PROCESS BOOK

for

Global Mortality Dashboard

(Final Project for CS 171 - DATA VISUALIZATION)

The Team

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Original Project Proposal

Background and Motivation

The data we are considering for visualization is the ***Global Burden of Disease (GBD)***, which is a systematic, scientific effort by a collaborative of researchers worldwide to quantify the comparative magnitude of health loss to diseases, injuries, and risk factors by age, sex, and geography over time coordinated by the Institute for Health Metrics and Evaluation (IHME) at the University of Washington.

We are looking to examine how causes of mortality vary by region, age, and sex. We are trying to determine how people die, particularly looking at where they live and how geography affects how and when they die. In an effort to quantify the effect of the various causes of mortality, we use the years of life lost to measure the effect, a disease has on the world population. YLL (Years of Life Lost) looks at the age a person dies as a way to quantify loss. Also, Unlike other studies which look solely at cause of mortality, we will use YLL as a key factor, allowing us to add a measure of weight to causes which strike earlier in life.

Project Objectives

"Provide the primary questions you are trying to answer with your visualization. What would you like to learn and accomplish? List the benefits."

We plan to use the following questions to guide our visualizations, due to the limited amount of time we have to complete this project, we may decide to concentrate our efforts on a few key questions. Our biggest goal is to identify trends in mortality causes, determining the best outlets for scientific study and funding.

1. What are the mortality rates - no. of deaths, years of healthy life lost, years of life lost and years of adjusted life due to the various disability causes? Understanding how people die helps us identify potential opportunities for research.

2. How have the mortality rates changed over time? Ideally we should be able to identify decreases in some mortality rates due to advances in science. This study should also identify those causes which are causing higher levels of YLL as other causes decline.

3. What are major causes for infant mortality? By studying the changes in infant mortality rates we can better understand where we can spend limited funding to achieve the most benefit.

4. How much does death from non-medical causes such as violence, accidents change among age groups and regions?

5. Find which regions/countries have higher violent mortality rates.

6. Examine which causes are most significant by age by sex and by region. Regional differences may affect how countries spend their research money. Some regional trends are to be expected (We don't expect to see much malaria in arctic regions.)

7. Examine which regions are most affected by respiratory diseases? We expect that industrialized countries with less pollution control tend to have high rate of mortality from respiratory related diseases.

8. Which regions have the most number of birth defects? Are the technologically advanced countries showing lower levels birth defects?

9. Which are the regions with the highest cancer rates? Do developed regions have higher rates of cancer?

Data

"From where and how are you collecting your data? If appropriate, provide a link to your data sources."

The main data source we plan to use for this visualization is the Institute for Health Metrics and Evaluation (IHME) Global Burden of Disease Study 2010 (DGB 2010).

We need to determine population in the different regions for some of the visualizations. The problem we need to solve is developing filter functions which use the user inputs to determine the data for the visualizations.

Data Processing

"Do you expect to do substantial data cleanup? What quantities do you plan to derive from your data? How will data processing be implemented?"

The Global Health data is very large, it's broken down by region, sex, mortality cause, and age buckets (but not country). The full data set is too large to download each time the page loads. We will need to generalize the information, decreasing the client computer's workload and shrinking the file transfer sizes. We may need to find population estimates for each region so we can normalize the information to population sizes. We anticipate storing the information on the server, then using ajax calls to get the necessary information based on user inputs.

Visualization

"How will you display your data? Provide some general ideas that you have for the visualization design. Include sketches of your design."

The site will have a world map, which compares chosen demographics by coloring countries or regions. The page will initially display with some default demographics, the user will have the option to filter the data. When the user filters the data the page will execute an ajax call, gathering new data and re-drawing the map with the new data. When a user clicks on a region the user views a custom dashboard which gives more information about that region.

We might make the map smaller (top half of page) and show some visualizations along the bottom half of the screen and below the fold.

Must-Have Features

“These are features without which you would consider your project to be a failure.”

We definitely want to have a world map which colorizes the regions/countries according to selected parameters. We also want to be able to click on a country/region to get more information about that country.

Optional Features

“Those features which you consider would be nice to have, but not critical.”

The complexity of the individual regional dashboards may change, as the project progresses we will determine how robust we can make the individual dashboards. As we examine the information, we will become more comfortable with how to visualize this information.

Project Schedule

“Make sure that you plan your work so that you can avoid a big rush right before the final project deadline, and delegate different modules and responsibilities among your team members. Write this in terms of weekly deadlines.”

We plan to use Scrum methodologies to develop this project, instead sticking to a hard schedule we plan to develop a list of tasks. As the project progresses, we will work through the list iterating the project as necessary. We plant to keep the following milestones in mind as we are developing this project:

Week 7 Thursday, March 13: Project proposal due (part of Homework 3)

Week 8 Meet with TA to discuss project, Finalize Data and Plan

Week 9 Begin drawing world map with GeoJSON (HW4 Due)

Week 10 Begin displaying Individual Dashboards

Week 11 Thursday, April 10: Functional project prototype due

Week 12 Project review with the TFs

Week 13 Finalize Project Create Screencast

Thursday, May 1: Projects due (including screencast)

Final Project Proposal Feedback

From Bryan's HW 3:
Comments P1:
"Nice proposal. The idea of modular vis is interesting, but not linking, etc"

From Bijish HW 3:
Comments P1:
"Good job, implementing your sketch would be a good project scope to start with"

From Project Feedback:
Hi Bryan, Bijish,
I'm Julie Zhang and going to be your final project TF. You two had a good proposal, however I believe that given the previous work we've done in the course, and that the final project should be at least double the scope of a normal homework, I think the minimum "must-have" features of your project should be your project sketch: the global map and the chart dashboards.

For FP1:

** The data collection, cleaning and wrangling has to be done. The data must be in a form that can directly be used by the visualization. It's OK if the dataset isn't complete (e.g., there will be more rows in a file), but the structure of the file and a reasonable sample must be there.*
** There must be a visible and working visualization of their major views. Maybe not all, maybe not in quite the complexity and not with all the interaction. But it should be there and it should be in D3.*
** Also submit your in-progress process book.*

In particular, for FP1 your visualization should have the global map portion completed, encoded with data, and interactive (clickable, zoomable at least). At least one dashboard chart should be done.

Please also think of some additional optional features beyond your current plan. Perhaps filters?

Good luck, and let me know if you have any questions.

Julie Zhang

Regional GeoJSON

The first step of our implementation was to visualize the 21 geographical regions represented in the study. We originally expected to find geoJSON or some other depiction of the regions which we could use to draw a choropleth. We quickly learned the 21 geographical regions used for this study do not correspond to any of the "standard" regions used in other studies, which meant the regional geoJSON did not exist, we needed to generate them ourselves.

We began the process by downloading international boundaries from:
http://www.naturalearthdata.com/downloads/50m-cultural-vectors/

We then used the information from the following link to determine which countries were in each region:
http://ghdx.healthmetricsandevaluation.org/country_profiles

We used the vectors representing all the countries, and a list of the countries in each region, to build a geoJSON file for each region. We used software called QGIS, which allowed me to "select" the countries in a region, from the cultural vectors and save their border information to a geoJSON file representing all of the countries in the region. We then edited the geoJSON files adding an attribute identifying the region to the geoJSON. We then needed to find a way to draw the 21 regions into one map, so we combined the 21 separate regions into one geoJSON file, which we used to draw a map of the Globe.

We initially drew the world map, and realized there were some problems with our geoJSON. A few of the African countries represented in the survey experienced a civil war, and split into separate countries, our geoJSON represented the latest geographical regions, so there were holes representing the new countries. We decided to represent these countries as one entity in our map, since they were one entity at the time the data was recorded. Once the continent of Africa was complete, we concentrated on the northern hemisphere where something was off. After studying some maps, we realized the island/country of Greenland was not represented in the survey, and is not showing in our map. We've reached out to the originators of the survey to find out which region Greenland falls into, at this point Greenland is not represented in our visualization.

We now had a world map, however we still represented countries, not regions. We needed a way to color the regions, and highlight them on mouseover. We chose to add a attribute with a class value of the region code to each country path. When the user mouses over a country, we use d3 to get the region code out of the data associated with that country, then color all country "paths" with that class yellow. When the user moves the mouse off the country/region, the color reverts to the original color. This allowed us to show the regions in a clear/concise, and interactive method.

Data Size

The original the Institute for Health Metrics and Evaluation (IMHE) data set is many gigabytes large, IMHE is still working on a web service to provide access to the data. Instead of offering a robust web service,IMHE provides a number of .csv files available for download. We wanted to explore global health trends at a global level, so we decided to work with their regional health data set.

The data set we chose to work with showed data for **21 regions**, with over **240 diseases**, multiple data points per disease, broken up by age, and sex. The data set represented 3 different years of study. The original .csv file was approximately **260MB** with over **832,000** rows, which was still too large to work with using d3.csv to process and import the data.

We decided we needed to slim down the data. We initially decided to reduce the number of columns in the data set, reducing redundant and unnecessary columns, but retained all of the rows. This slimmed the data slightly, but we needed to do more. We examined the data, when we drew our choropleth we realized that the regions containing India and China almost always showed the largest values due to their huge populations, so we decided to get rid of the columns which dealt with absolute numbers, instead choosing to work with columns dealing with population normalized death and injury rates (rate per 100,000 people) removing these columns slimmed the data set down to close to 75MB, but it was still too large to upload to github, and it took way too long to load the page. Our next step was modifying the data, we removed all the region names, replacing them with a 3 letter code (South East Asia became SEA). This change got the dataset down to approximately 60MB (still too large for github, and we needed to get the data into github so we can submit FP-1). We then removed the commas out of the strings (1,345,345 became 1345345) This got us down into the 50MB range, once we changed the year values from 4 digits to 2 digit s(1995 became 5, 2010 became 10) this got us below the magical 50mb threshold we needed to submit our data to github.

Our dataset is still too large, if you load the page using a local server the data loads within a few seconds, however loading the page over the internet takes over 45 seconds (1:30 at a Starbucks). We've decided there are a few more things we can do to load the page quicker:

1. We can slim the data set by converting the diseases to a 3 letter code, like we did with the regions.
2. We've broken the data set into 22 smaller data sets. When the page loads the "global" data set will load. The first time the user selects a sub-region, the data set for that region will download, and get appended to the dataset. Loading the page in this way allows us to rapidly display the page, while still giving us the flexibility to display the full data set as required to meet the users' needs.

When we tried to implement the code, downloading 22 separate data sets turned out to be a very bad idea, we needed all 22 data sets to color the map. We eventually decided to shrink the data set down as small as possible, and create a separate mappings.csv file which allows us to "expand" the data after loading. After shrinking the data as much as possible we got down to approximately 31MB.

One more trick we used was to use HTML5 local storage to store the data set. This feature currently only works with Google Chrome. When the user first opens the page the page tries to open the file from the local hard drive. If the file exists on the local storage, Chrome will use that file. If the page does not exist Chrome will download the file and save it to local storage. If the user does not use Chrome, the javascript will catch the error, and download the file using d3.csv. This trick significantly saves subsequent download times for Chrome users.

Data Manipulation Tools

We've used a number of different programmatic tools to split the data set, we've documented some of the methods below. This example shows how to split the large data set into Male, Female, and Both data sets based on the "sex" column. We eventually decided to break the data up by region, instead of sex, however the technique is the same, we simply use region name instead of ",Male," and male.csv.

Splitting Data Files

based on sex to reduce file size-
Use the git bash shell to run the following commands to split the data files based on sex

```
$ grep ",Male," full.csv > male.csv
$ grep ",Female," full.csv > female.csv
$ grep ",Both," full.csv > both.csv
```

Use word count (wc) with -l option to do a line count to make sure the rows count tally up

```
$ wc -l *.csv
 283826 both.csv
 280367 female.csv
 832906 full.csv
 268712 male.csv
1665811 total
```

Prefix the below header row into the newly split files:

```
“cause_medium,region_name,year,age_name,sex_name,death_abs,death_rate,YLL_abs,YLL_rate,YLD_abs,YLD_rate,DALY_abs,DALY_rate"
```

Filtering Data

D3 offers a filter function, unfortunately this function is called each time a visualization is generated, which would mean the filter would walk through the dataset multiple times in order to draw the visualizations for our page. The dataset used for this page has the potential to be extremely large, we decided to write our own filter function, looping through the large data set producing smaller data sets which the visualization functions use as necessary. Anytime the user changes the form, the filter function is called. This filter function reads all the form values into a JS object, then loops through the dataset building smaller datasets. As we develop new visualizations we simply modify the filter function to develop a new dataset, or we use one of the existing datasets with the new visualization.

Using the filter function to loop through the datasets speeds page transitions, and simplifies the code.

Design Studio - Feedback

We met with Lana Nelson (shvetusya@gmail.com) and Charles Bandes (charley@charlesbandes.com) on 4-10-2014

Feedback:

- Overall excellent project, we're on the right path to display the data using very clear methodologies.
- When we discussed the size of the data we talked about setting up some node.js or server side alternatives to serve the data on demand, and agreed it was outside the scope of the project. We also talked about how we were going to break the data into regions, then load the regions on demand. There was some discussion about automatically loading the regions in the background, plus downloading the data on demand if it has not downloaded once the user requests a region.
- The projection we chose to use, is the correct projection to use for a Choropleth, however it's still weird, we might want to consider allowing the user to choose from different projections.
- The bar charts are still a little difficult to understand what they are as it was work-in-progress and we all agreed we need to title them.
- They liked how we used a modal window to zoom in on the smaller images.
- They liked the idea of being able to choose the image in the top where the map is.
- They think we should explore zooming the map into the chosen region, or centering the map on the region.
- They recommended exploring how we could use sex as a second dimension in the bar charts. They recommended using a stacked bar chart, or side by side bars to show the two different sexes. They also thought we could show the 3 different years in one chart if we kept the number of x axis values small enough.
- They suggested using one color, and controlling the saturation instead of using a two color range.

