
Body Image and Barbie

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***Abstract:** With students' constant awareness and desire for mathematics content to be relevant to their world, intertwining a statistics and social justice lesson into one can provide students with the unique opportunity to discover, discuss, and explore a social justice topic using statistics. The author provides evidence for why body image is important and proposes an idea of how teachers can incorporate statistics and body image into one cohesive lesson.*

***Keywords.** Social justice, statistics, data analysis*

1 Introduction

The National Eating Disorder Association (NEDA) reports that there are 20 million women and 10 million men in the United States who have been diagnosed with a "clinically significant eating disorder," but there are many more individuals who struggle with "body dissatisfaction," "the best-known contributor to the development of anorexia nervosa and bulimia nervosa" (NEDA, n.d.). These thoughts of negative body image may start at a staggeringly young age, with 40 to 60 percent of 6 - 12 year olds having expressed concern about their weight (NEDA, n.d.). According to Mattel, approximately 90 percent of American girls own at least one Barbie before age 11 (Griffin, 2009). The presence of Mattel's Barbie dolls in so many young girls' lives provides an avenue for mass-communicating a powerful message. While many argue that Barbie's "unusual thinness is also a subject of scrutiny for many" (Mukhopadhyay, 1998), Mattel, who released three new body types for Barbie, including tall, petite, and curvy, has made an effort in recent years to offer "girls choices that are more reflective of the world they see today" (Mattel, 2016). Just how reflective are these different body types of what girls and young women are actually seeing and experiencing?

Body image, the way that a person views their own body, is often influenced by one's surroundings. The activity described in this article was created in an effort to raise awareness about the importance of body image, viewing one's body in a positive way, and the impact that surroundings can have on body image. This activity is broken down into two parts. First, students statistically compare Barbie's and various action figures' body measurements to humans in an effort to see if these toys are truly reflective of what children are seeing around them. Various statistical topics can be touched on here, including, but not limited to, measures of center, using graphical displays to analyze data, and outliers. In Part Two, students are presented with the opportunity to do the following: formulate their own research question, find their own data from various online resources to answer their question, analyze their data from various people groups using graphing technology such as Excel, and interpret their results to draw conclusions about the effects that the media may have on one's body image.

1.1 Connections to GAISE

The Guidelines for Assessment and Instruction in Statistics Education (GAISE) framework, a project funded by the American Statistical Association and headed by post-secondary educators across the nation, was created in an effort to promote statistical literacy for all students, pre-kindergarten through college (Franklin, Kader, Mewborn, Moreno, Peck, Perry, & Scheaffer, 2005). The framework is laid out into three levels, A, B, and C, which transition activities from being teacher-driven to being a shared level of drive from teacher and student to being fully student-driven. Each of the areas of this lesson, forming a question, collecting data, analyzing data, and interpreting data, registers at Levels B or C. This is because of students' self-guiding role in the activity and the act of taking one set of data and generalizing it to a broader context.

1.2 Social Justice in the Classroom

One definition of social justice is the idea that "everyone deserves equal economic, political and social rights and opportunities" (National Association of Social Workers, n.d.). The ideals of equality can vary drastically from city to city, school to school, even classroom to classroom; however, a few social justice topics include child labor, racial profiling, poverty, specific (and relevant) political issues, and sex trafficking. Our Barbie lesson promotes "social rights," affording students the opportunity to think critically about how society impacts how students view themselves and their peers. The conversations that occur before, during, and after a mathematics lesson regarding a social justice topic are invaluable. The teacher must be prepared to mediate discussions that occur, providing a platform for students where they feel safe to discuss their thoughts and opinions in a respectful way. Having a guidance counselor, health teacher, social studies teacher, or other school-related specialist readily available to support this piece of the lesson may be valuable. The importance of the role that the teacher plays in any lesson related to social justice cannot be overemphasized. Students can become empowered to make a positive change in their own lives, the lives of the people around them, and the world-at-large.

