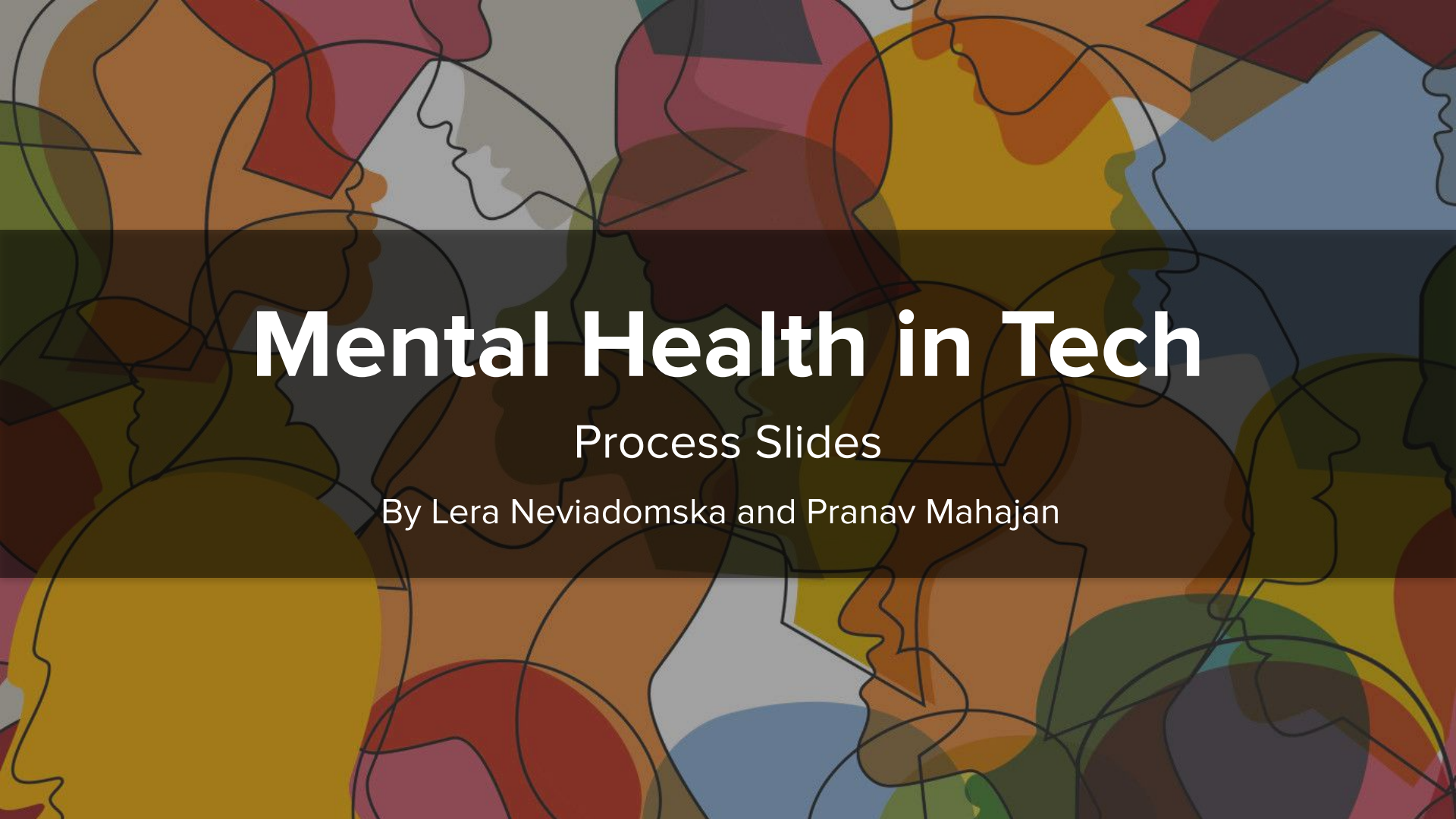


# Mental Health in Tech

## Process Slides

By Lera Neviadomska and Pranav Mahajan

# Background

- The tech sector is built on bright minds developing new solutions to create economic or social impact.
- The worst affected are startups which are blooming everywhere in tech.

  *Researchers from the University of California found that **72%** of entrepreneurs surveyed self-reported mental health concerns. And about **49%** disclosed they deal with ADD, ADHD, bipolar disorder, addiction, depression or anxiety.*

- As students, soon to be entering this industry, this issue relates with us very closely.

# Motivation

- There are very few spaces to discuss mental health and practice self-care, and in tech we are conditioned to refrain from acknowledging our weaknesses and vulnerabilities
- We try to address the issues through half-hearted measures (like Weekly Yoga Classes).
- Talking about it is the first step that we all need to take together.
- Through storytelling (via data) we can normalize mental health and get the conversation started.

# Related Work

Both of us got inspired by this project, as some of our friends had a lot of negative experiences while working in the tech industry. A lot of the issues they have experiences rooted from the toxic environment and lack of support from the companies.

The data from Mental Health research is available online in a form of csv files. However, the results from it were never communicated in an accessible format to wide audiences. Such data availability has inspired us to explore the topic further.