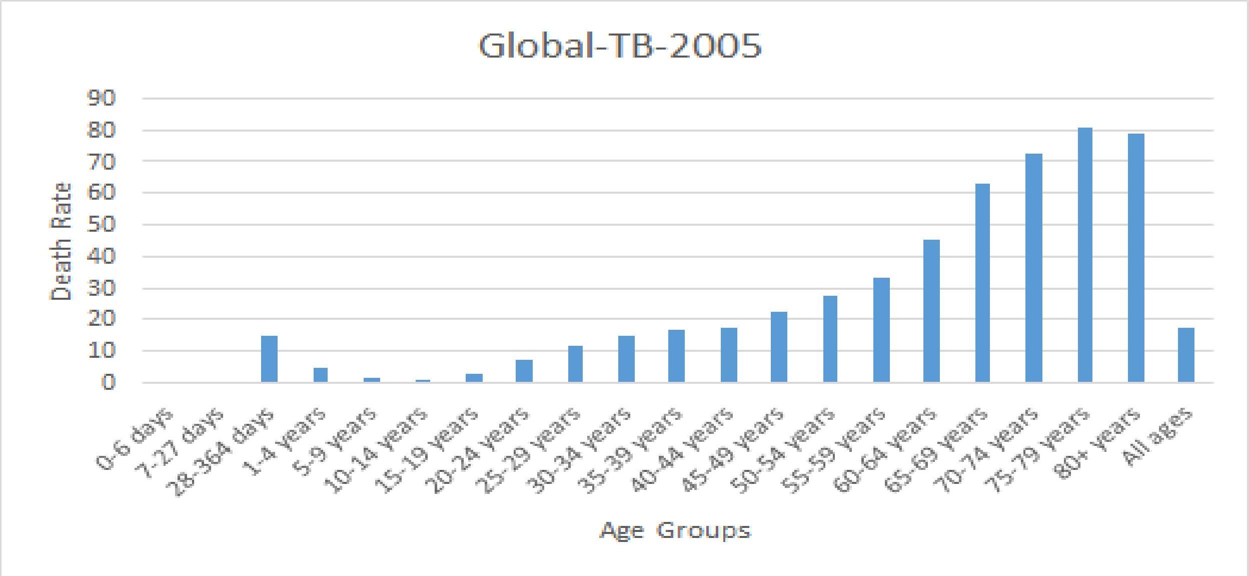
Implementation

Following are brief descriptions of the various aspects/challenges that need to be resolved or taken care of during the implementation of the project

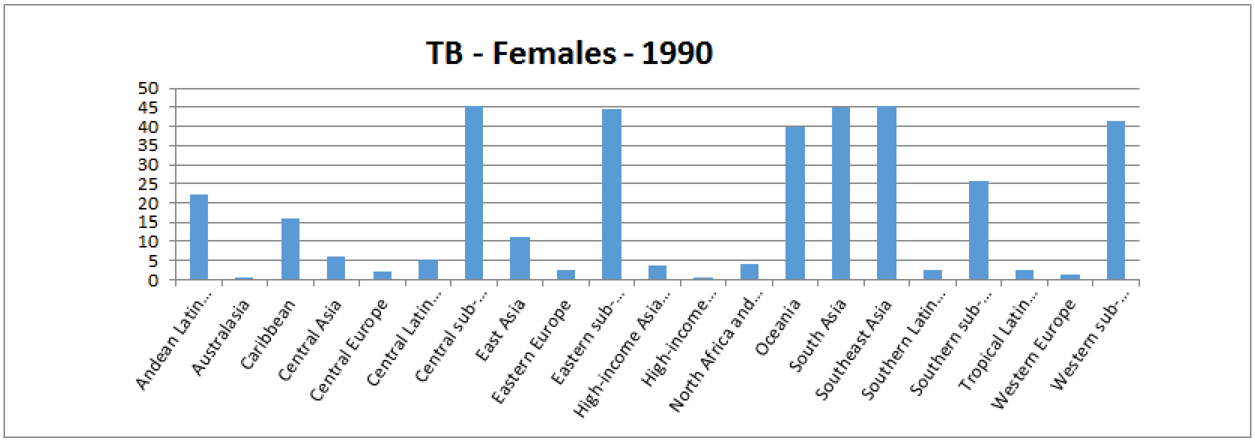
Sketches

Below are the sketches of the basic visualizations that we came up before implementing them using D3. The rest of the 3 visualizations are extensions of the below visualizations that compare the metrics with different years of study (1990, 2005 and 2010) and between the different sexes.

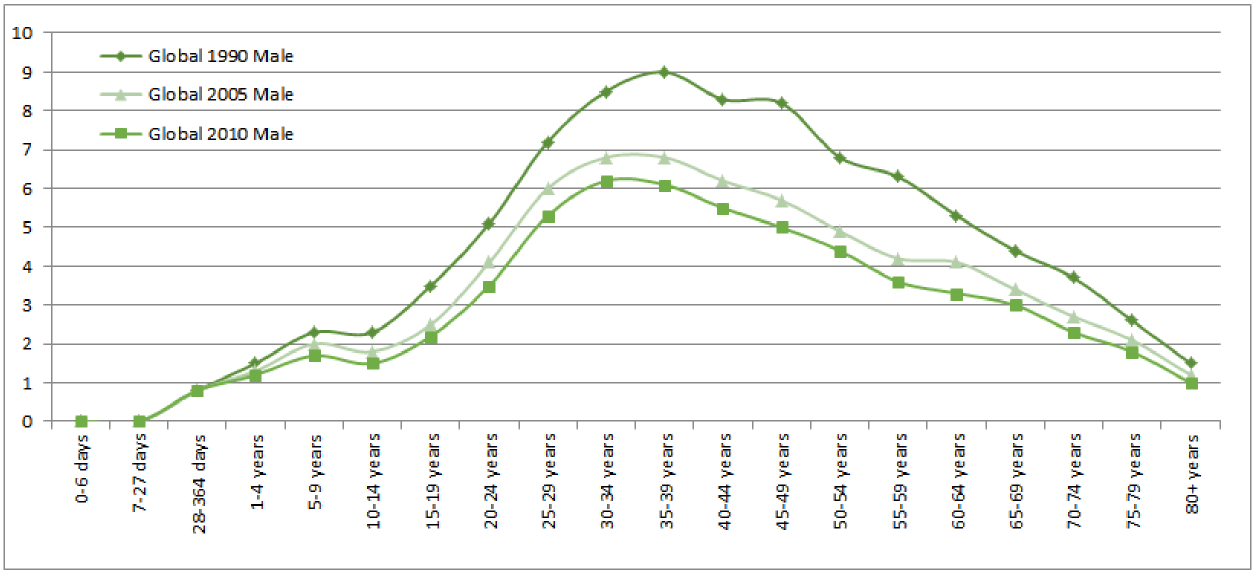
Death Rate vs Age Groups for any particular region/age group/sex for any year of study



Death Rate vs Regions for any cause/age group/sex for any year of study



Region-Cause-Sex Trend (1990-2005-2010)

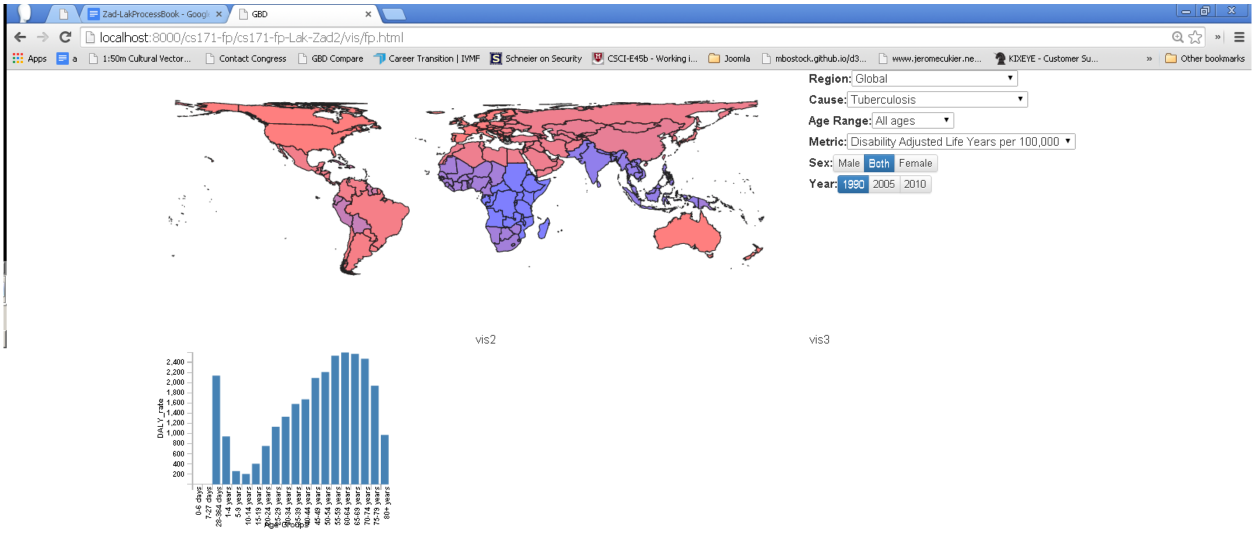


Adjusting the chart region sizes and functionality

- Broke the map section into it’s own map.js file to keep everything organized.
- Changed the page load logic, loading all the data and using logic to draw the charts once everything is loaded.
- Added a “spinner” to hide the page while data is loading, and remove it once all the data is downloaded (using the logic from above). This can change when we start storytelling
- Added cookie.js with functions for managing cookies.
- Worked with the html/css to change the region sizes of the page
- Added a title along the header, and put some text for the help.
- Added a hidden div along the top for storytelling/help section.
- The entire page is now 1200px wide.The Main vis section is now 900px wide. The Filter section is 300 px wide. Each of the smaller vis are 300px wide, which gives us the ability to have 4 vizs along the bottom.
- Re-formatted the filter so the select dropdowns and the buttons are all the same width.
- Added functionality to highlight bars when the user hovers over a region.
- Fixed the bug where the region loses the yellow color when the user clicks (The entire map was re-coloring, so I changed that region back to yellow after I triggered the filter.change())
- Modified the choropleth, changing the thickness of the paths used to draw the map, making the map wider, and translating the map so we only see the regions of the map we care about (we do not see the dead area where antarctica is).
- Changed the colors for the choropleth from red/blue to white/red; where red color indicates higher levels of death or disability. The borders in the after picture are only for reference, they will be removed in the former project.

- Added an .htaccess file so the csv files and the images cache when the user downloads them from the server side.
- Adjusted the margins for the sub visualizations so they use the available space better.

Before:



localhost:8000/cs171-fp/cs171-fp-Lak-Zad2/vis/fp.html

Region: Global

Cause: Tuberculosis

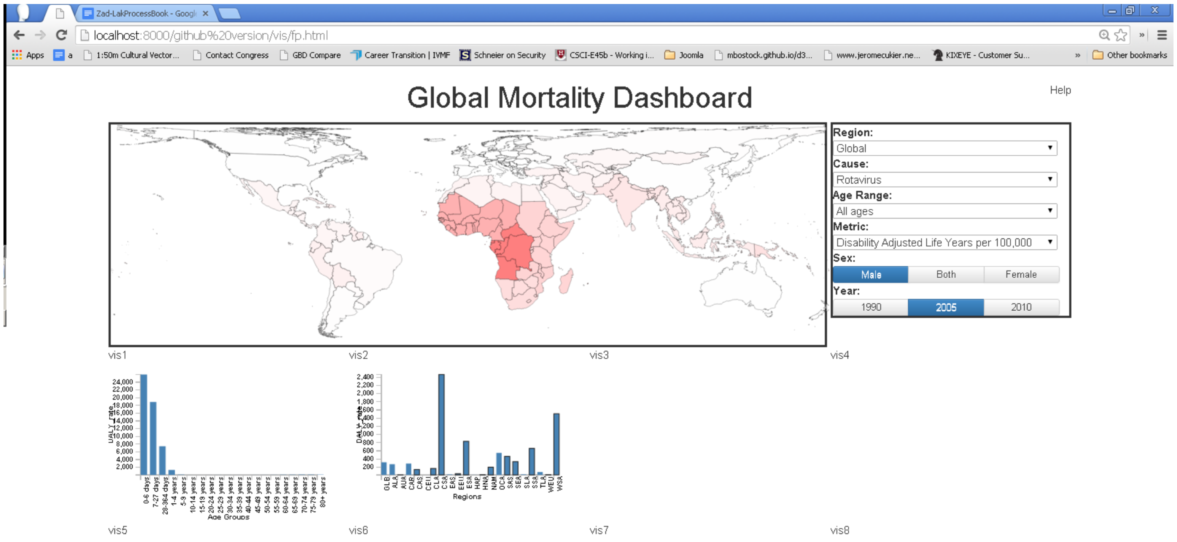
Age Range: All ages

Metric: Disability Adjusted Life Years per 100,000

Sex: Male Both Female

Year: 1990 2005 2010

After:



localhost:8000/github%20version/vis/fp.html

Global Mortality Dashboard

Help

Region: Global

Cause: Rotavirus

Age Range: All ages

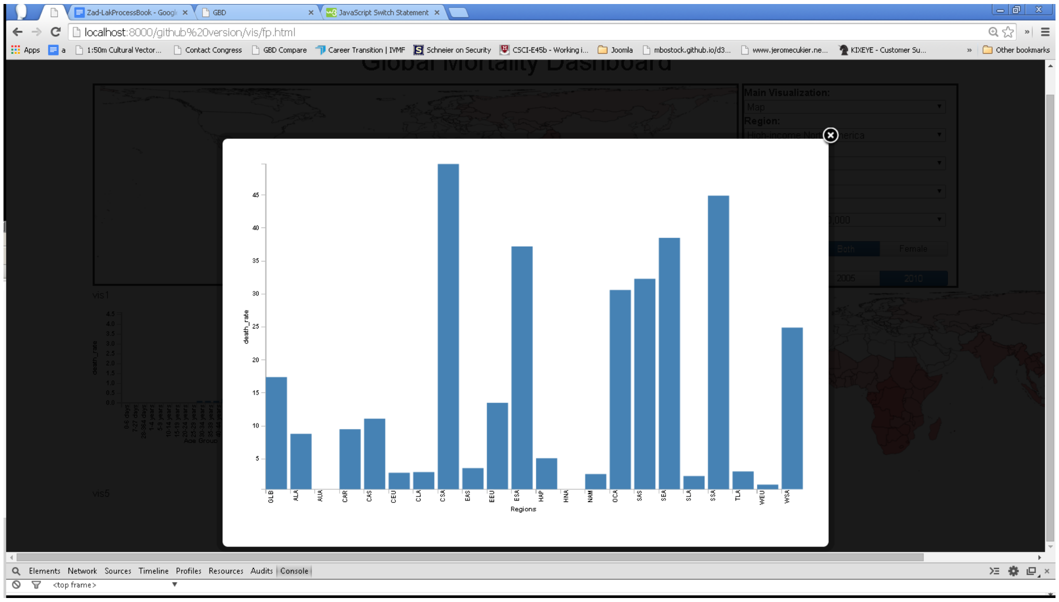
Metric: Disability Adjusted Life Years per 100,000

