Interpreting Data

Nicole Gasser

Content Objectives

Teaching students Statistics gives me the lovely opportunity to teach 12th grade students getting ready to finish one chapter of their lives in order to move onto the next. I have found that many, if not all of these students have little trouble visualizing data, especially on a simplistic level. However, I have also found that many of them struggle with interpreting the data in context. They lack the ability to make sense of the data in order to use it to solve real-world problems. In other words, they are lacking mathematical literacy. Although this problem is not uncommon, I believe it can be worked on by helping students realize that the real world, much like math, is all about finding and analyzing patterns. This curriculum unit describes how to implement ideas about lead, our health, and the environment into a first unit of a statistics course.

The first unit in my statistics class is geared towards helping understand what this course is all about. This course appeals to many students because it is considered a "softer" alternative to calculus. It also appeals to many because it offers a lot of real world application. Unfortunately, I have many students who come in on day 1 asking the dreaded, but important question: "What is statistics?" The essential questions that shape this unit are the following: What is statistics? How can we measure data? Why do we measure data in different ways? How can we display data visually? How is data used and how does it inform our decisions? Although this seems like a lot, the skills used are not overly complicated and include identifying individuals and variables, classifying variables, using dot plots, stem plots, histograms, and box plots, and calculating measures of center and spread.

Like stated, the difficult part of this unit doesn't come from displaying or visualizing data, rather the interpretation, especially in context. Many times, students struggle with putting into words exactly what they're showing. I've thought a lot about why this is. Why can a student so easily apply the skills to represent a set of data, but then cannot put into their own words why it matters? On one hand, it may be because they don't truly understand the content, rather just working out of memory. However, I am starting to believe it has more to do with the idea that these skills are being applied to situations in which they only have a very surface-level understanding. For example, in unit 1, we talk about many societal issues, like the war on drugs and stop and frisk data. Although these are relevant topics to many of the students that we teach, spending one day very briefly talking about these things may play into why it's so difficult for them to interpret whatever it is they are trying to show. The big idea of incorporating lead and health into

the curriculum is to 1) focus on the idea that math class is just like the real world in the sense that we are trying to make sense of the patterns in order to make decisions for the future, and 2) incorporating a concept that is relevant to student's life and gaining a deeper understanding, more than just surface level, will help with the interpretation aspect of the unit. With these two things being the focus of this unit plan, students will be able to take these skills and apply to other parts of math classes, as well as their lives.

There is only one PA State Core Standard to be covered in the first unit of statistics. Although there is only one state core standard, there are many things that I want students to be able to do at the end of the unit. There are four content objectives that need to be reached. They are as follows: Students will 1) Develop a set of tools for understanding and interpreting variability in data. 2) Use tools to make informed decisions from data. 3) Measure various shapes, centers, and spreads to describe a distribution. 4) Compare data distributions using numerical measures and visual representations. As far as content objectives for implementing lead and health, it is my goal to introduce students to the topic and make them aware of why it matters and what they can do as members of our community and society. Breaking this down into smaller pieces, it will be important to start with what lead is, how we can be exposed, the health effects, especially when considering children of young ages, and then why exactly it is relevant to us in our homes and schools. I'd also like to spend time fitting in social justice, specifically using case studies like Flint, Michigan.

Next, I will describe where "Lead and Health" can be tied into these four content objectives to strengthen student's knowledge and abilities in regards to what they need to be able to do.

Content Objective 1: Thinking about variability in data, we give students the knowledge to find the range of data specifically focusing on IQR and standard deviation and understanding that standard deviation is non-resistant to outliers where IQR is resistant. This strong knowledge stems from measures of center which will be talked about later in this paper. Interpreting variability in data requires an understanding of these terms and what they mean. After the initial introduction to lead, where we find it, and the health effects, it would be helpful to look at large data sets or any type of quantitative data regarding lead, especially in the Philadelphia area. With these larger data sets, students can begin practicing calculating these measures of spread and getting practice using google sheets. Along with this, it's a good place to practice interpreting values in context, which relates back to my problem statement of students lacking mathematical literacy. This interpretation in content leads to the bigger questions of not only what do these values tell us, but why do they matter and how will we use them to make decisions leading into content objective #2.