# Project Objective

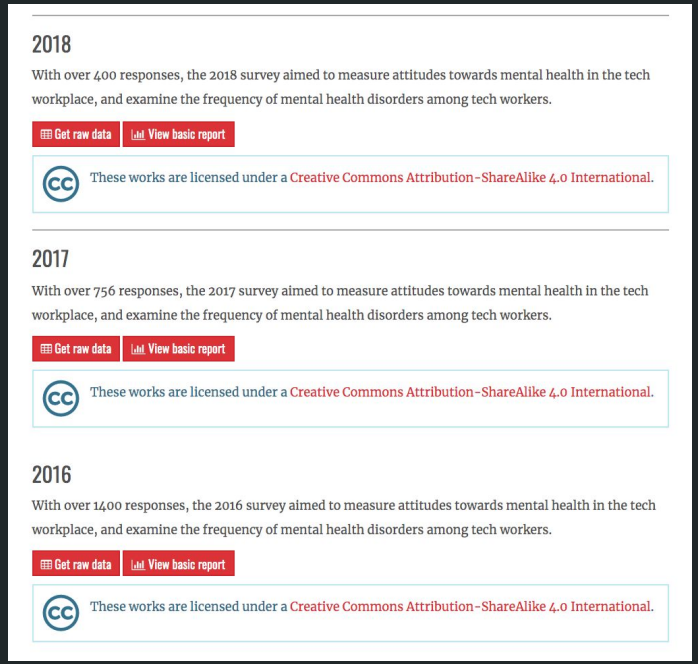
- From the dataset and visualizations, we want to learn about the current real situation in the workplaces regarding the attitude and recognition of mental health issues.
- Such visualizations can help to raise awareness about the mental health issues and how companies in tech industry account for them.

# Questions to Explore

- What illnesses do employees tend to suffer from the most?
- Do companies provide a support system for people with mental health issues?
- What are some of the bad experiences that people had around coversations about mental health?
- Which states and countries have the most people suffering from mental health conditions?
- How can the situation be improved?

# Data

- The data was collected from OSMI's website. We took into account reports from the last three years - 2016, 2017, and 2018.
- Data from all 3 years had to be merged together; however, the structure of the survey has changed over the years, which led to a lot of data pre-processing needed to merge the files.




https://osmihelp.org/research

# Data Processing - Data Cleaning

- Python and it’s pandas library was used to run the data cleaning.
- A lot of graphs are also using the hard coded data that was pre-processed by Python earlier. The Jupyter Notebook file containing data cleaning is attached to this submission.
- After processing, we ended up having approximately 2600 rows and 20 columns.

# Data Processing - Data Exploration

- Data from 2016 and 2017 (sample columns)

```
In [82]: data1.head()
```

Out[82]:

| | Are you self-employed? | How many employees does your company or organization have? | Is your employer primarily a tech company/organization? | Is your primary role within your company related to tech/IT? | Does your employer provide mental health benefits as part of healthcare coverage? | Do you know the options for mental health care available under your employer-provided coverage? | Has your employer ever formally discussed mental health (for example, as part of a wellness campaign or other official communication)? | Does your employer offer resources to learn more about mental health concerns and options for seeking help? | Is your anonymity protected if you choose to take advantage of mental health or substance abuse treatment resources provided by your employer? | If a mental health issue prompted you to request a medical leave from work, asking for that leave would be: | ... | If you have a mental health issue, do you feel that it interferes with your work when being treated effectively? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 26-100 | 1.0 | NaN | Not eligible for coverage / N/A | NaN | No | No | I don't know | Very easy | ... | Not applicable to me |
| **1** | 0 | 6-25 | 1.0 | NaN | No | Yes | Yes | Yes | Yes | Somewhat easy | ... | Rarely |
| **2** | 0 | 6-25 | 1.0 | NaN | No | NaN | No | No | I don't know | Neither easy nor difficult | ... | Not applicable to me |
| **3** | 1 | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | ... | Sometimes |
| **4** | 0 | 6-25 | 0.0 | 1.0 | Yes | Yes | No | No | No | Neither easy nor difficult | ... | Sometimes |

5 rows × 63 columns

| Is your anonymity protected if you choose to take advantage of mental health or substance abuse treatment resources provided by your employer? | If a mental health issue prompted you to request a medical leave from work, asking for that leave would be: | ... | If you have a mental health issue, do you feel that it interferes with your work when being treated effectively? | If you have a mental health issue, do you feel that it interferes with your work when NOT being treated effectively? | What is your age? | What is your gender? | What country do you live in? | What US state or territory do you live in? | What country do you work in? | What US state or territory do you work in? | Which of the following best describes your work position? | Do you work remotely? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I don't know | Very easy | ... | Not applicable to me | Not applicable to me | 39 | Male | United Kingdom | NaN | United Kingdom | NaN | Back-end Developer | Sometimes |
| Yes | Somewhat easy | ... | Rarely | Sometimes | 29 | male | United States of America | Illinois | United States of America | Illinois | Back-end Developer\|Front-end Developer | Never |
| I don't know | Neither easy nor difficult | ... | Not applicable to me | Not applicable to me | 38 | Male | United Kingdom | NaN | United Kingdom | NaN | Back-end Developer | Always |
| NaN | NaN | ... | Sometimes | Sometimes | 43 | male | United Kingdom | NaN | United Kingdom | NaN | Supervisor/Team Lead | Sometimes |
| No | Neither easy nor difficult | ... | Sometimes | Sometimes | 43 | Female | United States of America | Illinois | United States of America | Illinois | Executive Leadership\|Supervisor/Team Lead\|Dev ... | Sometimes |

