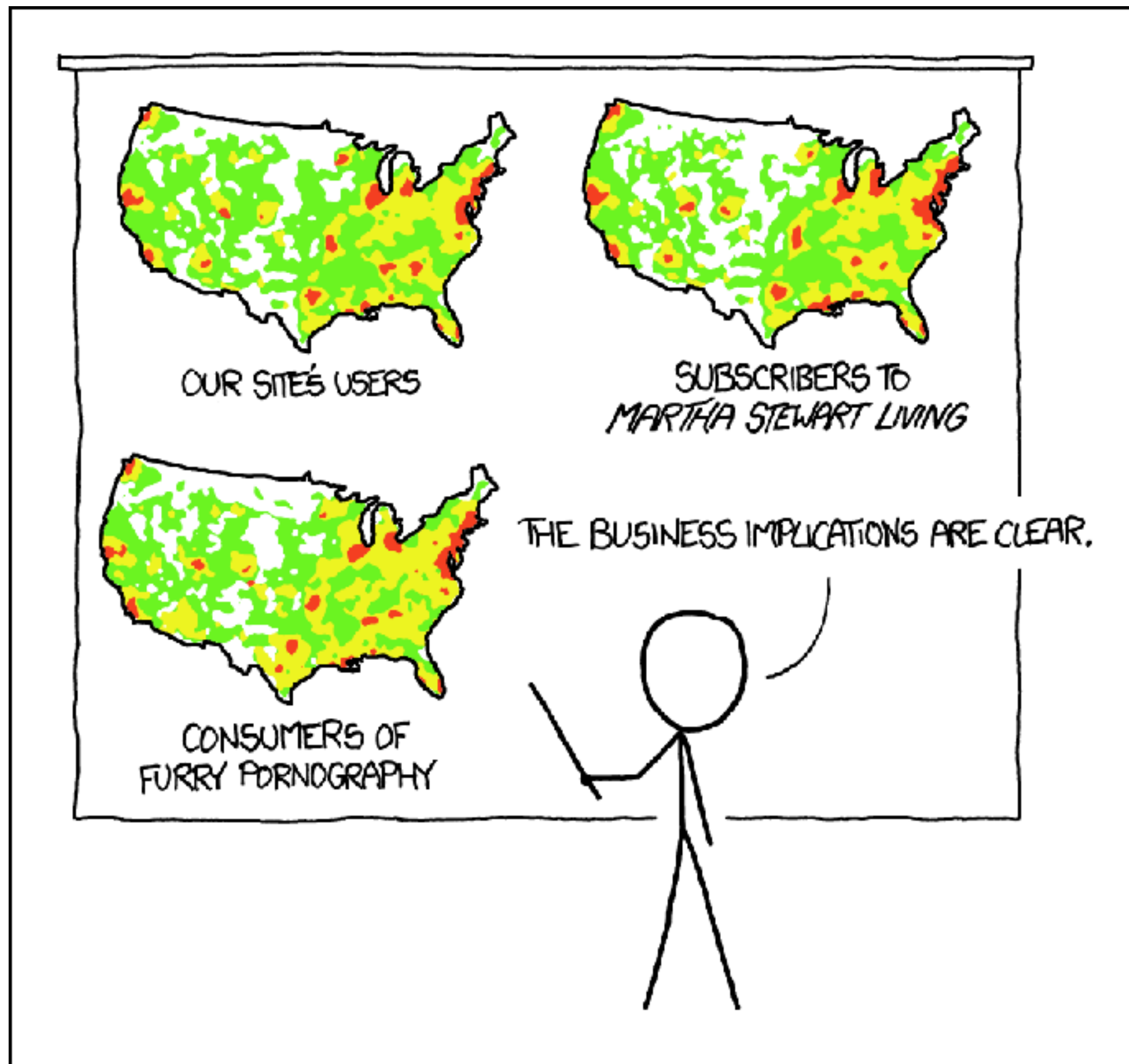
# plot heatmap
ggplot(cellphone_tidy,
      aes(
        x=timepoint,
        y=names,
        fill=pickups)) +
  geom_tile()
```



Better heatmaps in ggplot tutorial!



source: <http://www.roymfrancis.com/a-guide-to-elegant-tiled-heatmaps-in-r/>



PET PEEVE #208:
GEOGRAPHIC PROFILE MAPS WHICH ARE
BASICALLY JUST POPULATION MAPS