Sex: Male Both Female

Year: 1990 2005 2010

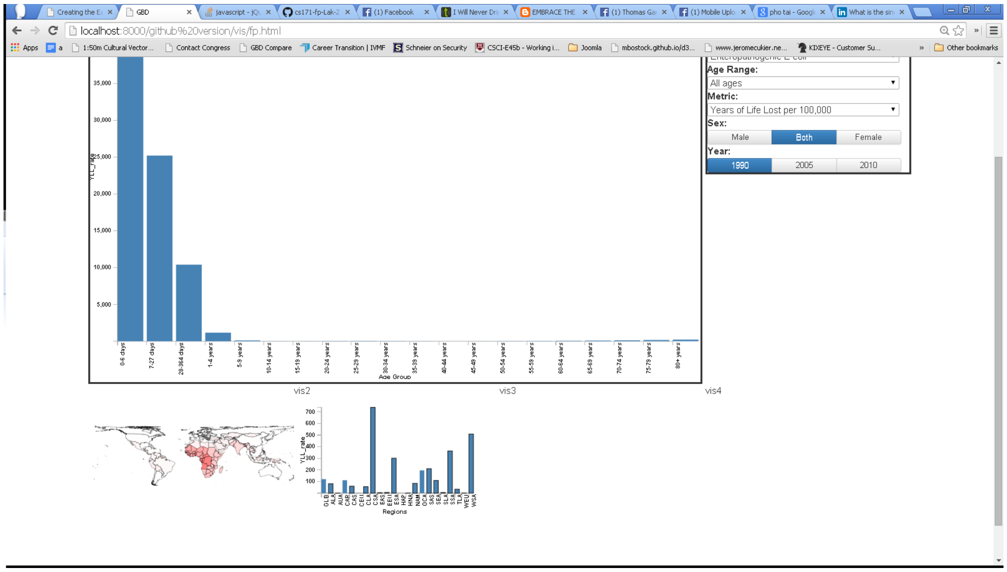
Larger Views

We originally were going to have the small visualizations open in a modal window in order to give the users a better view:



localhost:8000/github%20version/vis/fp.html

However,this did not allow the users to edit the filter and see the changes, nor did it allow the user to see the linked data which occurs when the user interacts with the screen. I worked out a way to have the chosen image show in the main div, and the map replace the chosen image in the smaller divs, but the map become incredibly small. After trying to display the smaller vis in the main window with the same aspect ration I determined we could change the ration to use a shorter vis, and still get the same usability out of the image.



localhost:8000/github%20version/vis/fp.html

Age Range: All ages

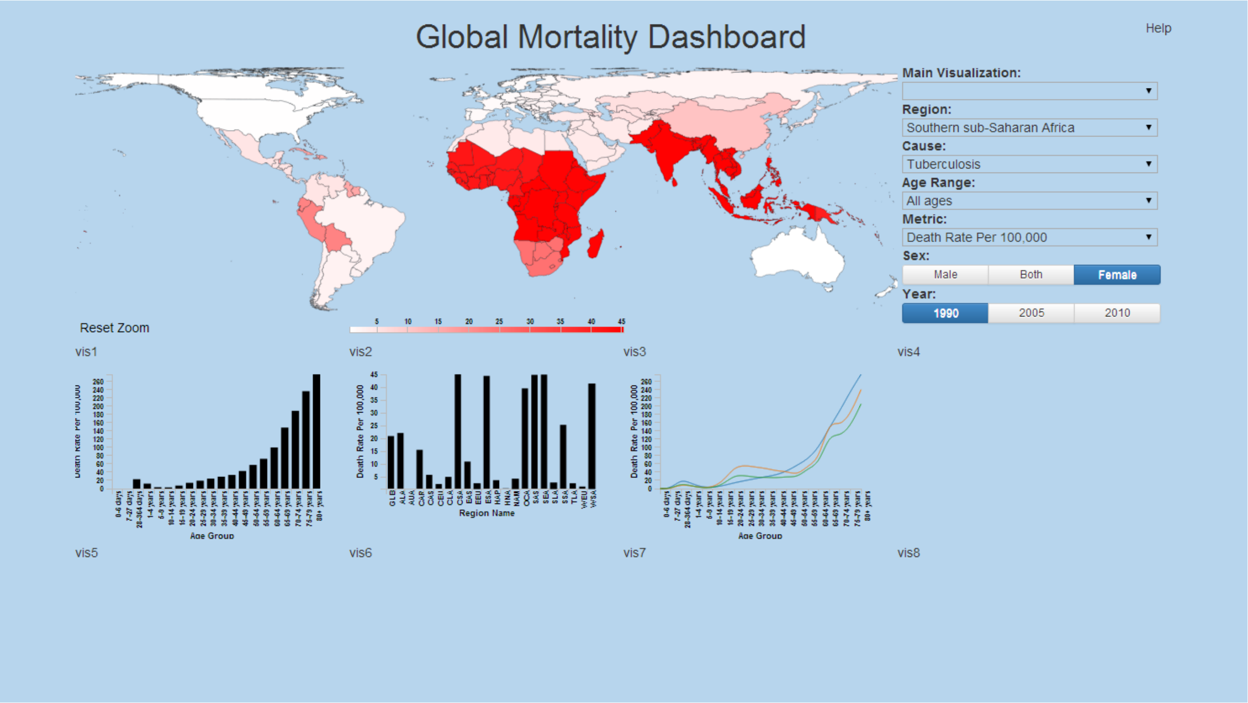
Metric: Years of Life Lost per 100,000

Sex: Male [✓ Both] Female

Year: [✓ 1990] 2005 2010

Graph Coloring

The choropleth is colored on a white/red scale; where red color indicates higher levels of death or disability. The graphs were not color coded to indicate the year the data came from or what sex they referred to. We decided to color the graphs to indicate what category the data is coming from. We decided it was too difficult to determine the colors on the smaller graphs, so we colored the buttons to match the appropriate category. Coloring the buttons allowed us to create one legend which applied to all of the graphs on the page.



Global Mortality Dashboard

Main Visualization:

Region: Southern sub-Saharan Africa

Cause: Tuberculosis

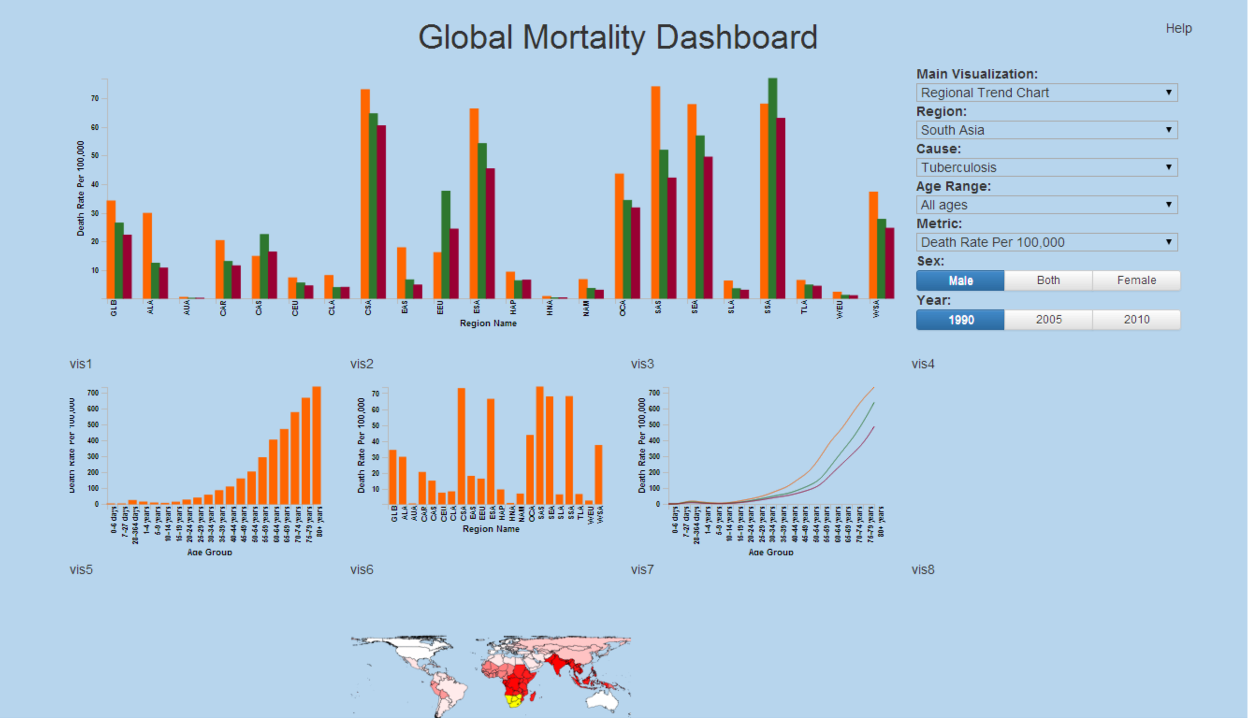
Age Range: All ages

Metric: Death Rate Per 100,000

Sex: Male | Both | Female

Year: 1990 | 2005 | 2010

After coloring graphs by year:



Global Mortality Dashboard

Main Visualization: Regional Trend Chart

Region: South Asia

Cause: Tuberculosis

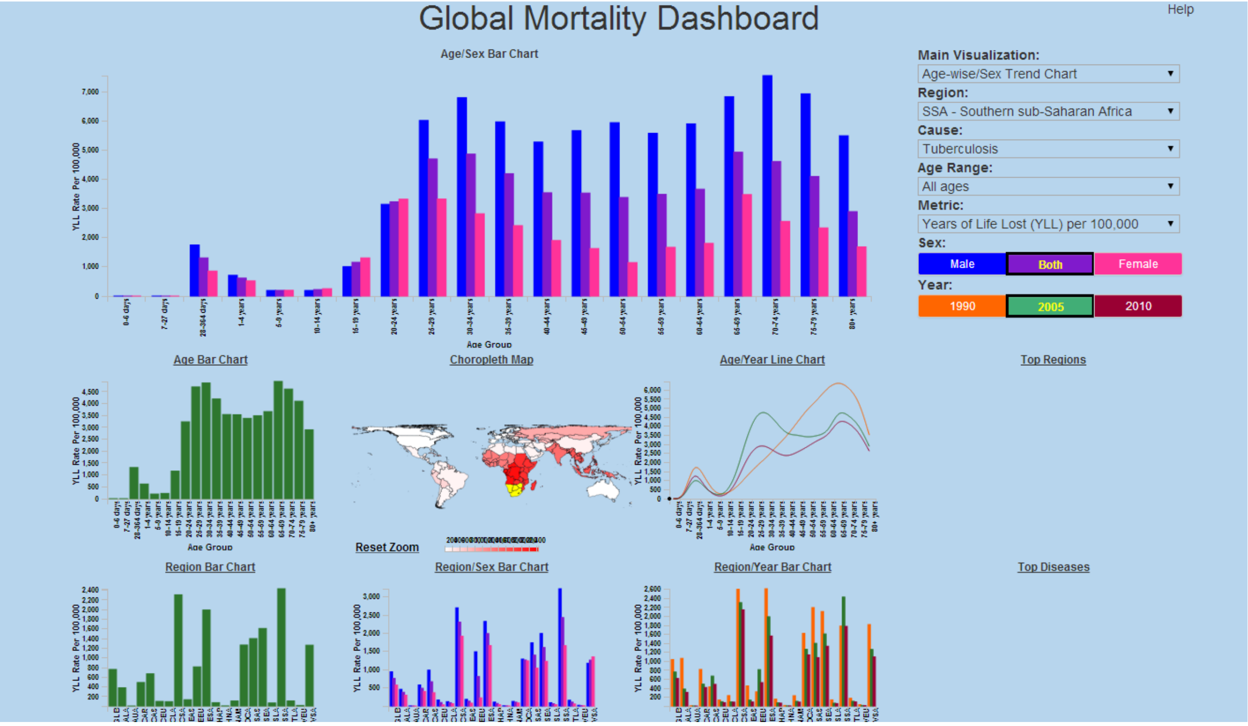
Age Range: All ages

Metric: Death Rate Per 100,000

Sex: Male | Both | Female

Year: 1990 | 2005 | 2010

After coloring graphs by sex and colorizing the buttons:



Global Mortality Dashboard

Main Visualization: Age-wise/Sex Trend Chart

Region: SSA - Southern sub-Saharan Africa

Cause: Tuberculosis

Age Range: All ages

Metric: Years of Life Lost (YLL) per 100,000

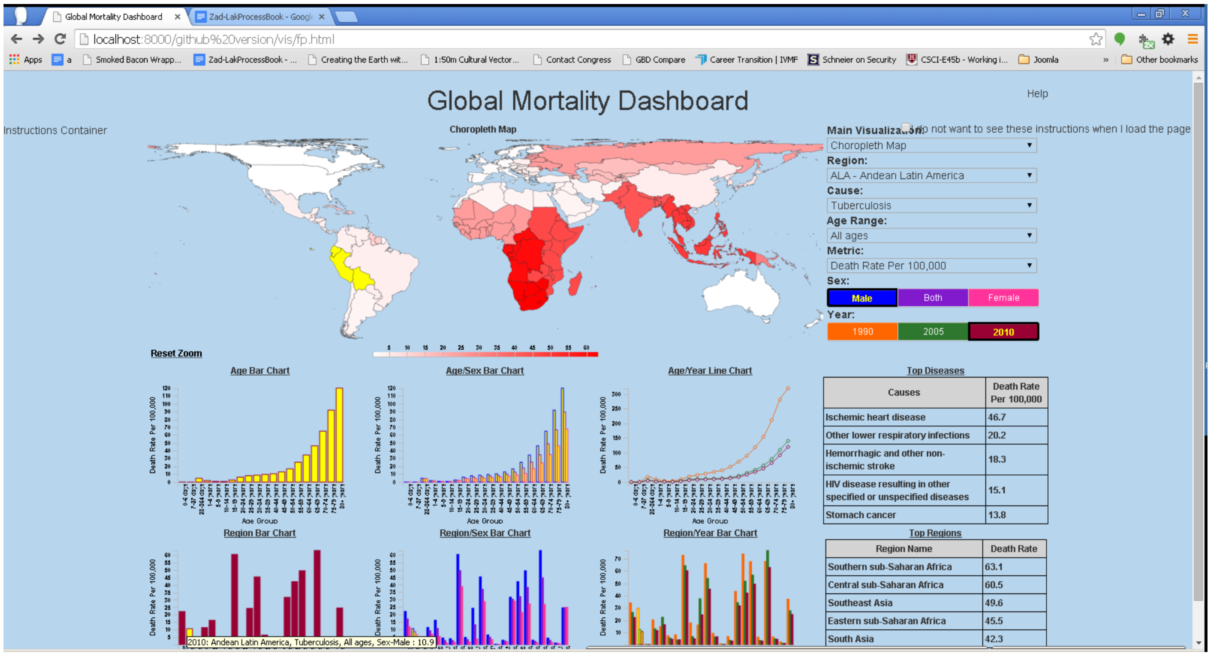
Sex: Male | Both | Female

Year: 1990 | 2005 | 2010

Linking Charts

As we worked through linking the charts we decided to add a class with the 3 letter region code to each rect/path. We used that 3 letter class to highlight each of the appropriate rect/path by adding a class of highlight.