# Data Processing - Data Exploration

- Data from 2017 (sample columns)

```
data2.head()
```

| | # | Are you self-employed?  | How many employees does your company or organization have? | Is your employer primarily a tech company/organization? | Is your primary role within your company related to tech/IT? | Does your employer provide mental health benefits as part of healthcare coverage? | Do you know the options for mental health care available under your employer-provided health coverage? | Has your employer ever formally discussed mental health (for example, as part of a wellness campaign or other official communication)? | Does your employer offer resources to learn more about mental health disorders and options for seeking help? | ar p c ac c su tr re er |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | e49fe87572831232dcfa51b376b22039 | 0 | 100-500 | 1.0 | 1.0 | No | Yes | No | I don't know | |
| 1 | a1eede444ac024928d247a8372d54931 | 0 | 100-500 | 1.0 | 1.0 | Yes | Yes | No | No | |
| 2 | 37d3fd67f62bd1e0a2dea4f9cd440d98 | 0 | 6-25 | 1.0 | 1.0 | I don't know | No | I don't know | No | |
| 3 | 519b759442c1cab0e9b5a8a1acb1b216 | 0 | More than 1000 | 1.0 | 1.0 | Yes | Yes | I don't know | I don't know | |
| 4 | ef0af4927b575b1a3e607c11ca37870e | 1 | NaN | NaN | NaN | NaN | NaN | NaN | NaN | |

5 rows × 123 columns

```
data2.head()
```

| Is your anonymity protected if you choose to take advantage of mental health or substance abuse treatment resources provided by your employer? | ... | What is your gender? | What country do you live in? | What US state or territory do you live in? | What is your race? | Other.3 | What country do you work in? | What US state or territory do you work in? | Start Date (UTC) | Submit Date (UTC) | Netw |
|---|---|---|---|---|---|---|---|---|---|---|---|
| I don't know | ... | Female | United Kingdom | NaN | NaN | NaN | United Kingdom | NaN | 2018-05-16 12:32:04 | 2018-05-16 12:42:40 | 464b |
| I don't know | ... | male | United Kingdom | NaN | NaN | NaN | United Kingdom | NaN | 2018-05-16 12:31:13 | 2018-05-16 12:40:40 | 464b |
| Yes | ... | male | United States of America | Missouri | White | NaN | United States of America | Missouri | 2018-05-09 05:34:05 | 2018-05-09 05:46:04 | 1eb7 |
| Yes | ... | Male | United States of America | Washington | White | NaN | United States of America | Washington | 2018-05-04 23:19:14 | 2018-05-04 23:23:23 | 6385 |
| NaN | ... | female | United States of America | Illinois | More than one of the above | NaN | United States of America | Illinois | 2018-05-03 00:40:24 | 2018-05-03 00:53:20 | 4323 |

# Data Processing - Data Exploration

- Data from 2018 (sample columns)

```
data3.head()
```

| | # | Are you self-employed?  | How many employees does your company or organization have? | Is your employer primarily a tech company/organization? | Is your primary role within your company related to tech/IT? | Does your employer provide mental health benefits as part of healthcare coverage? | Do you know the options for mental health care available under your employer-provided health coverage? | Has your employer ever formally discussed mental health (for example, as part of a wellness campaign or other official communication)? | Does your employer offer resources to learn more about mental health disorders and options for seeking help? |
|---|---|---|---|---|---|---|---|---|---|
| 0 | e44a0a34f2465940beda2a1537e9b99e | 0 | More than 1000 | 1.0 | 0.0 | Yes | Yes | Yes | Yes |
| 1 | 0d698e3beca20fb75f19b9d528e36d73 | 0 | More than 1000 | 1.0 | 1.0 | Yes | Yes | No | I don't know |
| 2 | 61a40c9071eb36fa9caa254d31500c41 | 0 | 6-25 | 0.0 | 1.0 | Yes | Yes | No | No |
| 3 | f8624340bead7deb08abb766704ddf6b | 0 | 6-25 | 1.0 | 1.0 | No | No | No | No |
| 4 | 31d3ae93b68d79e504a0a643601b6b1e | 0 | 26-100 | 1.0 | 1.0 | Yes | Yes | Yes | Yes |