Content Objective 2: Using tools to make informed decisions is a fundamental principle throughout our statistics course. There are many places to implement lead into this idea,

but I find it most relevant when thinking about social justice and the consequences of being exposed to lead, especially at a younger age. Like stated, the idea is to give students sufficient understanding about the cumulative risk of lead in children. The big picture and big takeaway is that this matters and could have a negative effect on the future. Students will read through numerous articles/case studies to get a solid understanding of the crisis that places like Flint, Michigan faced. Although Flint made the national news, I think it's also important to put an emphasis on life in Philadelphia and where/why we see lead is more prevalent in certain places. Giving students the sufficient background knowledge can help them to use what they know to find ways to get involved and make a difference, especially in our schools. In order for real things to be accomplished, we need a lot of people to care for a lot of different reasons. Why not start with the students, who it is potentially affecting the most?

Content Objective 3: Being able to describe a data set by its shape, center, and spread is another fundamental concept that will carry throughout this course. At this point, it would be interesting to start thinking about how we can collect quantitative data surrounding lead. Constructing non-biased surveys and sending them out to a sample of the population is a major concept that we practice in this course. I imagine getting some background information on our population's understanding of lead, then doing actual research on the numbers, especially focusing on the Philadelphia area. There are numerous ways to represent this information as well as getting practice finding the numerical summaries of our data sets and interpreting what they are telling us, tying back to the idea of making informed decisions based on what we learn.

Content Objective 4: Comparing distributions is an important aspect of Unit 1 in statistics. Although we will have not yet gotten into correlation and bivariate data, it's not a bad idea to start examining the relationship between variables. For example, a big part of the background information given on Lead and Health will focus on how certain populations, specifically low-income populations, are affected more by lead. We will spend time researching and talking about why that is. We will also visually represent this truth. Some specific examples that come to mind are income and lead levels, location and lead levels, age of school building and lead levels. Creating infographics to display this information and make people aware of the connection between poverty and lead and would be a cool way to display this information so that the general public can make sense of it.

Teaching Strategies

There will be a number of teaching strategies used to implement the concept of lead and health into a statistics course. To start, there will be a number of performance tasks including daily warm up assignments, individual/group classwork assignments, homework assignments, standards-based quizzes, mini-projects, and a final benchmark project. Working at a project-based school, students will be working towards one final project culminating everything that they've learned that unit. The final project will be focused on lead in the environment.

To begin getting students interested in the topic of lead and health, I will ask them to read an article outlining their thoughts on the events that happened in Flint, Michigan. I'd like to start off with this because although students may not be able to directly relate, they seem to be able to connect to more current events. Some students may have possibly have heard about this on the news which might pique their interests. Rather than asking guided questions, I may just ask students to read and respond in their own words, about one paragraph minimum. This gives students the freedom to point out what stuck out to them and gives me some insight as to their viewpoint, understanding, and interest in lead. Following this, we will have a discussion about what they read, what stood out to them, and just their overall thoughts.

As we began our discussion about lead, I imagine that some of the core concepts of this first unit of statistics will be mixed into the curriculum. So although lead will be a major focus, I'll also be interweaving some math skills and knowledge. This is generally done in the form of some type of notes, guided notes, or investigations. As students begin to learn more and more concepts, it'll be easier to connect lead to what they are learning in class, especially using data to practice with the mathematical concepts.

Before I am able to fully implement lead into the mathematical practice, students need to have an understanding of what lead is, how we are exposed, and the health effects. It's likely that many students will have heard of lead before, know that it's bad, but have no idea what it actually is. Unfortunately, there will not be enough time to go into serious detail, rather skim the surface on some of the fundamental background knowledge needed to understand why this matters. SLA is a school where students each have their own Chromebooks, so I'd like a lot of this to be research that they can do on their own. Research is a core value at SLA, so it's something that seniors in statistics class have practiced with. With such a big concept, it might be easier if the research were a bit more guided. For example, giving students key terms and/or questions to look up. Then, we can have a whole-class discussion organizing what they have learned from their research, going through a short set of slides summarizing important information, and determining what questions students still have. The ultimate goal is that students come away with an understanding of why this issue matters.
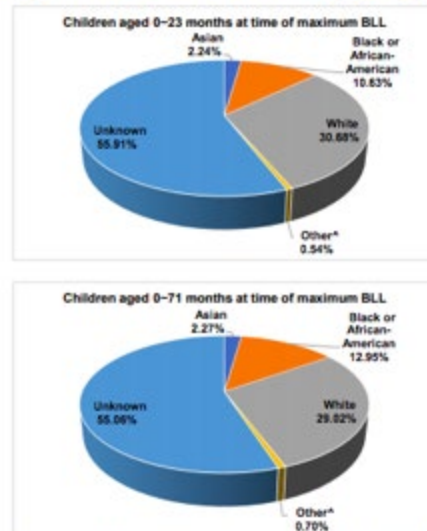
After students have their initial understanding of lead, exposures, and health effects, I'd like to explore some tables and charts that break down the population.