2 Task

The process of creating this lesson was extensive, beginning with Swapna Mukhopadhyay's 1998 article, "When Barbie Goes to Classrooms: Mathematics in Creating a Social Discourse." Mukhopadhyay (1998) argues that school mathematics too often has little relevance for students. She offers "Reconstructing Barbie" as a way to make mathematics more meaningful for students, bridging the gap between mathematics and pop culture. While Mukhopadhyay's original lesson focuses on geometry, using proportions to give students an idea of how Barbie would look if she was a full-grown adult (5 foot 9 inches), my revision explores the topic from a statistical point of view. Care has been taken to discourage students from comparing themselves to the "ideal" or average presented in the lesson. Moreover, a male version has been incorporated in an effort to better engage all students, providing all with opportunities to interpret data and justify their conclusions.

2.1 Part One

In Part One, students use previously-compiled data to determine how Barbie compares to other women (Figure 1) (note that collecting data from classmates would compromise individual confidentiality required for this topic).

	Height	Waist	Hips
Original Barbie ^e	167.4 cm	54 cm	78 cm
Curvy Barbie ^e	167.4 cm	63 cm	91.2
Tall Barbie ^e	180 cm	56.4 cm	78 cm
Petite Barbie ^e	150 cm	52.8 cm	72 cm
“Average” US Woman (age 20-29)	163 cm ^f	90 cm ^f	107 cm ^g
Serena Williams ^h	175 cm	71 cm	112 cm
Simone Biles ⁱ	145 cm	61 cm	84 cm
Lady Gaga ⁱ	155 cm	66 cm	94 cm
Emma Watson ⁱ	165 cm	58.5 cm	87 cm

Fig. 1: Measurements of various humans, as well as the adjusted measurements of various Barbies.

In an attempt to make the content relatable for boys and girls, an alternate version of Part One includes action figures’ body measurements and those of average men. Students represent the data in any way they choose; they defend their reasoning for use of their representation in drawing conclusions about the data. An example is provided in Figure 2.

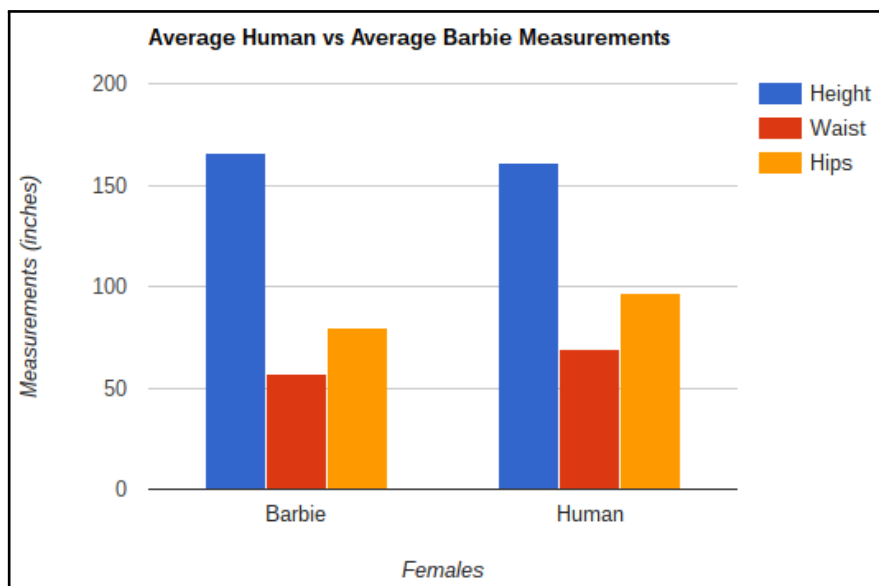


Fig. 2: Comparison of average height, hip size, and waist size for humans and Barbies.

Asking the students to defend their statistical representation requires them to acknowledge what statistical conclusions can be drawn from their representation, as well as providing the teacher with valuable feedback related to students’ understanding. Next, students are asked to answer the question at hand: “are the dolls’/action figures’ body measurements representative of the population they are supposed to characterize?” Part One concludes with students providing both a defense for and a criticism against the toy producer for why the toys are proportioned the way they are. These questions are meant to provide students with the opportunity to interpret the data from multiple standpoints, again allowing them to demonstrate their understanding of statistical representations in meaningful and relevant ways.