Before:



Global Mortality Dashboard

Main Visualization: □ I do not want to see these instructions when I load the page

Choropleth Map ▾

Region: ALA - Andean Latin America ▾

Cause: Tuberculosis ▾

Age Range: All ages ▾

Metric: Death Rate Per 100,000 ▾

Sex: Male | Both | Female

Year: 1990 | 2005 | 2010

2010: Andean Latin America, Tuberculosis, All ages, Sex-Male : 10.9

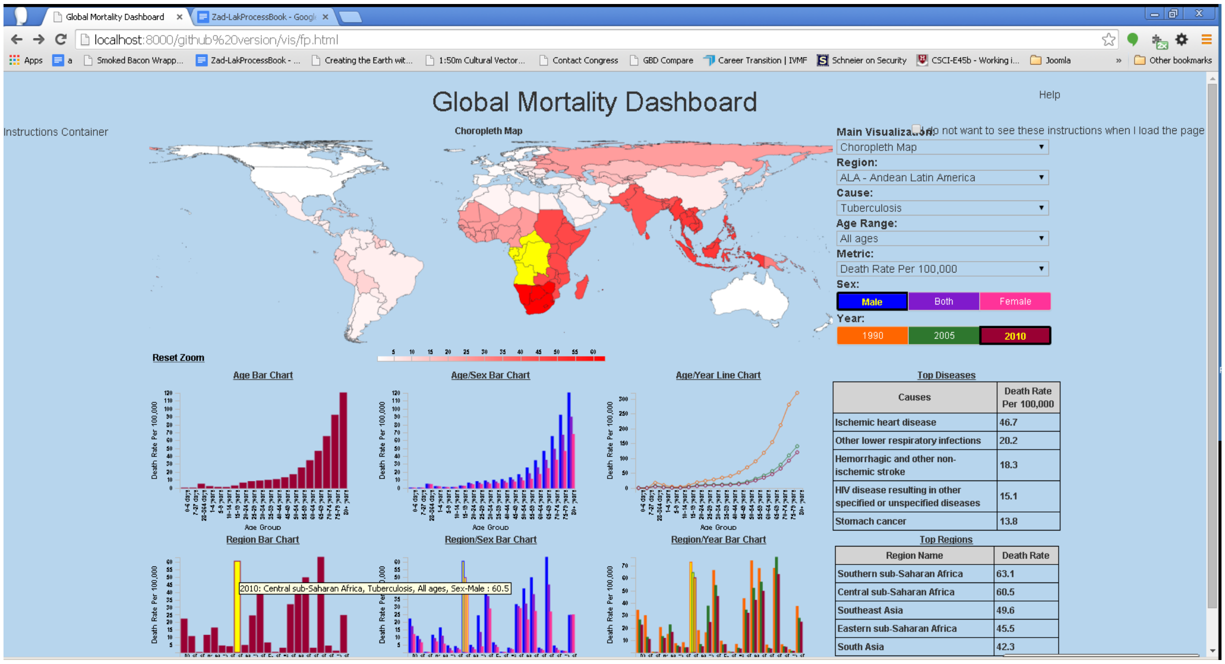
Top Diseases

Causes	Death Rate Per 100,000
Ischemic heart disease	46.7
Other lower respiratory infections	20.2
Hemorrhagic and other non-ischemic stroke	18.3
HIV disease resulting in other specified or unspecified diseases	15.1
Stomach cancer	13.8

Top Regions

Region Name	Death Rate
Southern sub-Saharan Africa	63.1
Central sub-Saharan Africa	60.5
Southeast Asia	49.6
Eastern sub-Saharan Africa	45.5
South Asia	42.3

After:



Global Mortality Dashboard

Main Visualization: □ I do not want to see these instructions when I load the page

Choropleth Map ▾

Region: ALA - Andean Latin America ▾

Cause: Tuberculosis ▾

Age Range: All ages ▾

Metric: Death Rate Per 100,000 ▾

Sex: Male | Both | Female

Year: 1990 | 2005 | 2010

2010: Central sub-Saharan Africa, Tuberculosis, All ages, Sex-Male : 60.5

Top Diseases

Causes	Death Rate Per 100,000
Ischemic heart disease	46.7
Other lower respiratory infections	20.2
Hemorrhagic and other non-ischemic stroke	18.3
HIV disease resulting in other specified or unspecified diseases	15.1
Stomach cancer	13.8

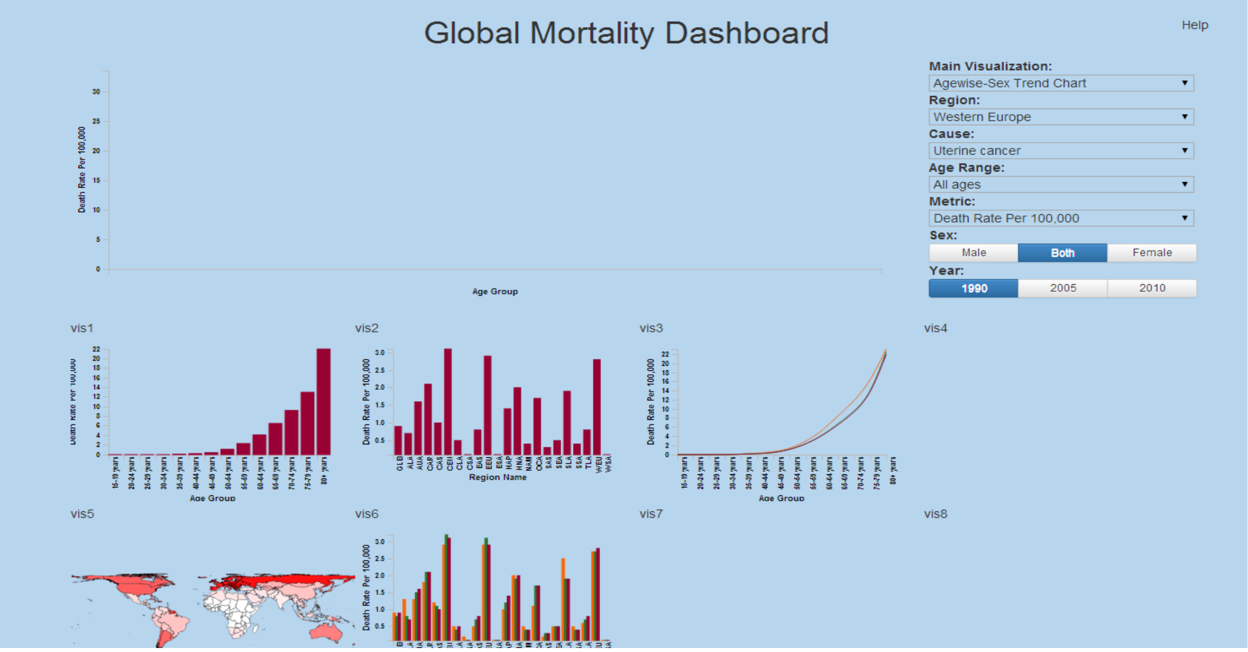
Top Regions

Region Name	Death Rate
Southern sub-Saharan Africa	63.1
Central sub-Saharan Africa	60.5
Southeast Asia	49.6
Eastern sub-Saharan Africa	45.5
South Asia	42.3

Issues

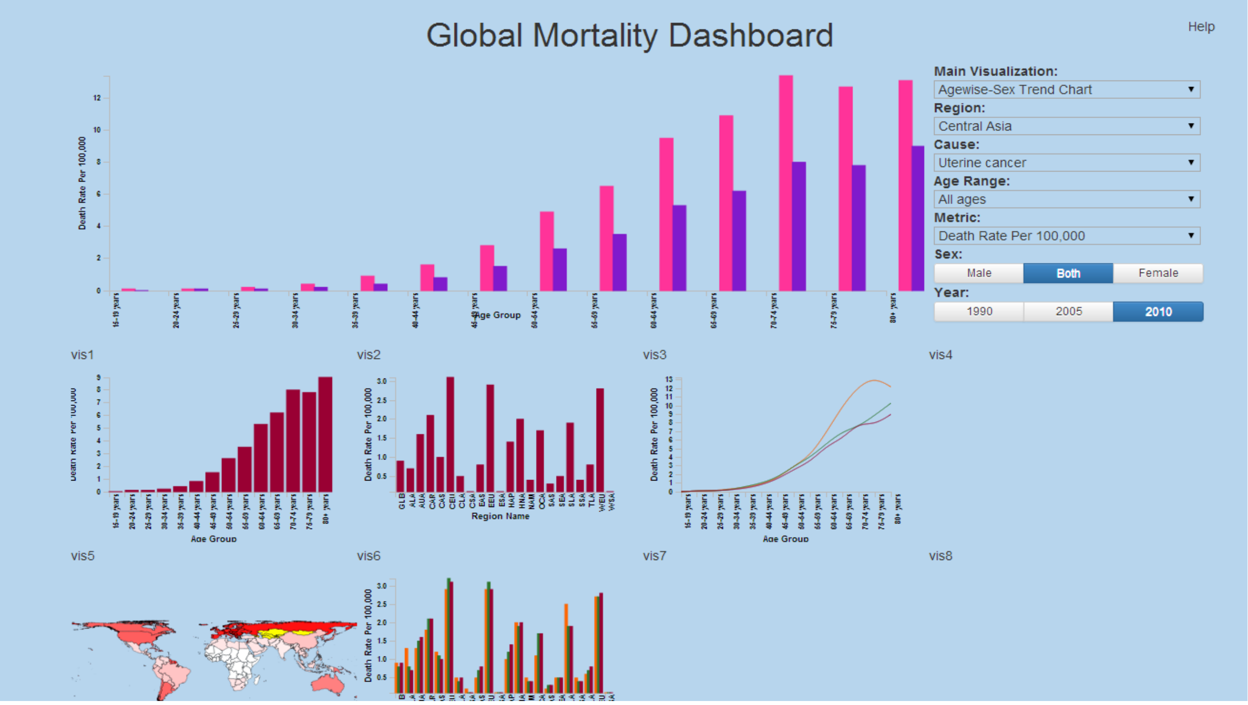
Discussed below are some of the issues/challenges faced during the implementation

1. Agewise-Sex Trend Chart would not populate if any of the 3 datasets was empty due to absence of data for certain causes specific to certain groups. e.g. Males will not contain metrics for Breast Cancer and Uterine Cancer. Females will not contain metrics for Prostate Cancer.