Ex:

Statewide Summaries by Race:

The following graphic displays the percentage of children tested by race, for children under ages 2 and 6. Note, the Department does not receive identifiable race data with most childhood lead reports; therefore, the data presented in the figures below may be an over- or under-representation of children tested by race.

Figure 1. Percent* of Children Tested for Lead, by Age Category and Race, 2017

Children aged 0–23 months at time of maximum BLL
Asian 2.24%
Black or African-American 10.63%
White 30.68%
Unknown 55.91%
Other* 0.54%

Children aged 0–71 months at time of maximum BLL
Asian 2.27%
Black or African-American 12.95%
White 29.02%
Unknown 55.06%
Other* 0.70%

*Percent was calculated as the number of children in race category divided by the total number of children tested in each age category.
Data sources: Lead testing data - Pennsylvania Department of Health, PA-NEDSS. Estimated population data - National Center for Health Statistics. Vintage 2017 postcensal estimates of the resident population of the United States (April 1, 2010, July 1, 2010-July 1, 2017), by year, county, single-year of age, bridged race, Hispanic origin, and sex.

CHILDHOOD LEAD POISONING PREVENTION PROGRAM   PENNSYLVANIA DEPARTMENT OF HEALTH   12

At this point, students already have a strong understanding of displaying categorical data, specifically using bar graphs and pie charts. This images break down children tested for lead by age, category, and race. After some of the initial readings and understandings of the importance of testing children, students can begin to interpret premade graphs. As an extension, students can read through pieces of the annual report and find ways to graphically display some of the charts that are made. At times, students can be mindless with numbers. So, although they may be able to look at a dataset and construct a perfectly well-done graph, they may have no idea what it actually means. The interpretation piece is an important link between the overall unit and the problem statement stated in my prospectus. In order to gain more mathematical literacy, students need practice with

interpretations. After students construct graphs, they can interpret what they mean in a few complete sentences.

Ex:

Table 2. Characteristics of Children Tested for Lead, by Age Category, 2017

	Children aged 0–23 months		Children aged 0–71 months	
	N	% of total	N	% of total
Total number of children tested†	82,318	100.00	151,756	100.00
Age at time of maximum BLL				
Under 1 year	42,067	51.13	42,067	27.73
One year	40,229	48.87	39,529	26.05
Two years	-	-	43,690	28.79
Three years	-	-	11,489	7.57
Four years	-	-	8,935	5.89
Five years	-	-	6,026	3.97
Sex				
Female	39,637	48.15	72,886	48.03
Male	41,776	50.75	77,831	51.29
Unknown	903	1.10	1,039	0.68
Race				
Asian	1,841	2.24	3,440	2.27
Black or African-American	8,752	10.63	19,647	12.95
White	25,256	30.68	44,036	29.02
Other*	442	0.54	1,060	0.70
Unknown	46,025	55.91	83,573	55.07
Maximum BLL (µg/dL)‡				
<5	78,500	95.36	142,431	93.86
5–9.9	2,946	3.58	7,190	4.74
10–19.9	712	0.86	1,732	1.14
20–44.9	148	0.18	374	0.25
45–59.9	3	0.00	15	0.01
60–69.9	5	0.01	9	0.01
≥70	2	0.00	5	0.00

†Number of Pennsylvania children within the age category who had at least one blood lead test done with a specimen collection date in 2017
*Other race includes multiracial children, American Indians and Pacific Islanders
‡Highest venous blood lead level (BLL) obtained per child in 2017, or highest BLL from a capillary or unknown specimen source, if no venous test was performed
Data sources: Lead testing data - Pennsylvania Department of Health, PA-NEDSS. Estimated population data - National Center for Health Statistics. Vintage 2017 postcensal estimates of the resident population of the United States (April 1, 2010, July 1, 2010-July 1, 2017), by year, county, single-year of age, bridged race, Hispanic origin, and sex.

Using the table above, students can choose ways to represent the categorical breakdown of this data. Students will choose how they'd like to represent a part of this table, construct a graph, interpret the graph, and then justify why they chose that particular representation.

At this point, students will have a solid background on lead, health, and representing data. I'd like to put a strong focus on how poverty is related to lead and what factors play into why that is. Initially, I'd like students to look at the map below which breaks down Blood Lead Levels of children by zip code.