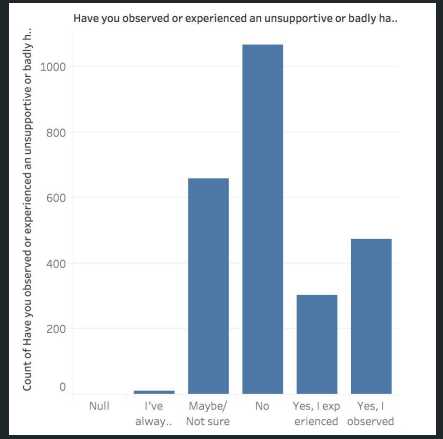
5 rows × 123 columns

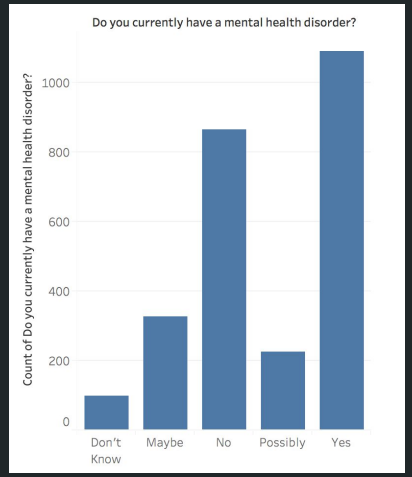
```
data3.head()
```

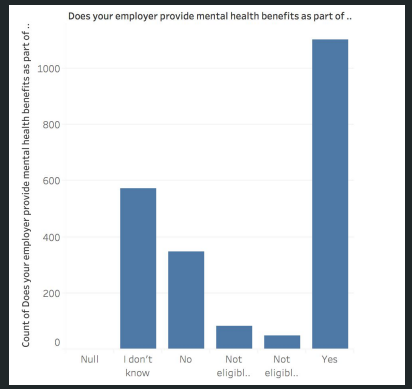
| Is your anonymity protected if you choose to take advantage of mental health or substance abuse treatment resources provided by your employer? | ... | What is your gender? | What country do you live in? | What US state or territory do you live in? | What is your race? | Other.3 | What country do you work in? | What US state or territory do you work in? | Start Date (UTC) | Submit Date (UTC) | Netwo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Yes | ... | Female | Canada | NaN | NaN | NaN | Canada | NaN | 2018-12-29 23:46:38 | 2018-12-30 00:00:03 | 4bbb8 |
| I don't know | ... | male | United States of America | Massachusetts | White | NaN | United States of America | Massachusetts | 2018-12-27 21:40:40 | 2018-12-27 21:45:45 | 275e7 |
| I don't know | ... | Male | United States of America | Florida | White | NaN | United States of America | Florida | 2018-12-21 17:37:43 | 2018-12-21 18:08:01 | 43994 |
| I don't know | ... | male | Norway | NaN | NaN | NaN | Norway | NaN | 2018-12-21 16:37:56 | 2018-12-21 16:44:44 | 907b3 |
| Yes | ... | Ostensibly Male | United States of America | Tennessee | White | NaN | United States of America | Tennessee | 2018-12-20 19:39:02 | 2018-12-20 20:58:34 | 26df2 |

# Exploratory Data Analysis

- To get a gist of what the data looked like, we have used **Excel** and **Tableau** to be able to quickly build graphs and see how data is being spread out, and to get the most basic insights. From the visualizations we were able to see some trends, and were able to adjust the questions, so that they convey some of the most interesting insights.



# Exploratory Data Analysis

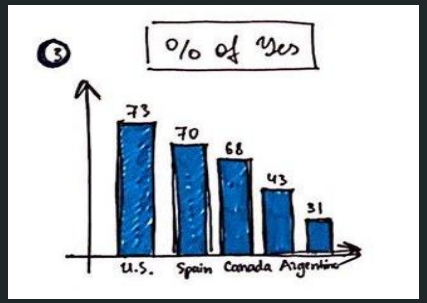
We have also used the online text analysis tool to get an insight into the question regarding the improvements, as it allowed to look for the most common word combinations from the text. This allowed us to identify most common **ideas** rather than **words**.

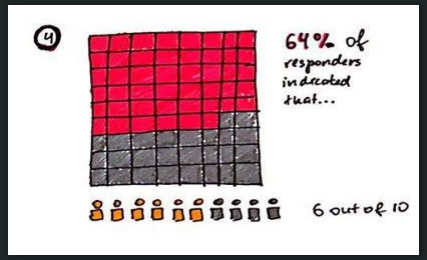
Example of the usefulness of such tool and extracting word combination is on the right.

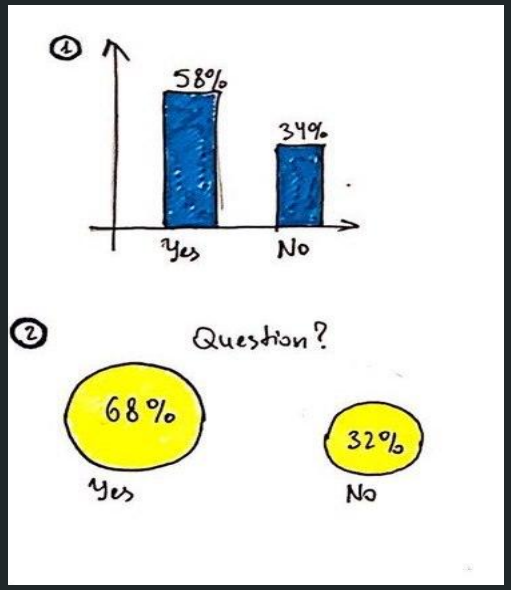
| | |
|---|---|
| mental health days | 12 |
| in the tech | 12 |
| there is a | 12 |
| to mental health | 11 |
| talking about it | 11 |
| in the workplace | 11 |
| more open about | 11 |
| people with mental | 11 |
| open about it | 9 |
| mental health care | 9 |
| industry as a | 9 |
| encourage people to | 9 |
| talk about mental | 9 |
| it clear that | 8 |
| health issues are | 8 |
| their mental health | 8 |
| think the industry | 8 |
| those with mental | 8 |
| be open about | 8 |

# Approaching Yes/No Questions

Thinking about a way to best compare the answers to yes and no across one dimension, we wanted to present our data as clear as possible, ideating around the most intuitive and relatable ways. Something like bar charts or size comparisons would be an effective way to communicate the message well.

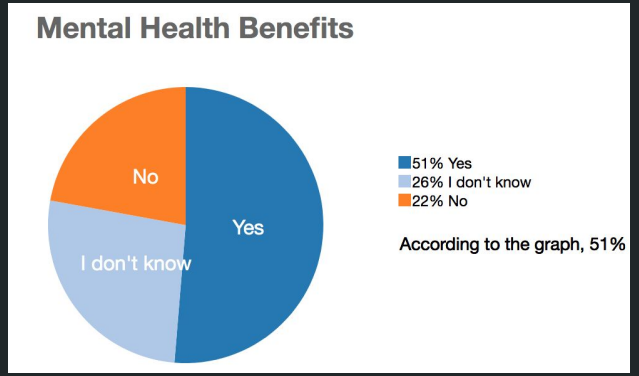


# Final Design for Yes/No Questions in One Dimension

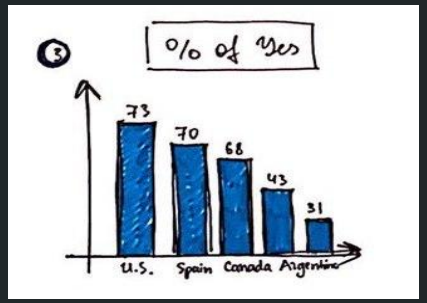
In the proposal, we have outlined that the waffle chart would be an ideal solution. However, we have decided to incorporate it as a final design for the next section, so had to pick something else to consider.