Global Mortality Dashboard

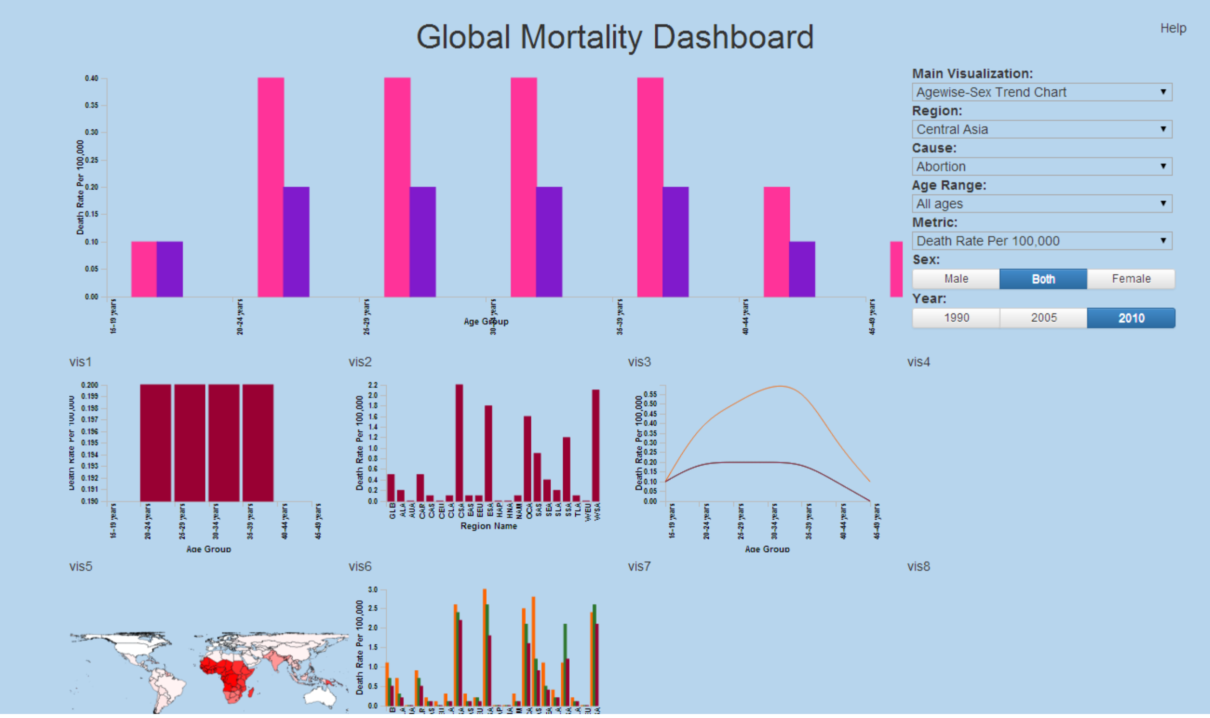
Main Visualization: Agewise-Sex Trend Chart
Region: Western Europe
Cause: Uterine cancer
Age Range: All ages
Metric: Death Rate Per 100,000
Sex: Male [✓ Both] Female
Year: [✓ 1990] 2005 2010

After the fix:


Global Mortality Dashboard

Main Visualization: Agewise-Sex Trend Chart
Region: Central Asia
Cause: Uterine cancer
Age Range: All ages
Metric: Death Rate Per 100,000
Sex: Male [✓ Both] Female
Year: 1990 2005 [✓ 2010]

2. Selecting criteria that has a small number of x-axis ticks results in the graph extending beyond the div width and getting truncated.   Fixing this involved increasing the input range for the xScale to array.length + 1, which made the tick spacing slightly smaller, but fit all of the bars on one screen.



Main Visualization: Agewise-Sex Trend Chart

Region: Central Asia

Cause: Abortion

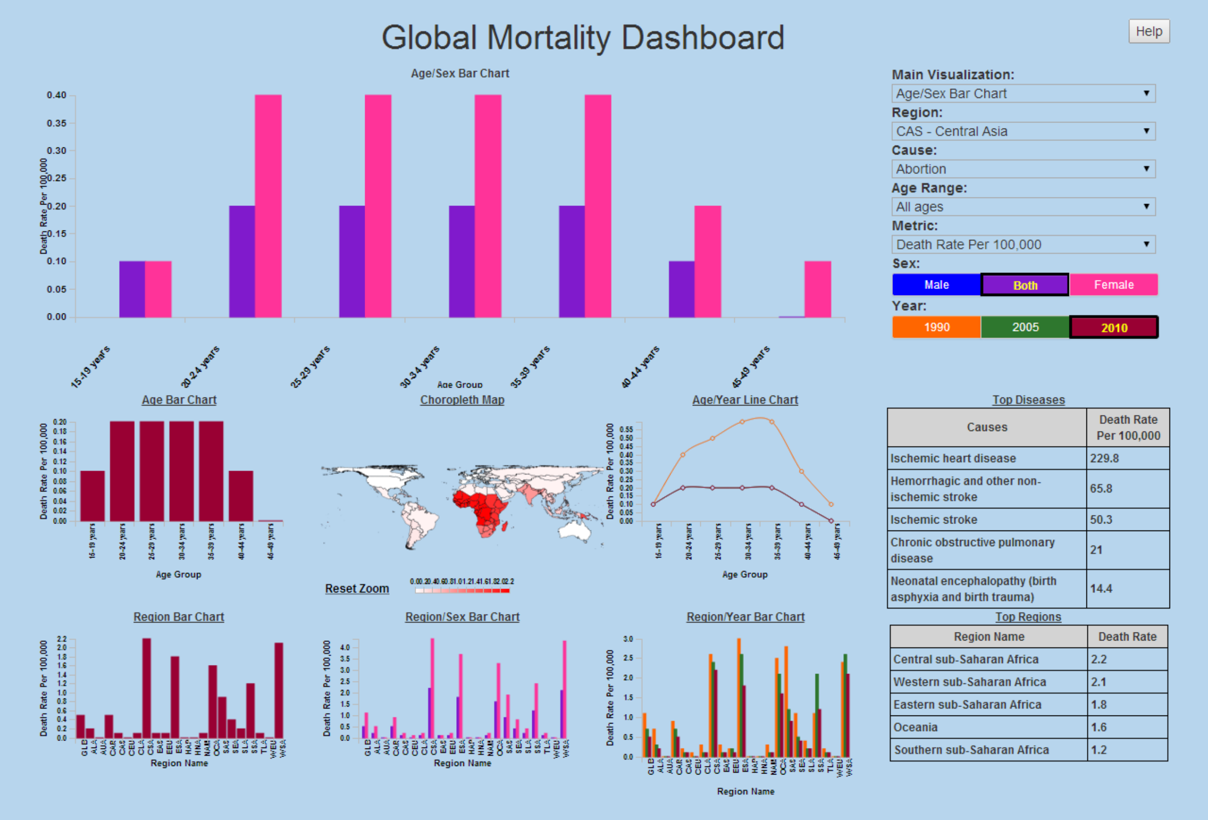
Age Range: All ages

Metric: Death Rate Per 100,000

Sex: Male [✓ Both] Female

Year: 1990 2005 [✓ 2010]

After the fix:



Main Visualization: Age/Sex Bar Chart

Region: CAS - Central Asia

Cause: Abortion

Age Range: All ages

Metric: Death Rate Per 100,000

Sex: Male [✓ Both] Female

Year: 1990 2005 [✓ 2010]

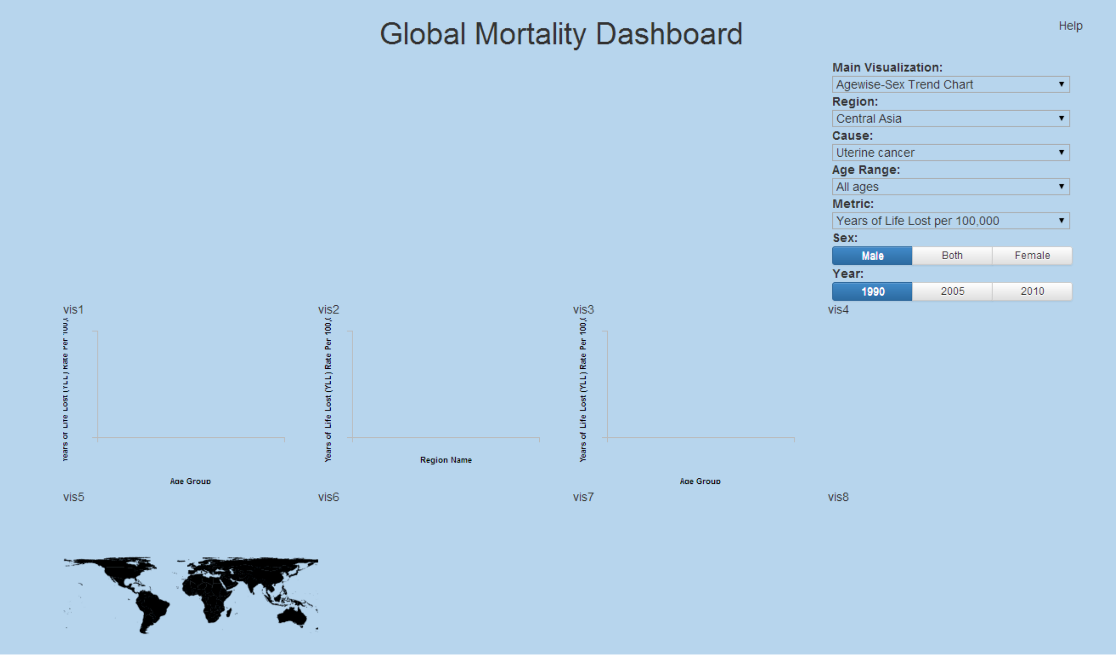
Top Diseases

Causes	Death Rate Per 100,000
Ischemic heart disease	229.8
Hemorrhagic and other non-ischemic stroke	65.8
Ischemic stroke	50.3
Chronic obstructive pulmonary disease	21
Neonatal encephalopathy (birth asphyxia and birth trauma)	14.4

Top Regions

Region Name	Death Rate
Central sub-Saharan Africa	2.2
Western sub-Saharan Africa	2.1
Eastern sub-Saharan Africa	1.8
Oceania	1.6
Southern sub-Saharan Africa	1.2

3. Data Not available. It’s possible to select a data set which has absolutely no data available, which causes empty visualizations. We decided to replace the empty visualizations with a short note explaining the absence. (This is similar to issue number 1 above, with the exception of we chose MALE instead of BOTH for the sex, which causes a majority of the charts to lack data.


Global Mortality Dashboard
Help
vis1
vis2
vis3
vis4
Years of Life Lost (YLL) Rate Per 100,0
Age Group
Region Name
vis5
vis6
vis7
vis8

Main Visualization: Agewise-Sex Trend Chart

Region: Central Asia

Cause: Uterine cancer

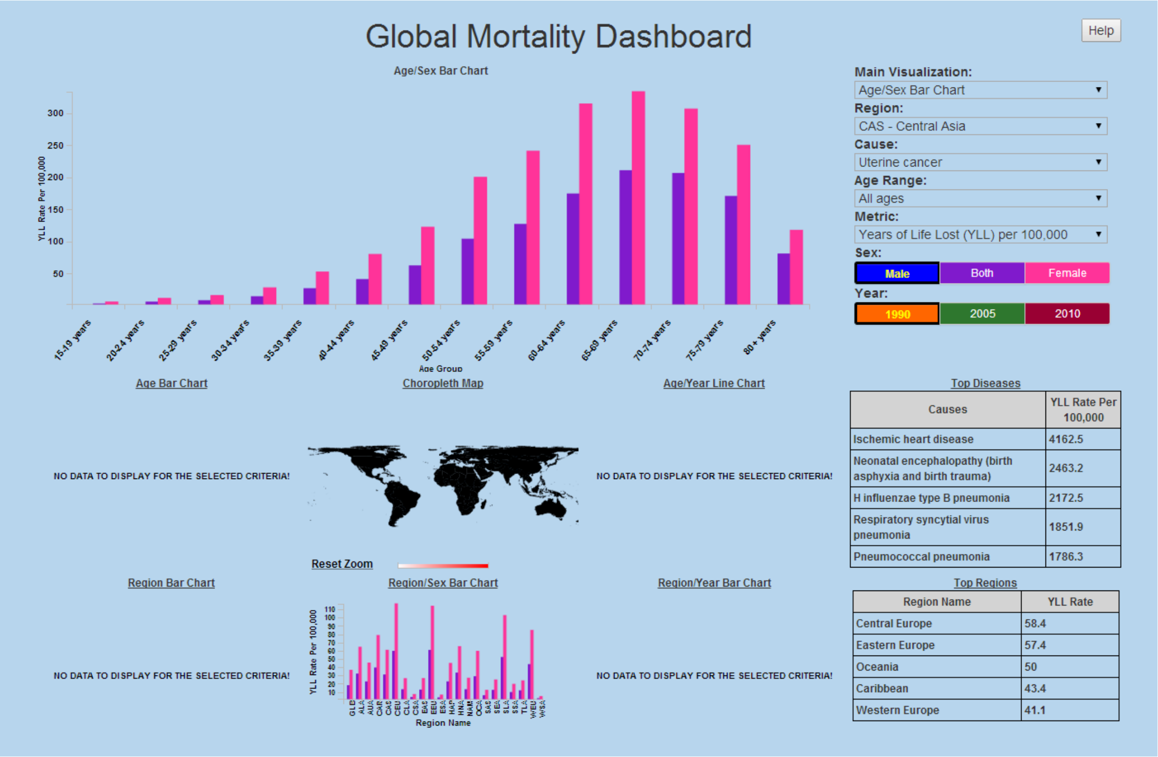
Age Range: All ages

Metric: Years of Life Lost per 100,000

Sex: Male | Both | Female

Year: 1990 | 2005 | 2010

After the fix:



Main Visualization: Age/Sex Bar Chart

Region: CAS - Central Asia

Cause: Uterine cancer

Age Range: All ages

Metric: Years of Life Lost (YLL) per 100,000

Sex: Male | Both | Female

Year: 1990 | 2005 | 2010

NO DATA TO DISPLAY FOR THE SELECTED CRITERIA!

NO DATA TO DISPLAY FOR THE SELECTED CRITERIA!

NO DATA TO DISPLAY FOR THE SELECTED CRITERIA!

NO DATA TO DISPLAY FOR THE SELECTED CRITERIA!