Figure 8. Incidence of children with venous BLLs of 5-9 µg/dL by zip code, 2015.
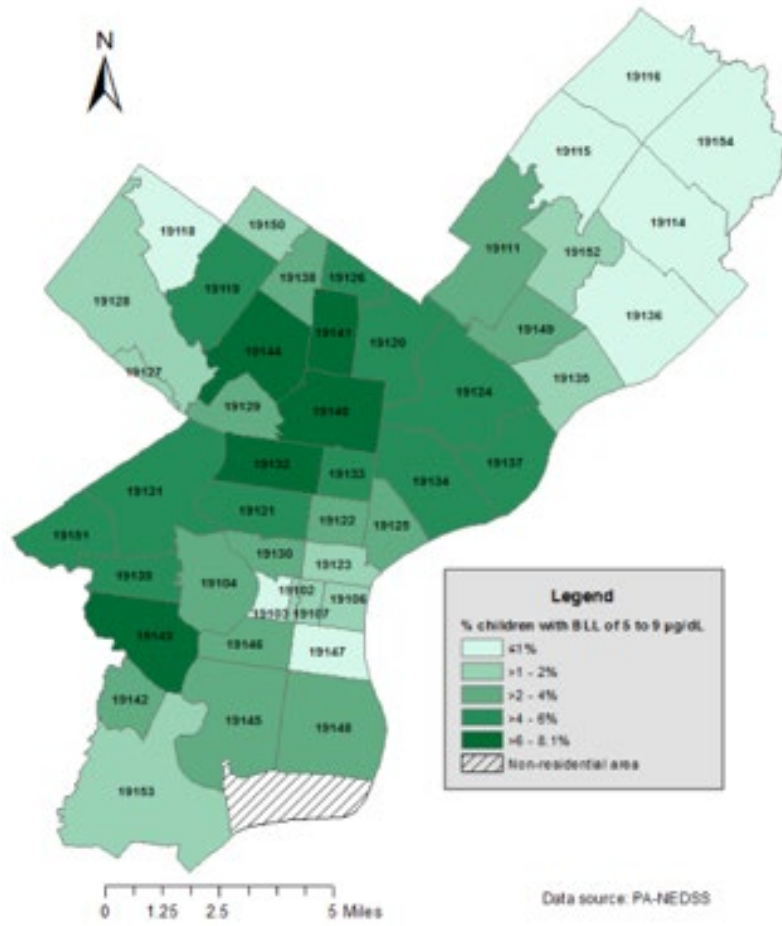
To begin this discussion, I'd like to get students initial thoughts on this breakdown, focusing on the extremes, areas where the BLLs are really high and where they are really low. This would be in the form of a warm up to begin class. I suspect that students are going to have legitimate feelings about this, considering these are the zip codes in which they actually live. Students will have a chance to share out their thoughts and feelings after going over as a class how to understand this map. There are a few different charts on the Philadelphia Childhood Lead Poisoning Surveillance Report and I'd like to explore them all. Students will break into groups, each focusing on a given map that will be printed out in color. As a group, students will have the chance to analyze each figure and present to the class their summaries. This will give us a chance to look at each map in detail, but where students are coming to their own conclusions first. Also, collaboration

and presentation are two more core values at SLA. Lastly, as a class we will look at more resources and data sets to be determined regarding the connection between lead and poverty which will give students the chance to start practicing displaying and interpreting more quantitative data.

Statistics class is a good place to introduce social justice to strengthen the connection between the real world and math. I'd like students to discuss with each other (think-pair-share) what they think social justice is and an example or two where they think social justice has been relevant. Ideally, I'd like to spend some time talking about what social justice is and then specifically focus in on how lead is related to this. Where has this been a problem in the past? Where are they seeing this in their everyday lives that may be affecting them or their peers? It would also be a great place to reintroduce Flint, Michigan, the place where we started this conversation. We would likely do some type of group activity that demonstrates ideas behind social justice and how they are connected to lead.