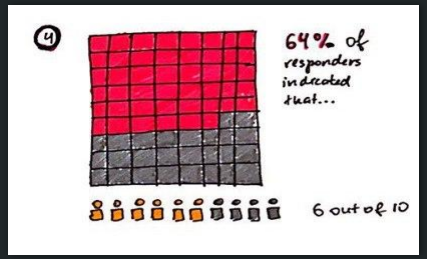


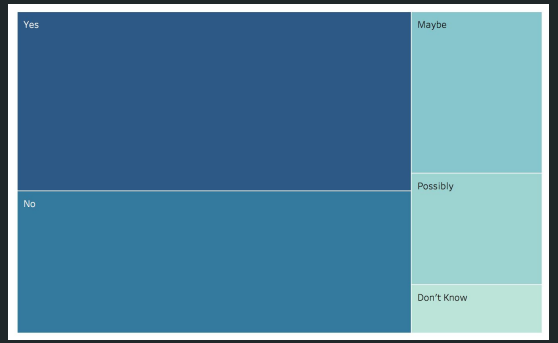

Since the questions had only Yes/No/I don't know answers, we have decided that the pie charts would be an ideal demonstration of such. It is not be percepted as confusing, since it only has a few options. Because of the colorfulness, the chart also stands out and attracts the audience's attention. To make it more straightforward, we have included the percentages for the reference, and a standing-out fact that provides a conclusion to the visual.

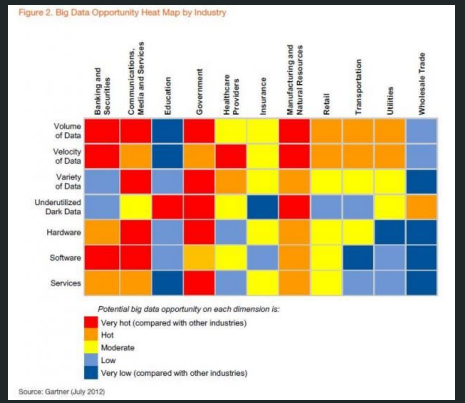
# Approaching Categorical Questions with Many Options

Although not included in our proposal, we have also decided to incorporate a categorical question, which outlines the most common mental health disorders. We found this question very interesting to explore, as the preliminary data analysis showed that the two biggest disorder groups (Anxiety and Mood disorders) can be very related and dependent from the work environment.



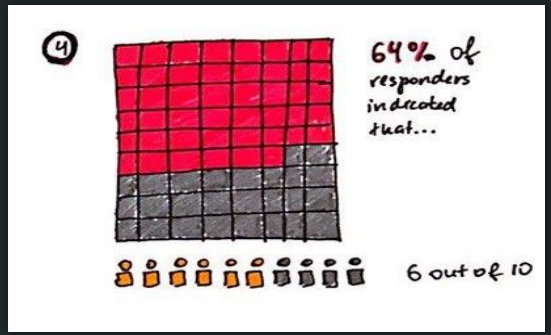



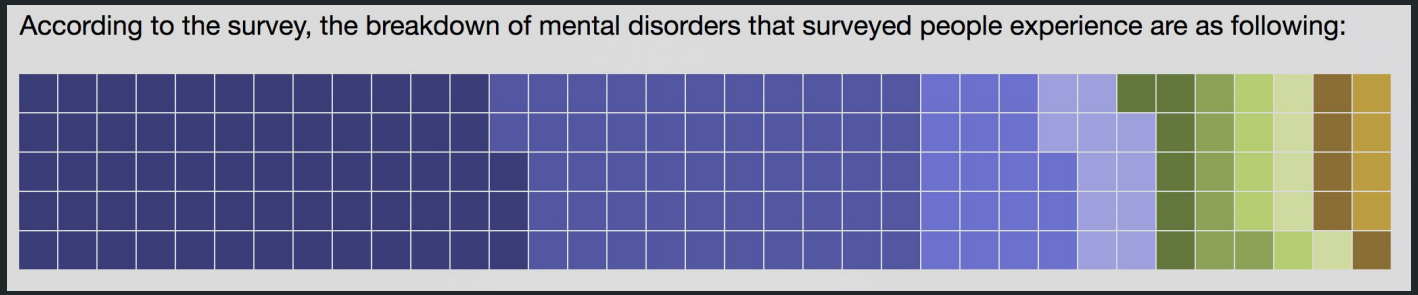



# Final Design for Categorical Questions

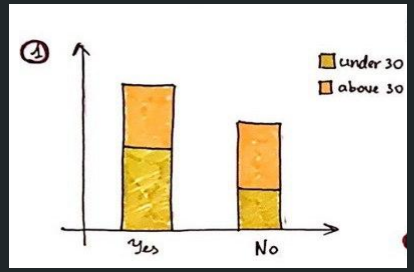
The final design we have picked for such visual is the waffle chart. It is a chart that attracts attention, and would be interesting to explore. Large color groupings also attract the eye, emphasizing the most common mental health disorders from the survey. The fact that this chart is unconventional (unlike the bar chart, that could also do a great job displaying the data) also helps it to be more interesting and users be more willing to explore the data.