Top Diseases

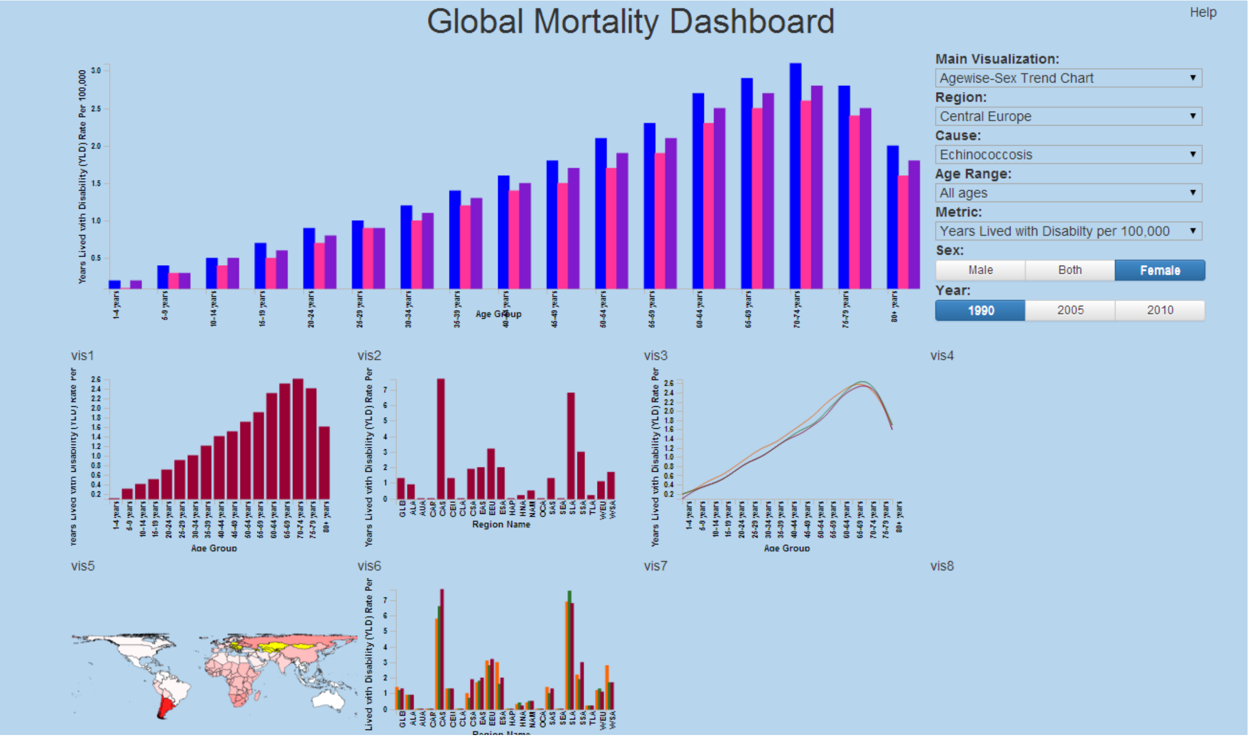
Causes	YLL Rate Per 100,000
Ischemic heart disease	4162.5
Neonatal encephalopathy (birth asphyxia and birth trauma)	2463.2
H influenzae type B pneumonia	2172.5
Respiratory syncytial virus pneumonia	1851.9
Pneumococcal pneumonia	1786.3

Top Regions

Region Name	YLL Rate
Central Europe	58.4
Eastern Europe	57.4
Oceania	50
Caribbean	43.4
Western Europe	41.1

Visualization Examples

Age/Sex Bar Chart



Global Mortality Dashboard

Main Visualization: Agewise-Sex Trend Chart ▾

Region: Central Europe ▾

Cause: Echinococcosis ▾

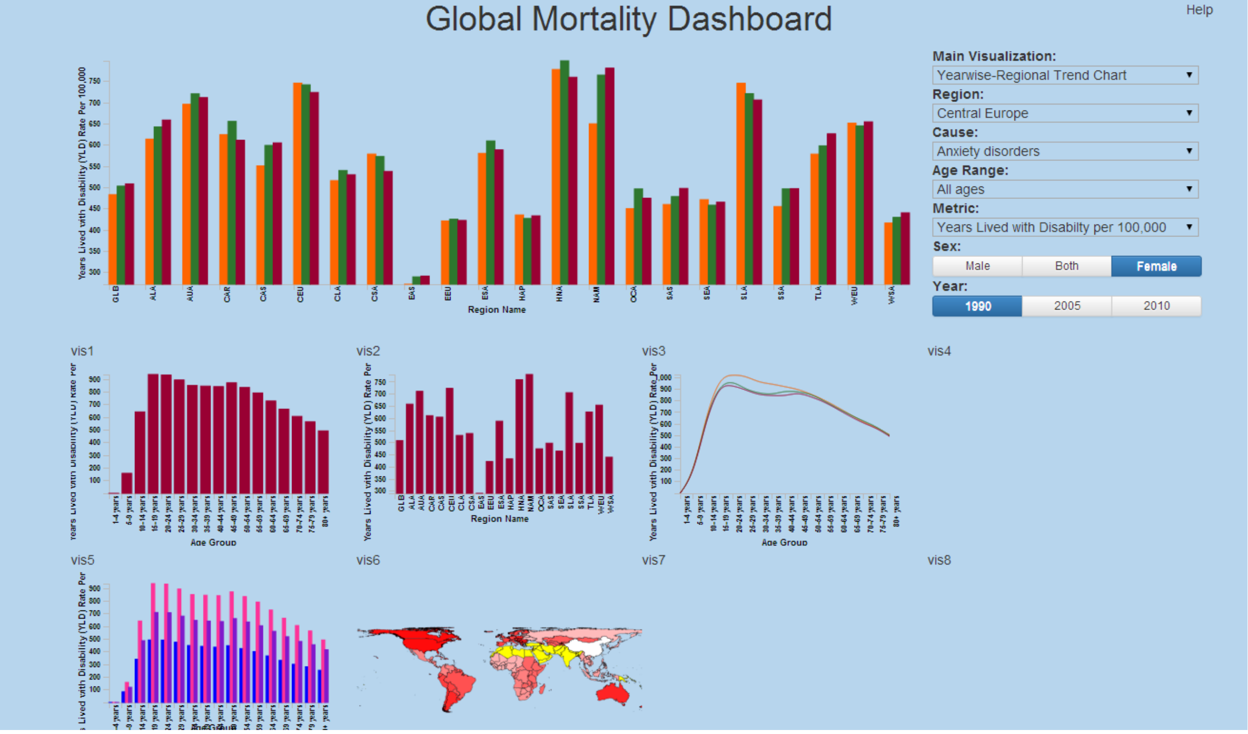
Age Range: All ages ▾

Metric: Years Lived with Disabilty per 100,000 ▾

Sex: Male | Both | [✓ Female]

Year: [✓ 1990] | 2005 | 2010

Region/Year Bar Chart



Global Mortality Dashboard

Main Visualization: Yearwise-Regional Trend Chart ▾

Region: Central Europe ▾

Cause: Anxiety disorders ▾

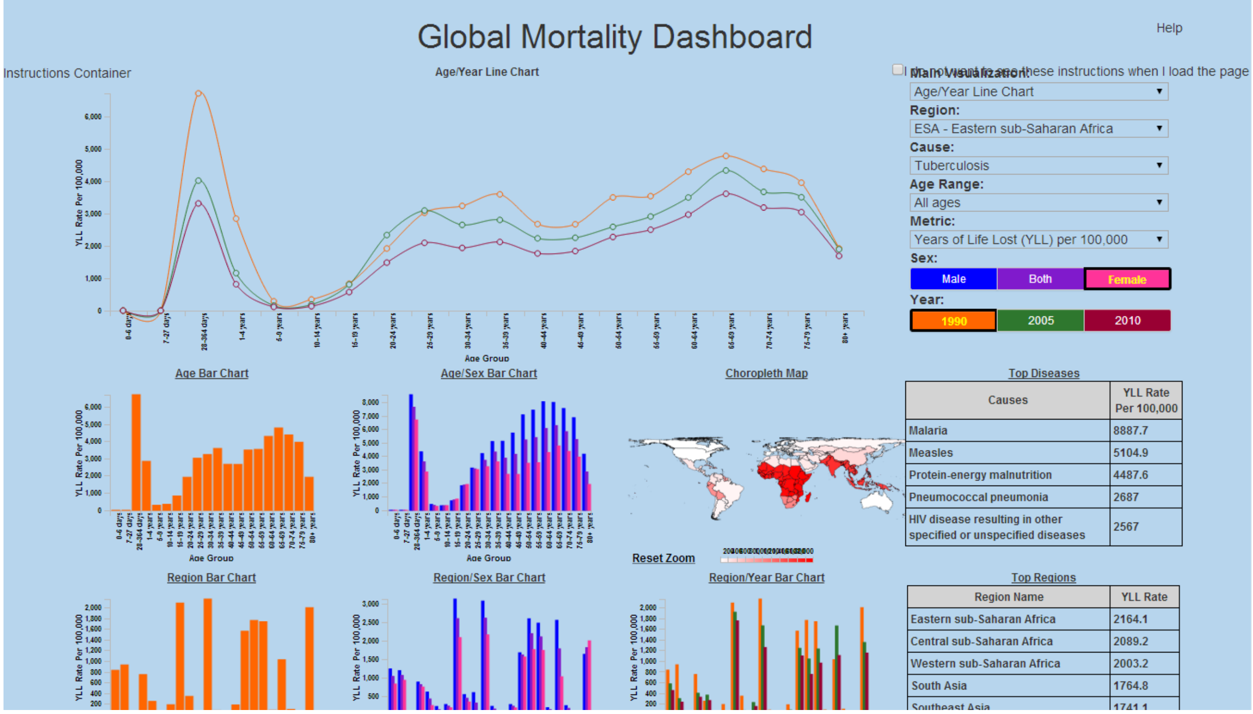
Age Range: All ages ▾

Metric: Years Lived with Disabilty per 100,000 ▾

Sex: Male | Both | [✓ Female]

Year: [✓ 1990] | 2005 | 2010

Age/Year Line Chart



□ I do not want to see these instructions when I load the page

Main Visualization: Age/Year Line Chart

Region: ESA - Eastern sub-Saharan Africa

Cause: Tuberculosis

Age Range: All ages

Metric: Years of Life Lost (YLL) per 100,000

Sex: Male | Both | **Female**

Year: **1990** | 2005 | 2010

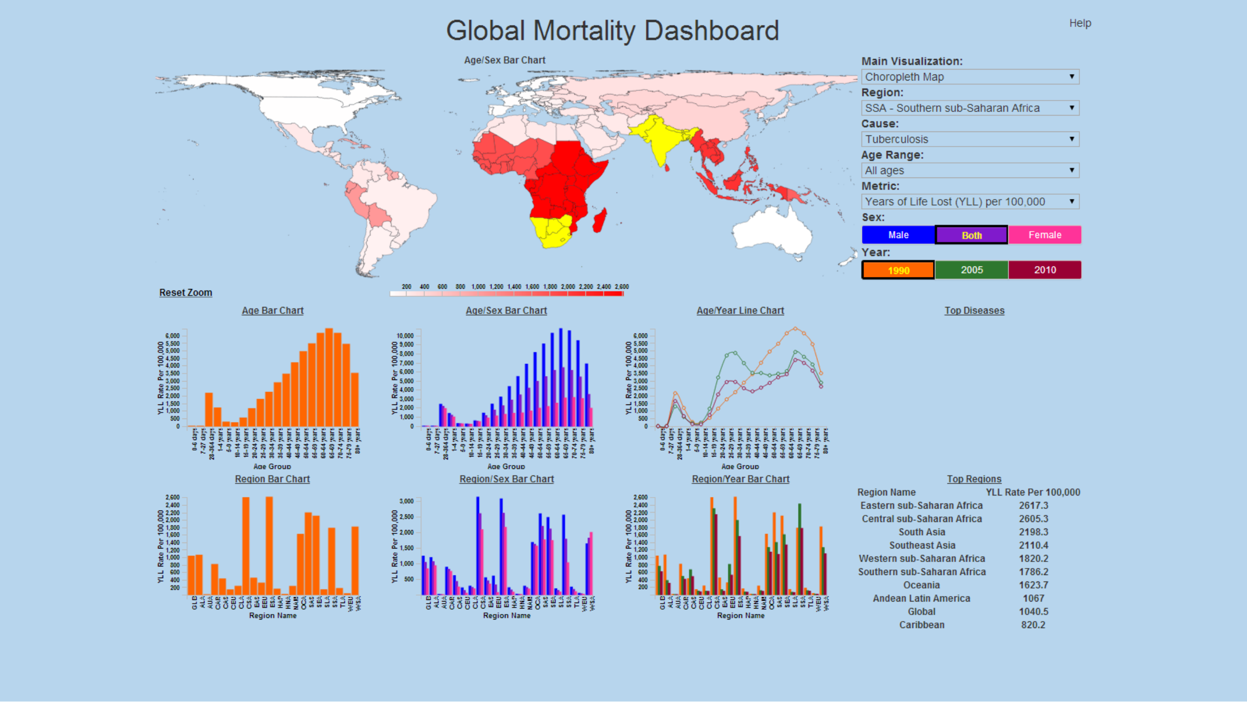
Top Diseases

Causes	YLL Rate Per 100,000
Malaria	8887.7
Measles	5104.9
Protein-energy malnutrition	4487.6
Pneumococcal pneumonia	2687
HIV disease resulting in other specified or unspecified diseases	2567

Top Regions

Region Name	YLL Rate
Eastern sub-Saharan Africa	2164.1
Central sub-Saharan Africa	2089.2
Western sub-Saharan Africa	2003.2
South Asia	1764.8
Southeast Asia	1741.1