Along with daily lessons in which some of the ideas were explained above, there are two other pieces to being a teacher at a project-based school. The first is standards-based quizzes. Although we don't give tests, students still need opportunities to demonstrate they understand the standards being assessed. Therefore, the math department gives standards-based quizzes. Rather than a quiz being one paper that asks a bunch of questions, we break it down into the standards that we are assessing. The quiz is not worth 100%, rather each standard is worth 5 points. The breakdown of the points looks like this: 5/5 means exceeding expectations, 4/5 means meeting expectations, 3/5 means approaching expectations, 2/5 does not meet expectations. What "meeting expectations" looks like is different for every standard. The nice thing about project-based assessments is that students always have the opportunity to retake one single standards without having to take an entire quiz over. At some point in the unit, I will be giving a standards-based quiz assessing the following standards throughout the unit: 1) Identify the individuals and variables in a data set. 2) Explain the difference between categorical and quantitative variables. 3) Display and interpret categorical data in bar graph/pie charts. 4) Display and interpret quantitative data. 5) Describe shape, center, and spread of a distribution. 6) Make and interpret histograms. 7) Calculate measures of center (mean, median). 8) Choose the most appropriate measure of center in a given setting. 9) Identify outliers. 10) Calculate and interpret measures of spread (range, IQR, standard deviation). These standards will be spread out over two-three standards-based quizzes.

Another method of assessment at a project-based school is projects or mini-projects. Because lead and health will be implemented over the course of a 1.5-2 weeks, it would be more appropriate to do a mini-project on the topic. Typically projects very complex and workshopped by a few teachers, but I do have some initial ideas for a mini-project. The first core value at SLA is inquiry, so based on what we have learned this unit, students will design an initial essential question regarding any component of lead and

health that we have discussed. The question to answer will need to be approved by me. Through research and collaboration, students will find the information that may support them in answering the question at hand. They will need to look for both categorical and quantitative data. Next, they will need to display and interpret this information using appropriate representations as we have discussed throughout the unit. The final product will be an infographic, giving them the chance to highlight key research that they've done, the graphs they've created, as well as their own thoughts on the topic. Depending on the question that they want to answer, they will likely find that social justice will come into play. They will present these infographics to their classmates. Then, as reflection is our last core value, we will reflect on what changes, even if they are small, we can make to truly answer some of each other's questions. With any luck, students will take away that their voice matters and they do have the abilities to make a change.

Classroom Activities

(This content will be introduced somewhere in the beginning of the school year, likely within the first week or two of class)

Day 1: To begin class, students will read the New York Times article "How a Pediatrician Became a Detective" to introduce them to Flint, Michigan and the lead crisis that they faced. Along with reading the article, students will answer a few questions to summarize and give their thoughts. These questions will likely be guided because this is the beginning of the school year and expectations may not be set yet. As the year continues, students have more chances to respond open-endedly. This article should prompt conversation surrounding what exactly lead is and what happened in Flint, Michigan. Although this article may not seem to fit right away, it's a good starting place for our conversation about lead being that it's an easier read and something that can be relatable.

Following this conversation, we will begin to explore the essential question of what is statistics and why it's important to have some background knowledge in it. The main takeaway being that statistics are tools that help us to understand the world around us. They help us make decisions now and they will help you to make decisions in your future career. The world is full of numbers and data. It's much easier to navigate this world when you have an understanding of how to collect and interpret data, especially data in context. At this point, I will look back to Flint, Michigan and discuss how understanding data may be a relevant point. To end class, we will look at the following quote: "There are three kinds of lies: lies, damned lies, and statistics." We will unwrap this quote and discuss why it's important to understand the "secret language" of statistics. We will look through some images of misleading graphs and talk through what these graphs are missing and what the message they are trying to convey is. See examples below:

PLANNED PARENTHOOD FEDERATION OF AMERICA:
ABORTIONS UP – LIFE-SAVING PROCEDURES DOWN
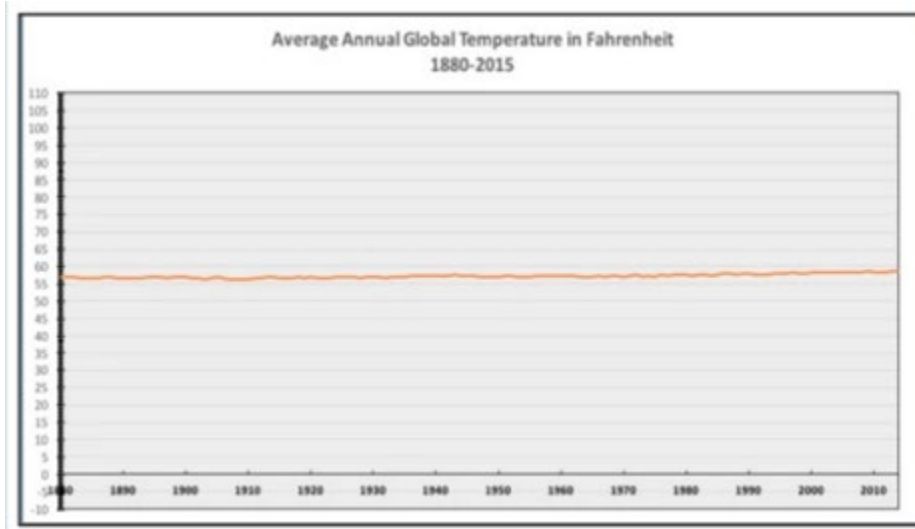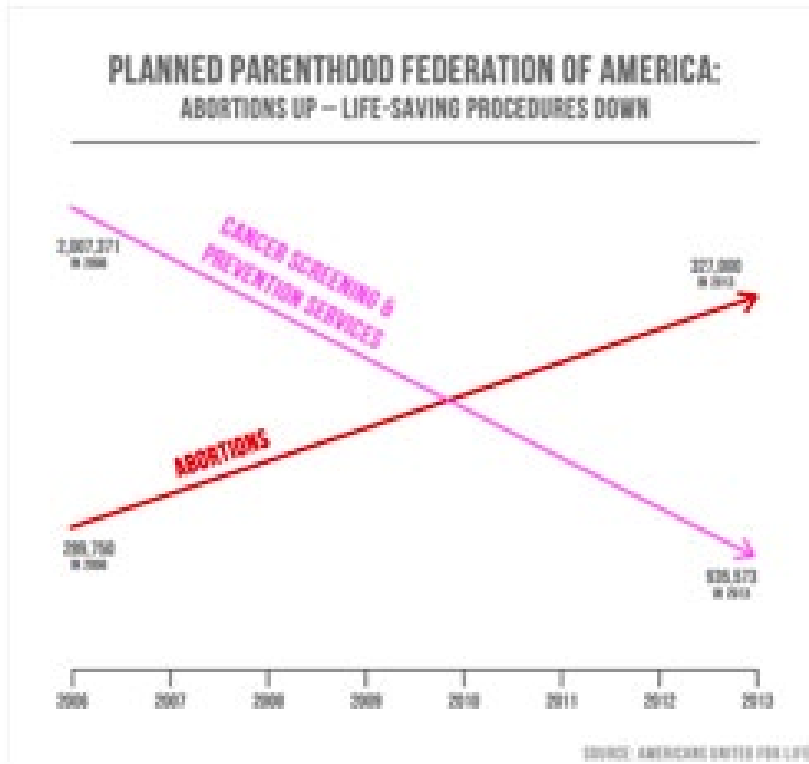
This would be another place to loop back to lead, possibly providing some misleading graphs. For homework, students will find their own examples of "well-wrapped

statistics" and answer a few questions pertaining to what they found. (Bonus points if they find graphs in relation to lead).

Day 2: On day 2, we will back away from talking about lead and get into some of the statistical content of the class. Typically, students do not struggle with the first few sections of statistics class as it's just an introduction to variables, breaking down the difference between categorical and quantitative data, and ways to display it including bar graphs, pie charts, histograms, stem-plots, dot-plots, etc… For most, these are skills that they've already learned in prior math classes. The most challenging representation is the histogram which takes some time reviewing. First, we will go through definitions and examples. Next, students will collect data on their own from their classmates and practice some of the skills they've learned by representing data. Although seemingly simple, it makes sense to give students at least a day or two to refresh themselves on basic skills, especially with easier data sets. Rather than jumping right into dense, lead-filled data, students will work with simple numbers like height, number of siblings, and how many pairs of shoes someone owns. This translates well when we are working with more complicated topics later down the road. The most challenging part of this is choosing the appropriate representation and explaining why it's appropriate. For example, students struggle when understanding when/why to use a histogram so I will try to make that a focus.

Day 3: After much of the basic statistical content is taught, I will then loop back to the idea of lead. On this day, I will give students a chance to work through some guided research to give them a basic understanding of what lead is, how we are exposed, and the health effects, especially when you are exposed at a younger age. It's likely that many students will have heard of lead before, know that it's bad, but have no idea what it actually is. I will use this "research time" as an extended warm up, giving students plenty of time to use their Chromebooks, work together, and get answers to some of the important questions regarding background information on lead. During this warm up, I will also have them think back to the article that they have read about Flint, Michigan to give them a deeper understanding of why it's a huge deal that should be taken seriously. After this extended warm up, we will spend some time going over what students found. Next, we will get through the information more formally by using slides. Using some of the slides and information presented in the seminar, I'd like to work through a similar PowerPoint with my students, probably keeping it as light as possible with many visual representations to keep students engaged in the content. I like to use guided notes or graphic organizers to ensure that students are following along. I also like to leave room for discussion. One idea that I'd like to introduce on this day is the focus on the communities that are most affected by lead in their homes. Using visuals, much like the map of Philadelphia broken down by county, we can talk about what they notice and wonder about the areas that are most affected. Being that these students live in these areas, it feels like a more personal connection to a topic that is seemingly irrelevant to

their lives. To end class, students will watch some type of engaging video outlining what we've talked about in class, as well as make the connection to lead more real.