2.2 Part Two

Part Two of the activity is open-ended, encouraging students to ask and answer their own statistical questions (ones that can be answered by drawing conclusions from a data set) on a topic that interests them related to body image (such as BMI, social media, eating disorders, models, obesity, international data, etc.). Students find (or collect) data related to the topic, visually represent the data in a way that helps them answer their question, and finally, construct an answer. An example of student-created work is provided in Figure 3, where the relationship between circulation of women's magazines and perceptions of weight health are explored.

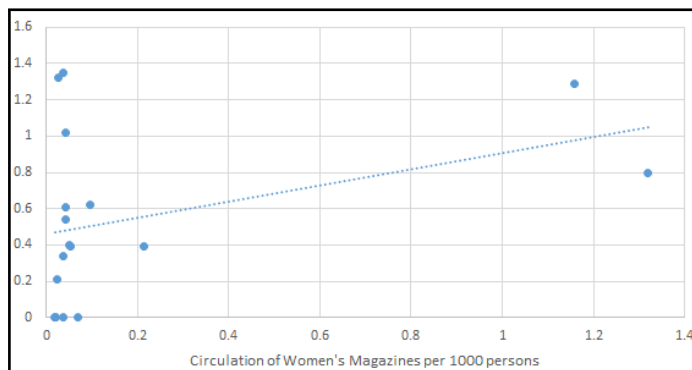


Fig. 3: Circulation of women's magazines per 1000 persons vs. perception of weight for women with BMI below 17.5.

Discussions throughout Parts One and Two help students and teachers more fully comprehend the material. Suggested topics include: analysis of data provided (What do the types of measurements tell us about how we judge men vs. women? How might normalizing the height of the male action figures affect the data? How representative of the general population are the specific celebrities that were included?), analysis of graph choice, and overall analysis of conclusions drawn.

2.3 Differentiation

The Barbie lesson may be differentiated in a number of ways. First, students may be provided with ideas of types of visual representations, such as box plots, scatter plots, bar graphs, histograms, five-number summaries, and measures of center. This may help some students who need more direction on that section. Similarly, teachers may wish to provide suggestions for research questions, such as the connection between obesity and poverty, celebrities and how they are perceived/judged, how other toys are or are not representative of the population they are supposed to characterize, and BMI's and body proportionality in different countries. Finally, students can be provided with suggestions of technological tools to create the visual representations or provide the option of using pencil and paper.

2.4 Next Steps

In this activity, students are given the opportunity to discover and decide for themselves whether or not toys (specifically Barbies and action figures) are representative of the population they are supposed to characterize. From here, the teacher and students decide what to do with what they have found. One possible extension is to team up with a social studies or English teacher to discuss the impact of the media on our perceptions of ourselves and the world on other issues. Another geometry-flavored extension involves using Barbie's given proportions to create her in real-life. A twist might include creating a Barbie-sized (in height) doll that has the proportions of a truly average woman. We encourage you to further explore this topic with your students and colleagues.

3 Conclusion

Many social justice topics exist that students would find vastly intriguing. A few examples were previously mentioned, and additional suggestions can be found on the Education for Justice's website (link in references). By teaching statistics for social justice, students can gain the ability to talk about important and potentially uncomfortable topics in a way that is grounded in numerical evidence, not just opinion. This lesson provides the reader with one example of how the topic of body image can be uncovered and discussed in a classroom setting. Statistical topics such as measures of center, comparing multiple sets of data using graphical displays, comparing graphical displays, analyzing data and displays to make conjectures, sampling, outliers, correlation, and linear regression can be explored through this lesson. With a plethora of other social justice topics in our world and many different statistical topics that were not covered in this lesson, the possibilities in creating and teaching a statistics lesson for social justice are endless. In the words of Nelson Mandela (n.d.), "Education is the most powerful weapon which you can use to change the world."

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