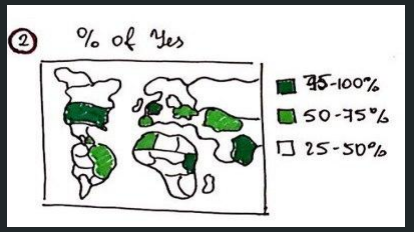


# Approaching Yes/No Questions in Multiple Dimension Questions

Accounting for multiple dimensions, we want to communicate the message clearly and intuitively, for people to immediately understand the actual picture. Thus, the ideation was going around simple charts we are used to seeing, such as stacked bar charts, maps, or pie charts.

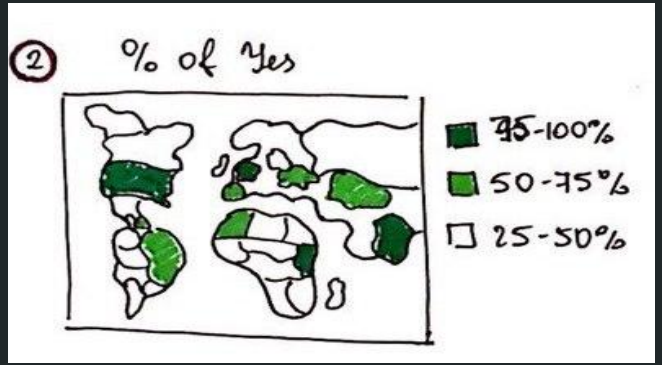



# Final Design for Yes/No Questions in Multiple Dimensions

Although initially selecting both pie charts and the map, we have decided to choose to work with just the map, as it relates the most to the question we were trying to answer comparing both the world and the U.S. states in terms of mental health disorder levels.

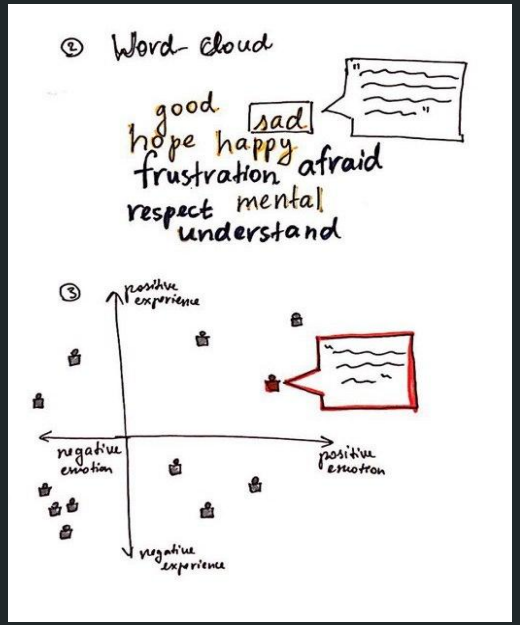
Using maps is a useful tool when comparing countries/states with each other. Maps provide a great opportunity to be able to spot the data fast by looking in the desired direction and encourages exploration.



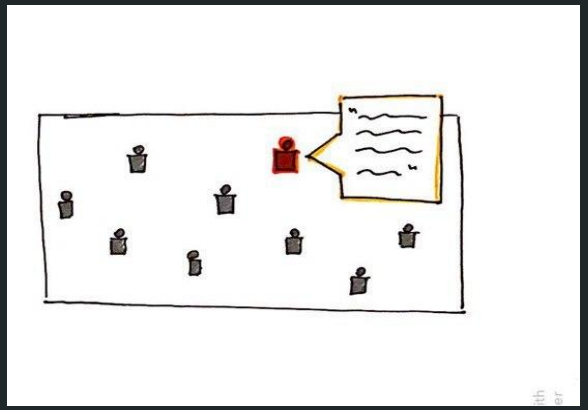
# Approaching Long-Answer Text Questions

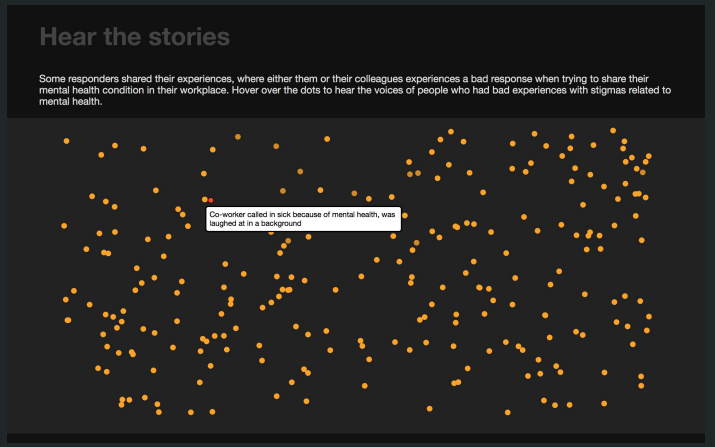
In our visualization that explores what the survey people say, we wanted to both show the proportions of people having positive and negative experiences, as well as provide a way for people to “hear” what the surveyed people say about their experiences.

The presentation of proportion of the topics brought up in the comments will provide useful insight onto the types of experiences the surveyed people have. At the same time, “hearing” from people will give a more feeling and exploratory experience, which would allow the audience to empathize with the topic and get inspired for action.