Day 4: By day 4, students will have a solid understanding of what lead is and how to affects us. They will also have an understanding of some of the foundational statistical topics in respect to representing data. Students will be given a research assignment in which I will provide the appropriate resources. Students will have two goals. One, given data sets that they will have to work through, they may need some type of code book to understand the labels of the sheets. The big idea is that they will need to choose four different ways to visually represent this data. They may use technology to create these representations. Included in their submission will be each representation that they've created, as well as a statement interpreting the representation. A big piece of this unit is understanding how to interpret data. This will be practiced in the previous activity where students collected data about each other. Although it's likely easier to form interpretations about those data sets, it was good practice for a research activity like this when they are combing through bigger sets of more challenging data to understand.

Day 5: On day 5, I would like to discuss lead in the context of being present in schools. To introduce this topic, I'd like students to visit the water testing archives of the Philadelphia School District and click through some of the schools that are meaningful to them (SLA, middle schools, schools their friends attend). Students will likely need to use data from 2017, as that seems to be the most complete version of this information. I'd like to specifically focus on SLA – which at this point will actually be co-locating with Ben Franklin, so it might make more sense to look at the information provided about Ben Franklin High School. I'm interested in how this makes students feel and what positive steps the school district has taken (testing schools, adding hydration stations, etc), as well as think about ideas for what can still be done.

After this warm up, I'd like to switch gears back to some statistical content, specifically talking about how we interpret data and how numerical summaries help us to do that. We focus on mean, median, IQR, standard deviation but obviously not all in one day. This typically takes some time because it's important for students to know the fundamentals on how to make these calculations on their own, but also how we can use technology to help us to do so. To practice this skill, we'll look back on some of the data sets that we've looked through, as well as graphs that have been created. I really encourage students to practice putting these representations into words in context. For example, rather than just saying "this distribution is skewed to the right," I want students to be able to say "This distribution of household incomes is skewed to the right. Most people make around $60,000, but there are a few outliers who make much more than that. Because of this, the average income will be higher than the median." Students will be given some type of homework assignment to practice with interpretations.

Day 6: Now that we've covered interpreting data, I'd like have students complete another research assignment in which they are reading through lead surveillance reports in both Philadelphia and Pennsylvania as a whole. Some of the visualizations that stood out to me are placed in the teaching strategies above. I'd like to look through a few examples and practice interpreting what they mean together. Then, give students the chance to look through these reports in groups with the understanding that this is A LOT of information and will need to be broken down so it's okay if it takes them awhile to get through it. The overall assignment would be to assign each group some type of visual representation regarding lead. Some examples of that would be summaries of lead by race, age, county, BLLs by county, etc. Based on their given topic and representation, students will do research and create a presentation to help their classmates gain a deeper understanding of that particular issue without taking the time to do intensive research for each one. The big takeaway of this day is that students get the chance to interpret visualizations, even if they are visualizations that they did not create themselves. Giving students time for this group work and research will likely take the entire period. Presentations will span the next few days (TBD how long, depending on class size).

Day 7: On Day 7 (next day after presentations), I'd like to bring the focus back to lead and its connection with poverty. Using some of the visualizations from the seminar, we will take a closer look at where we see lead in Philadelphia and what those regions have in common. This leads to the deeper issues of WHY there is a connection between poverty and lead levels and what's currently being done to change that. At this point in the year, we haven't talked about bivariate data or correlation, but it would be a nice way to briefly introduce the statistical concepts and then loop back to this when we return to it later in the year.

At this point, students will likely be curious if lead is present in or around their homes. Weather permitting, we will go outside and I will demonstrate how to collect a soil sample and how to properly label these samples to be tested. Students will be tasked with collected a sample from their homes and bringing them into class the next day to be sent in to Penn.