Choropleth



Main Visualization: Choropleth Map

Region: SSA - Southern sub-Saharan Africa

Cause: Tuberculosis

Age Range: All ages

Metric: Years of Life Lost (YLL) per 100,000

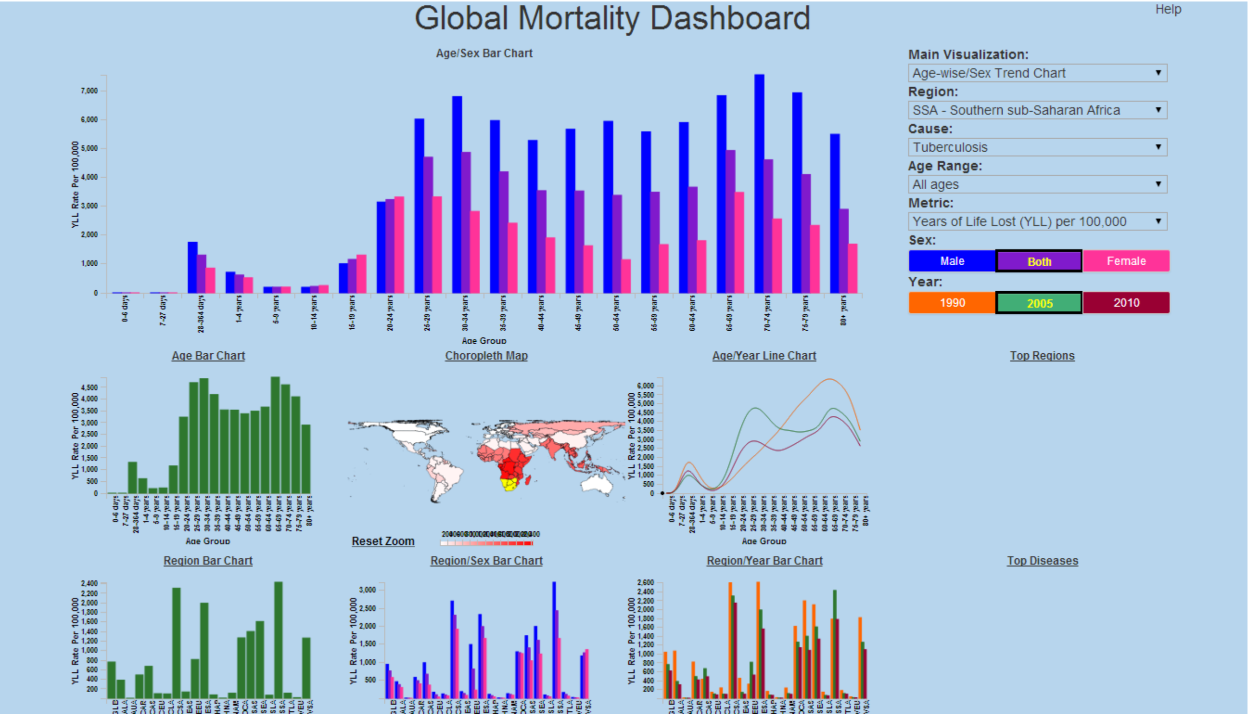
Sex: Male | **Both** | Female

Year: **1990** | 2005 | 2010

Top Regions

Region Name	YLL Rate Per 100,000
Eastern sub-Saharan Africa	2617.3
Central sub-Saharan Africa	2605.3
South Asia	2198.3
Southeast Asia	2110.4
Western sub-Saharan Africa	1820.2
Southern sub-Saharan Africa	1786.2
Oceania	1623.7
Andean Latin America	1067
Global	1040.5
Caribbean	820.2

Age/Sex Bar Chart



Main Visualization: Age-wise/Sex Trend Chart

Region: SSA - Southern sub-Saharan Africa

Cause: Tuberculosis

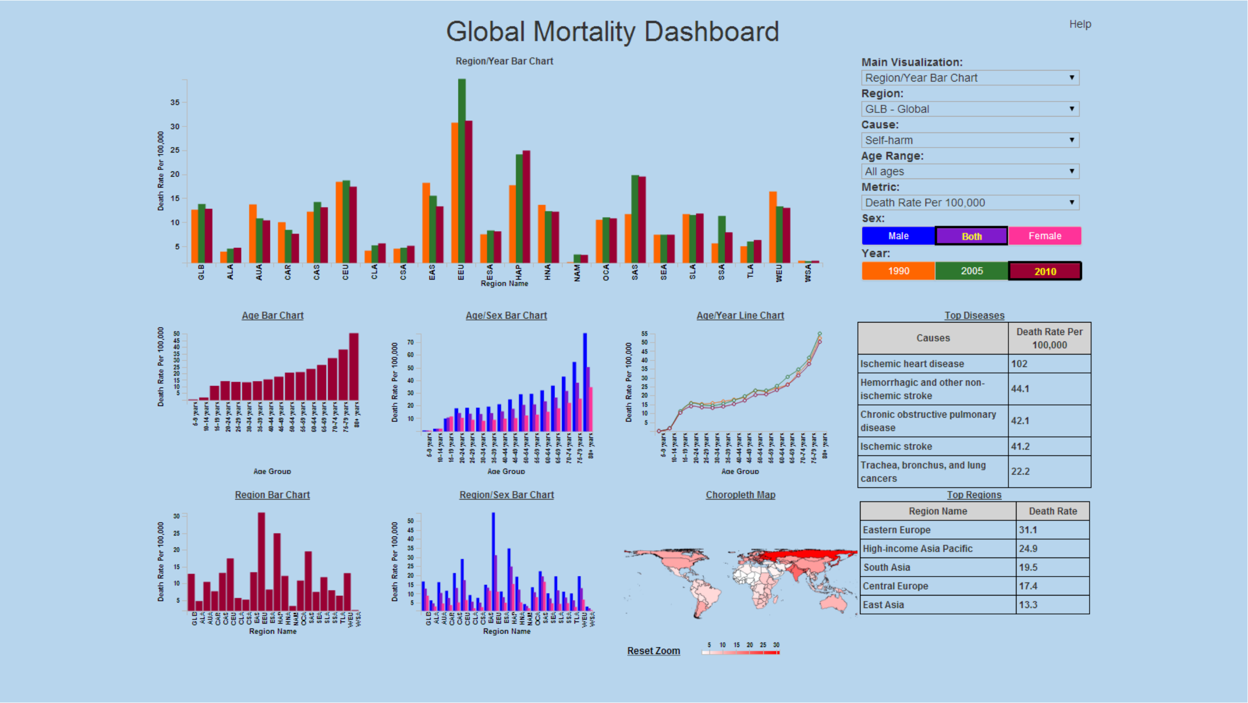
Age Range: All ages

Metric: Years of Life Lost (YLL) per 100,000

Sex: Both

Year: 2005

Region/Year Bar Chart



Main Visualization: Region/Year Bar Chart

Region: GLB - Global

Cause: Self-harm

Age Range: All ages

Metric: Death Rate Per 100,000

Sex: Both

Year: 2010

Top Diseases

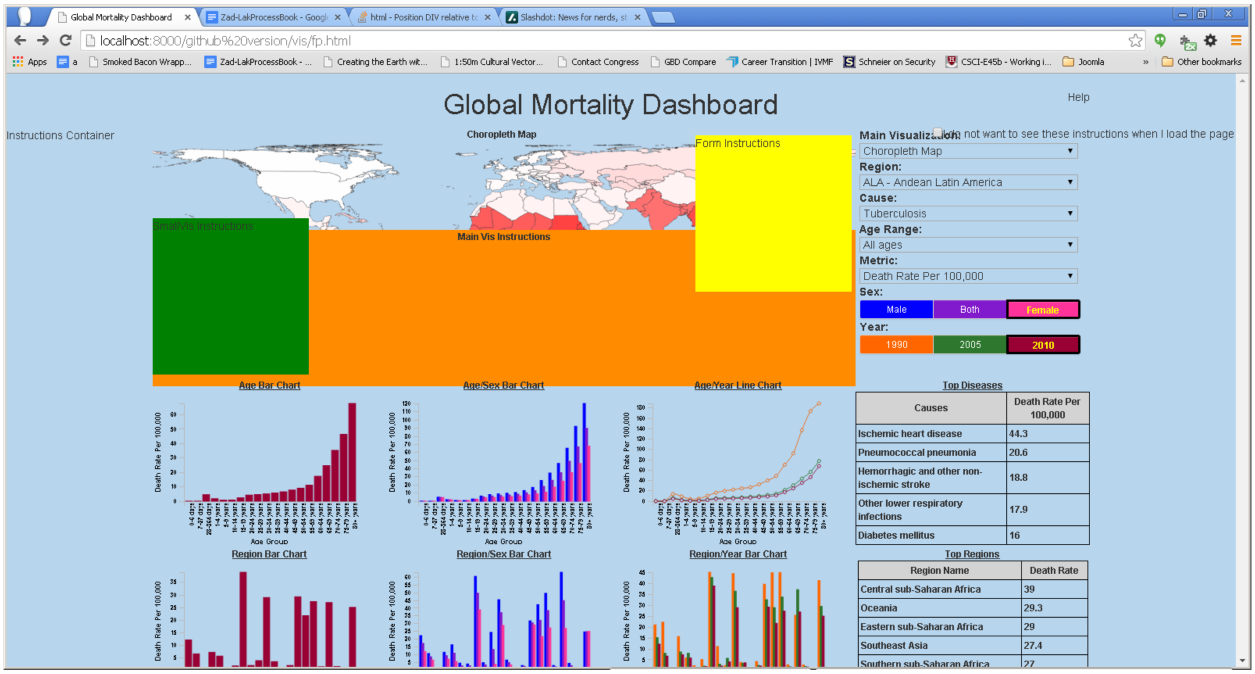
Causes	Death Rate Per 100,000
Ischemic heart disease	102
Hemorrhagic and other non-ischemic stroke	44.1
Chronic obstructive pulmonary disease	42.1
Ischemic stroke	41.2
Trachea, bronchus, and lung cancers	22.2

Top Regions

Region Name	Death Rate
Eastern Europe	31.1
High-income Asia Pacific	24.9
South Asia	19.5
Central Europe	17.4
East Asia	13.3

Story Telling

Our plan is to use a number of absolutely positioned divs to explain how the page works. We will start with a large div which displays over the Loading screen, this will have an explanation of the site, discuss our motivation, and have some information from the main GBD site. This section will be wordy, the goal is to give something for the users to read while the page is loading. Once the page loads there will be the Main visualization description (orange below), followed by the filter description (yellow) and the smaller vis description (green). Each div will have a checkbox which allows the user to stop showing the instructions on page load, and a next button to advance to the next visualization.



□ I do not want to see these instructions when I load the page

Main Visualization: Choropleth Map

Region: ALA - Andean Latin America

Cause: Tuberculosis

Age Range: All ages

Metric: Death Rate Per 100,000

Sex: Male | Both | Female

Year: 1990 | 2005 | 2010

Top Diseases

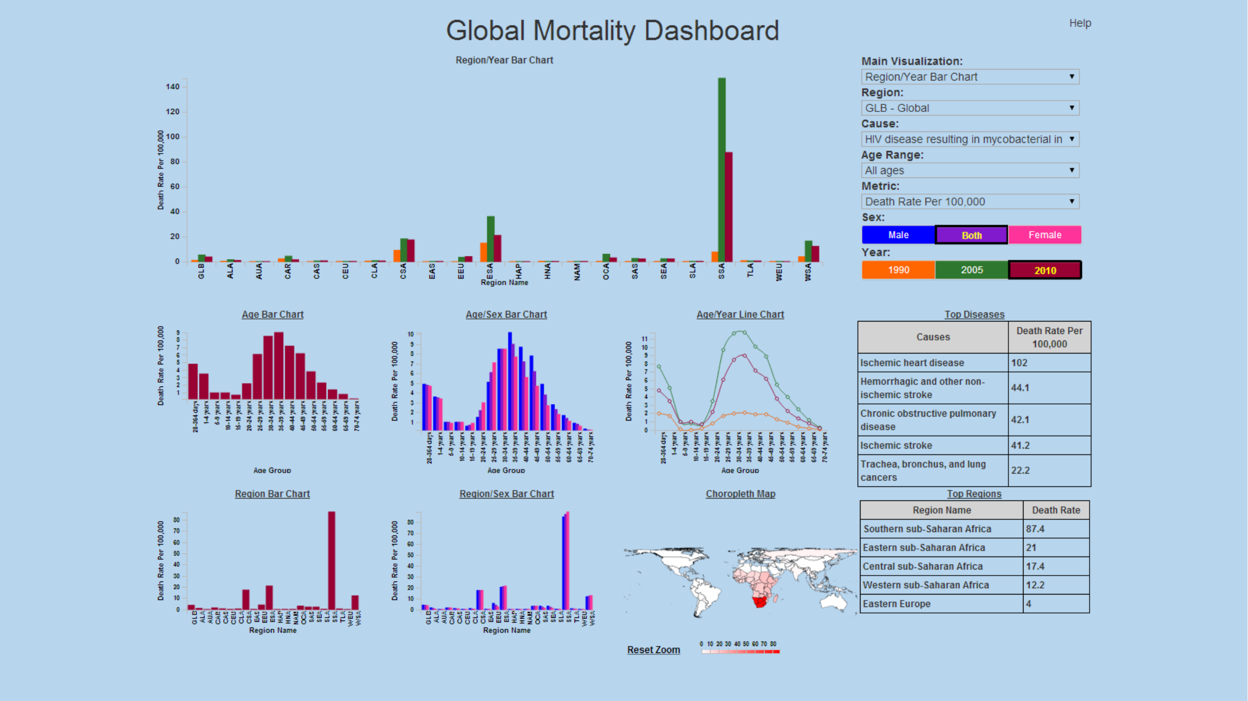
Causes	Death Rate Per 100,000
Ischemic heart disease	44.3
Pneumococcal pneumonia	20.6
Hemorrhagic and other non-ischemic stroke	18.8
Other lower respiratory infections	17.9
Diabetes mellitus	16

Top Regions

Region Name	Death Rate
Central sub-Saharan Africa	39
Oceania	29.3
Eastern sub-Saharan Africa	29
Southeast Asia	27.4
Southern sub-Saharan Africa	27

Few IHME Research Findings* Visualized

- HIV is the dominant cause of burden in Eastern sub-Saharan Africa and Southern sub-Saharan Africa.