# Final Design for Long Answer Text Questions

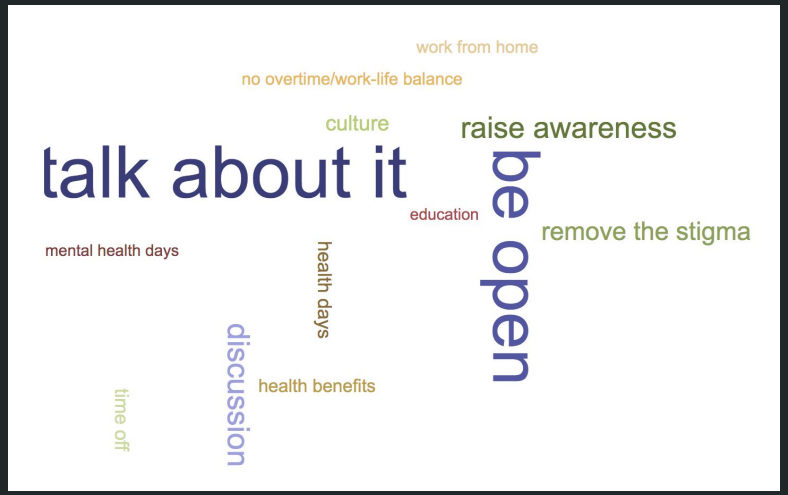





The final design for this visualization had to be simplified due to our limited technical ability (rip). While the chart does not have groupings available, it has the interaction and exploration feel we were looking for.

The dark colors were chosen to create a feel of intimacy while interacting with points that represent “voices” of the people.

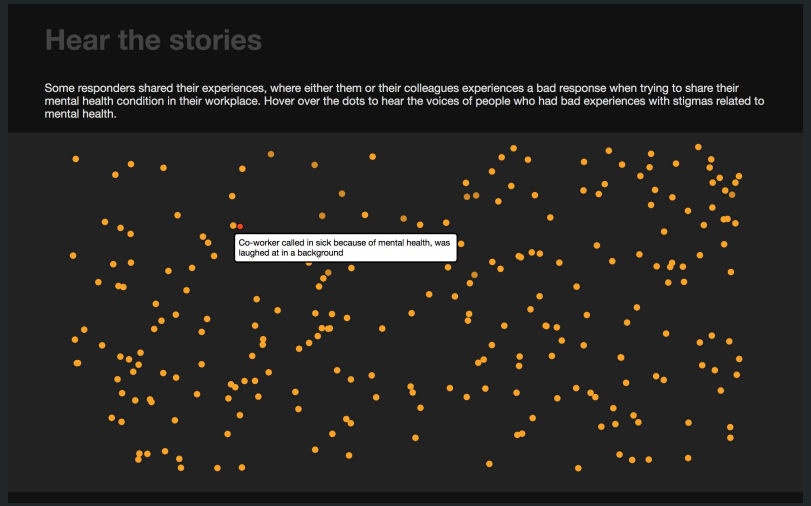
# Final Design for Long-Answer Questions: Idea Outlining

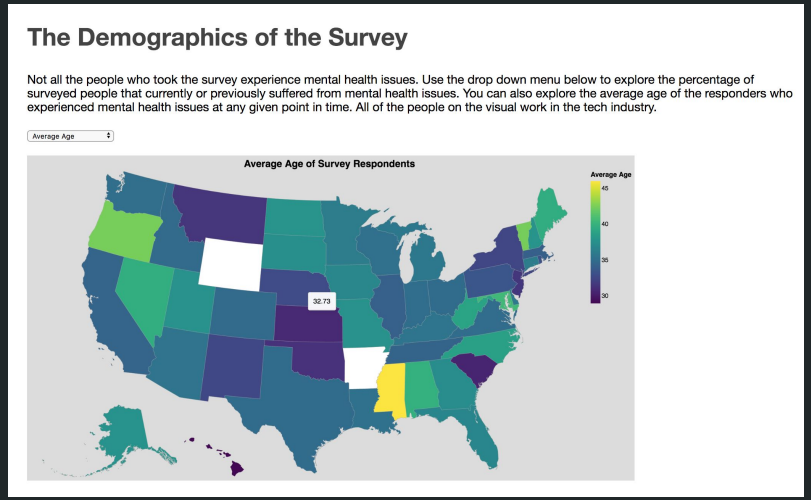



Since we did not want to be repetitive with the graphs, and the answers to the “How to improve” questions had a lot of common themes, for this question we have decided to use a word cloud, as an attention grabbing visualization that captures the recurring themes, with the more frequently mentioned ones having a bigger size.

# Implementation

We have ended up with two interactive graphs - the “people” graph and the map graph.



# People Graph Implementation

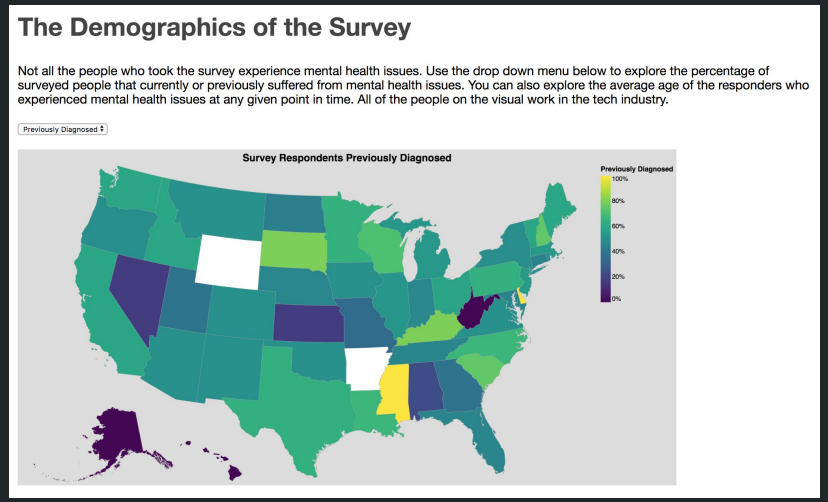
The intention of this visualization is to get people to empathize with people that have experienced badly handled or inappropriate situations at the workplace. This establishes a more intimate connection with the issue, and enables people with mental health disorders to relate to some experiences and know they are not alone.