We will also have not covered our unit on experiments vs. observational studies where we dive into samples vs. population, but once we do get the results from Penn, I'd like to create our own map by zip code using the results of our soil samples. In this case, students will be provided with information about zip code and amount of lead, and they will create their own interactive map which we will compare to the entire population. We will also revisit this way later at the end of the year when we approach this unit.

Day 8: Next, I'd like to focus on environmental health literacy for a day, as I think it's a place where students can connect. Many of the students that we teach in this school district are passionate about important issues and making a change when it's needed. The question that we posed in the seminar, which would be great for students to think about is

"Is the public equipped to differentiate fact from fiction?" This is a place where we can relate back to some of the misleading statistics that we've discussed earlier in this unit and think about what the media is telling us and how we can find credible sources to get our information from. I'd like to show the documentary that was talked about in class linking lead exposure with cognitive and mental health behavior. There is a specific focus on Baltimore and police brutality in this documentary so it really opens up the door for some deeper conversation about issues that are personal to the population of students that we teach. Although this content can be sensitive, it's important and seniors are typically mature enough to handle difficult subject matter. Through these discussions, I'd like students to think about the question "What can we do?" All of this information is great and valuable to know, but it becomes much more meaningful when the average person makes an attempt to make a difference. A big theme in this class is the quote that states "The biggest mistake we can make is doing nothing because we think what we are doing is too small." So, given the information about lead, health, the connection to poverty, social justice, and environmental health literacy, what can we do as students? I'd like students to think about this question for homework.

Day 9: The work that is done at a project-based school is typically leading up to one big project that both displays and assesses student's knowledge of what they've learned. On this day, I'd like to introduce students to their first quarter mini-project. The idea being that environmental health literacy is really important and in order to make a difference, students need to be aware of what's going on. For this final project, students will create a survey to send out to their classmates to find out how much they know about lead. They will need to do specific research, including at least 3 or 4 statistics that they have found interesting throughout this process. These survey questions will need to be approved by me. Students will send their survey out to members of the SLA community, or other high school students that they know. To evaluate them on their content knowledge, students will create and interpret visualizations of the data that they've collected.

Based on their survey results, students will determine one aspect of lead and health that they feel either really passionate about or feel really passionate that the SLA community needs to know more. Based on careful research and visualizations, students will create an infographic to be displayed around the school. It may also be interesting to collaborate with a senior science teacher in which we can have a "science-fair like" presentation of these infographics so that students can learn more about what interests them. Projects will typically span the course of a week or two and are incredible important as they are worth a huge portion of the grade. Students will be evaluated on a rubric containing five parts – design, knowledge, application, presentation, and process – see below for more detailed information about the rubric.

Day 10: When students have had the appropriate amount of time to collect, analyze, and create visualizations for the data that was collected, there will be some type of presentation component. This component will be either an in-class presentation to their

immediate peers or like stated above, a science-fair type exhibit in which they can reach a broader audience. The last piece of a project or a unit for that matter is a reflection in which students think back on what they've learned and also think about how they will use it in the future to inform their decisions. Because this unit incorporated a much deeper topic, it would be interesting to hear student's thoughts about the personal connections that they were able to make. It would also be useful to hear what students feel like they can do to make a difference, even if it is a small one. Lastly, it's also important to incorporate some feedback on how the unit went, what they've learned, and if they would change anything about the way that they learned it. Student feedback is so important to reflection as a teacher.

Resources

Hanna-attisha, M. (2018, June 09). How a Pediatrician Became a Detective. Retrieved from https://www.nytimes.com/2018/06/09/opinion/sunday/flint-water-pediatrician-detective.html

Childhood Lead Poisoning Prevention in Pennsylvania. (n.d.). Retrieved February 19,

2019, from https://www.health.pa.gov/topics/Documents/Environmental Health/2015

Lead Surveillance Annual Report.pdf

2017 Childhood Lead Surveillance Annual Report(pp. 1-35, Rep.). (n.d.). Pennsylvania

Department of Health. doi:December 2018

Childhood Lead Poisoning Surveillance Report Philadelphia Department of Health(pp.

1-20, Rep.). (n.d.). Philadelphia. doi:2015

Water Testing. (2018). Retrieved February 19, 2019, from

https://www.philasd.org/capitalprograms/programsservices/environmental/water-testing/

Office of Capital Programs. (2017). Retrieved May 29, 2019, from

https://www.philasd.org/capitalprograms/programsservices/environmental/water-testing-

archives/

Appendix

Standards. (n.d.). Retrieved from http://www.pdesas.org/Standard