Main Visualization: Region/Year Bar Chart ▾

Region: GLB - Global ▾

Cause: HIV disease resulting in mycobacterial in ▾

Age Range: All ages ▾

Metric: Death Rate Per 100,000 ▾

Sex: Male | **Both** | Female

Year: 1990 | 2005 | **2010**

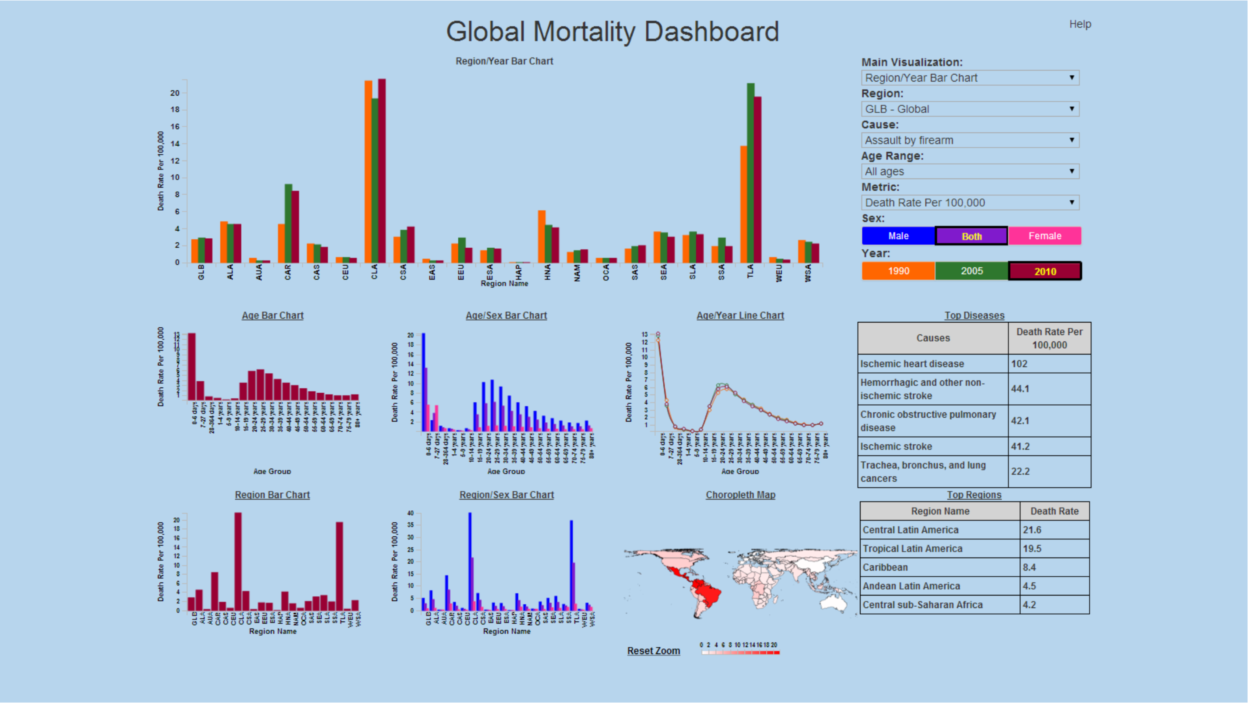
Top Diseases

Causes	Death Rate Per 100,000
Ischemic heart disease	102
Hemorrhagic and other non-ischemic stroke	44.1
Chronic obstructive pulmonary disease	42.1
Ischemic stroke	41.2
Trachea, bronchus, and lung cancers	22.2

Top Regions

Region Name	Death Rate
Southern sub-Saharan Africa	87.4
Eastern sub-Saharan Africa	21
Central sub-Saharan Africa	17.4
Western sub-Saharan Africa	12.2
Eastern Europe	4

- Interpersonal violence is a leading cause in central Latin America, tropical Latin America, and southern sub-Saharan Africa.



Main Visualization: Region/Year Bar Chart ▾

Region: GLB - Global ▾

Cause: Assault by firearm ▾

Age Range: All ages ▾

Metric: Death Rate Per 100,000 ▾

Sex: Male | **Both** | Female

Year: 1990 | 2005 | **2010**

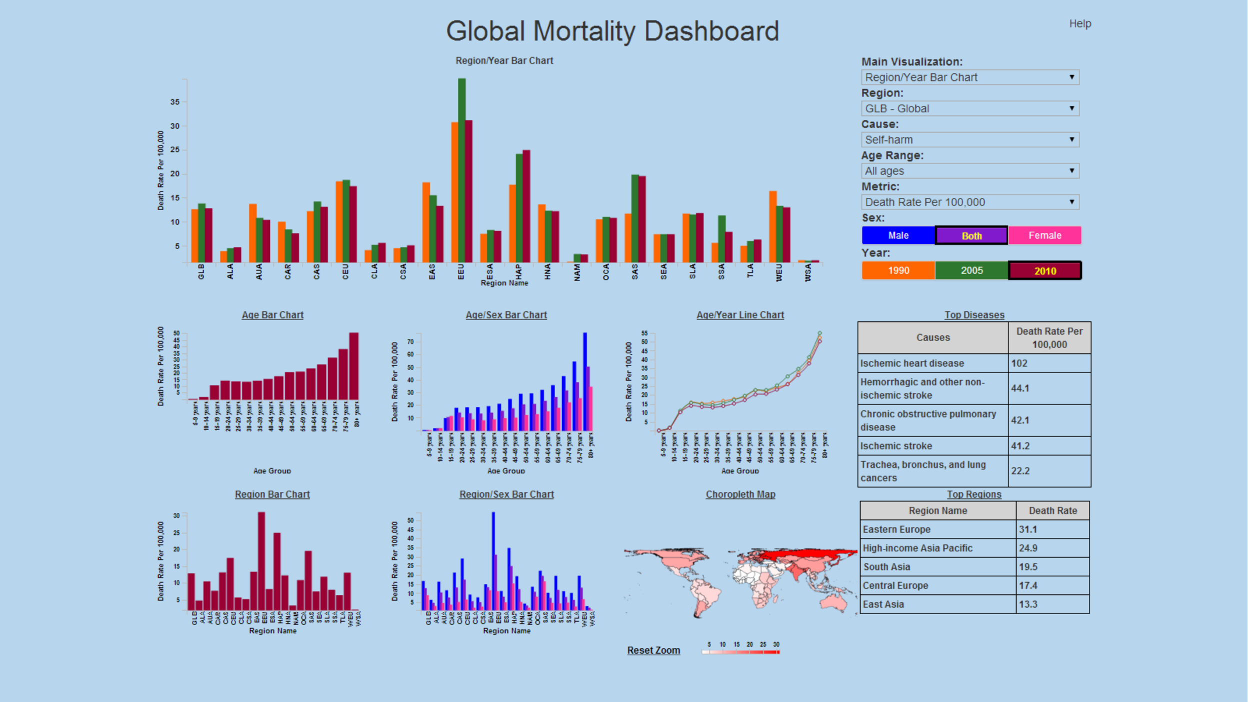
Top Diseases

Causes	Death Rate Per 100,000
Ischemic heart disease	102
Hemorrhagic and other non-ischemic stroke	44.1
Chronic obstructive pulmonary disease	42.1
Ischemic stroke	41.2
Trachea, bronchus, and lung cancers	22.2

Top Regions

Region Name	Death Rate
Central Latin America	21.6
Tropical Latin America	19.5
Caribbean	8.4
Andean Latin America	4.5
Central sub-Saharan Africa	4.2

- Suicide is a top ten cause of burden in high-income Asia Pacific and eastern Europe.



Main Visualization: Region/Year Bar Chart

Region: GLB - Global

Cause: Self-harm

Age Range: All ages

Metric: Death Rate Per 100,000

Sex: Male [✓ Both] Female

Year: 1990 2005 [✓ 2010]

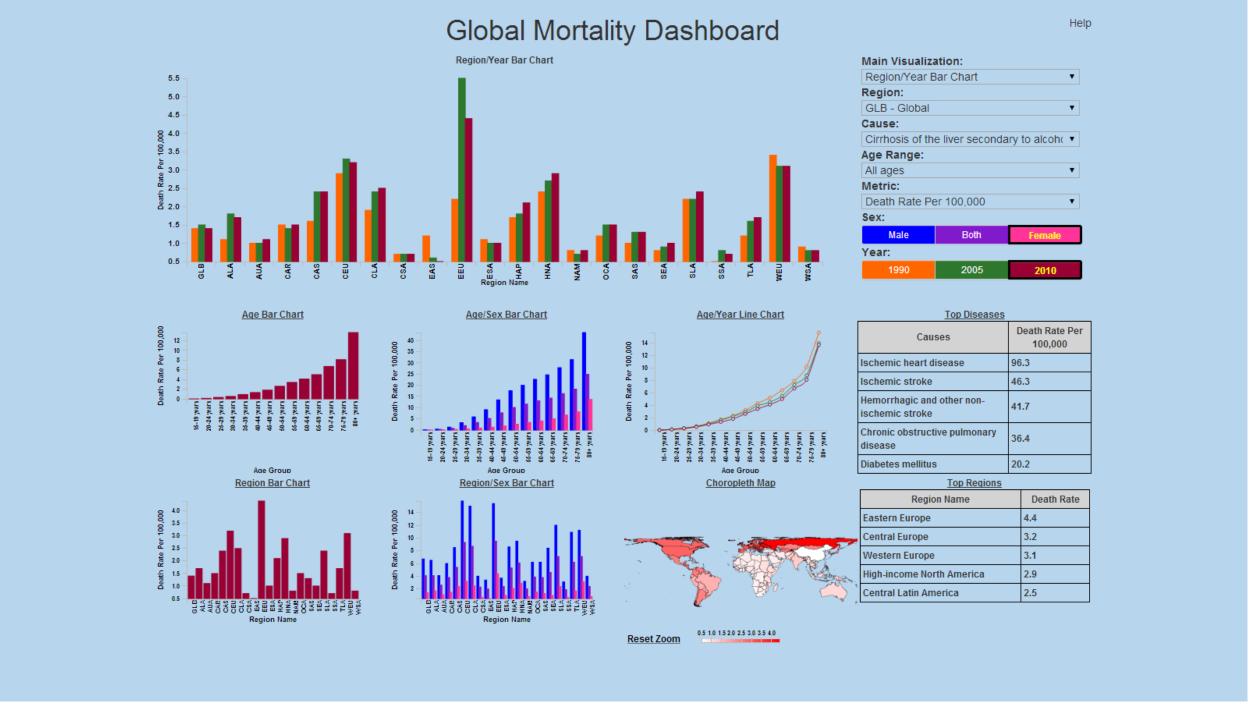
Top Diseases

Causes	Death Rate Per 100,000
Ischemic heart disease	102
Hemorrhagic and other non-ischemic stroke	44.1
Chronic obstructive pulmonary disease	42.1
Ischemic stroke	41.2
Trachea, bronchus, and lung cancers	22.2

Top Regions

Region Name	Death Rate
Eastern Europe	31.1
High-income Asia Pacific	24.9
South Asia	19.5
Central Europe	17.4
East Asia	13.3

- Cirrhosis is an important cause in central Asia, eastern and central Europe, and central Latin America.



Main Visualization: Region/Year Bar Chart

Region: GLB - Global

Cause: Cirrhosis of the liver secondary to alcoh

Age Range: All ages

Metric: Death Rate Per 100,000

Sex: Male Both [✓ Female]

Year: 1990 2005 [✓ 2010]

Top Diseases

Causes	Death Rate Per 100,000
Ischemic heart disease	96.3
Ischemic stroke	46.3
Hemorrhagic and other non-ischemic stroke	41.7
Chronic obstructive pulmonary disease	36.4
Diabetes mellitus	20.2

Top Regions

Region Name	Death Rate
Eastern Europe	4.4
Central Europe	3.2
Western Europe	3.1
High-income North America	2.9
Central Latin America	2.5

***Research Findings Source:**
http://www.healthmetricsandevaluation.org/gbd/publications/global-and-regional-mortality-235-causes-death-20-age-groups-1990-and-2010-sy

Meeting Notes

The following notes document the brainstorming points we took away from some of our in person meetings These notes do not document all of our meetings, as some meetings ended with programming tasks, which were documented in the code and subsequently removed. These notes are a stream of consciousness, we typed and organized them as we mused over the project, they exist now as they existed after the meetings. We also met daily over google hangouts, those meetings were usually smaller, and not documented here.

4/2/2014:

Brainstorming points

- What data will be plotted on the map?
- How can the death causes be listed on the page without taking up a lot of real-estate?
- Will there be comparison of regional data?
-How can multiple selections of causes/age-groups/sex/year be accommodated? (usage of checkboxes)
- How can the data from various years - 1990/2005/2010 be used? (showing changes over the years)
- What is the default view?
- If there is shading, what is the basis for the color?
- Data Structures?
- How will data be loaded from the csv file? In what order?
- What are the various filters?

4/8/2014:

To explore-
- What other visualizations to include?
- What color schemes to use?
- Add different visualization layouts for the user to configure as needed

Data structures-
- Different datasets to hold region-names/cause-names/age-groups/metric-names
- How to hold data optimally to be available for all of the visualizations?
- Loading datasets for different regions only on need basis and not to load all the data initially. As the user selects different regions, it will be loaded into d3. Once the data is loaded for a region, it is not removed so it loads only once.

Data Cleansing-

- Using short names for region names
- Splitting up of the full data CSV file into separate CSVs region-wise

- Making the following changes to the original CSV files to reduce file size and optimize data load times

1. Removing unwanted columns from the original CSV
2. Shortening the region names TLA (3 letter acronyms) region codes,
3. Replacing 4 digit year with 2 digits,
4. Using short cause name instead of the medium cause name
5. Shortening sex names (from Male/Female/Both to M/F/B)
6. Removing commas (000 separators) in numbers

4/10/2014

- Considering building a line graph showing how the chosen data changes over the 3 time ranges (One of our original objectives).
- Considering giving a dropdown box so users can choose what shows in the large top display, this will allow the users to show something “big”, and use the form to change the data.
- The rest of this meeting was spent doing the Design Studio 3 discussions, as described below.

Glossary & References

The Global Burden of Disease (GBD) is a systematic, scientific effort by a collaborative of researchers worldwide to quantify the comparative magnitude of health loss to diseases, injuries, and risk factors by age, sex, and geography over time. It is the most comprehensive effort to date to measure epidemiological levels and trends around the world, and its most recent iteration measures the impact of hundreds of diseases, injuries, and risk factors in 187 countries. The Institute for Health Metrics and Evaluation at the University of Washington is the coordinating center for this effort.

Disability-adjusted life years (DALYs)
The sum of years lost due to premature death (YLLs) and years lived with disability (YLDs). DALYs are also defined as years of healthy life lost.
Years lived with disability (YLDs)
Years of life lived with any short-term or long-term health loss.
Years of life lost (YLLs)
Years of life lost due to premature mortality.

IHME website: http://www.healthmetricsandevaluation.org/

Data Source:
http://ghdx.healthmetricsandevaluation.org/sites/default/files/record-attached-files/IHME_GBD_2010_COD_BY_REGION_1990_2010.ZIP

Metadata:

File Type	: CSV
Uncompressed size	: 261.6 MB (267,875 KB)
No. of records	: 832,905

Indicators used: Cause of death, Death rate, Years of Life Lost (YLLs), Years Lived with Disability (YLDs), Disability Adjusted Life Years (DALYs)

Countries and Regions: http://ghdx.healthmetricsandevaluation.org/country_profiles