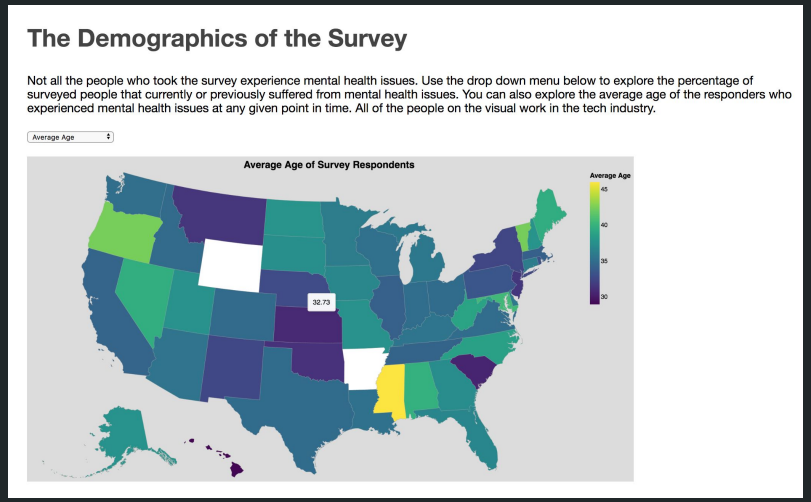
We attempted replace the points on the graph with custom images of a person figure to make the visual look more appealing, but that unfortunately did not work out :(

# People Graph Implementation

The key elements here are the orange points that represent the people's voices. Hover over the point to see what a "person has to say," and the selected "person" will be highlighted with red-ish color:

# Map Implementation

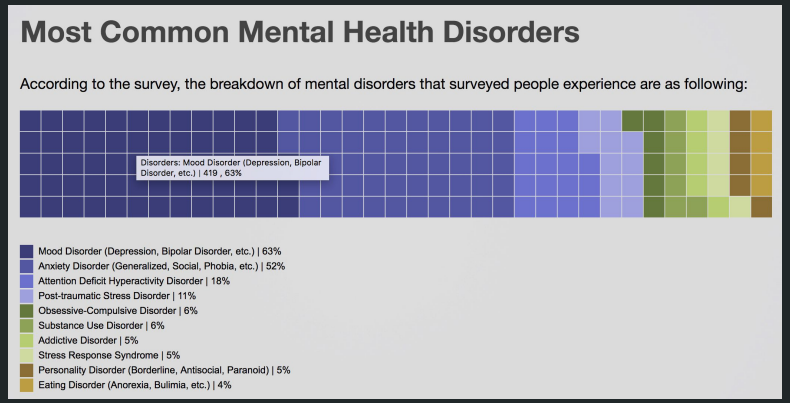


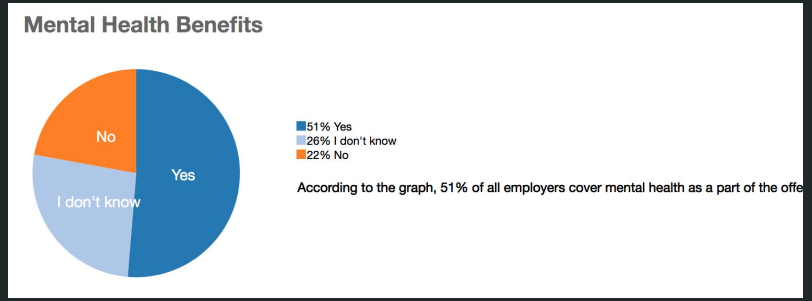



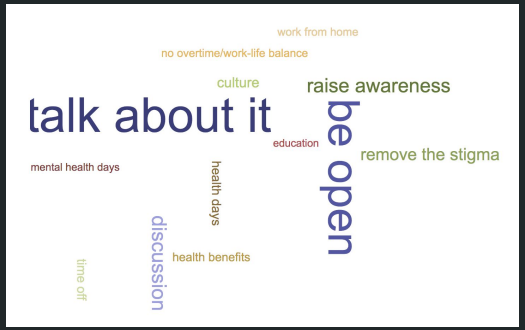

In this visual, we focused on the exploration aspect, having the map come in 3 different filters: Previously Diagnosed, Currently Diagnosed, and Age. The filters can be changed by choosing different selections in the drop-down menu, and the map will update with the new data. The coloring indicates either the average age or the percentage of people in each state/country, and hovering over the area shows the exact value. Such filters encourage exploration through interactivity, and also can provide useful insights.

# Implementation of Other Graphs

The rest of the graphs are not interactive, but provide a substantial information for the end user and help to tell the story. All of the graphs were implemented using D3.



# Evaluation

From the visualizations we have created, we have definitely learned more about the current state of mental health in the tech industry, and unfortunately, the real picture seems to look worse than we expected. A substantial percentage of people suffers from mental health issues across the states, and the majority of those seem to be relatively young professionals. The statistics show that only half of the employers out of those surveyed provide mental health benefits, and only 23% of them initiate discussions around the topic. Reading the stories of people we sometimes could not believe what we read - as situation when someone is being laughed at and not taken seriously are not something you expect to hear in 21st century.

However, most importantly, we have learned how to fix the negative environment by people providing feedback. This is a good takeaway message for the users, and hopefully they can foster a more mental health-friendly environments at their workplaces.

# Evaluation

As described before, we have answered our questions through both interactive and static graphs that encourage people to explore the data and leave a powerful message.

However, our visualizations are far from being perfect. Throughout the project we have struggled a lot with enabling interactivity, and in the future this project would benefit a lot from enhancing the interaction, enabling global filters that would make all graphs adjust for them, thus creating a more immersive experience for the users and encouraging exploration even further.