Engaging Mathematics Teaching Manual: Introductory Statistics with Student Designed Community-Based Projects

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An initiative of the National Center for Science and Civic Engagement, Engaging Mathematics applies the well-established SENCER method to college level mathematics courses, with the goal of using civic issues to make math more relevant to students.

Engaging Mathematics will: (1) develop and deliver enhanced and new mathematics courses and course modules that engage students through meaningful civic applications, (2) draw upon state-of-the-art curriculum in mathematics, already developed through federal and other support programs, to complement and broaden the impact of the SENCER approach to course design, (3) create a wider community of mathematics scholars within SENCER capable of implementing and sustaining curricular reforms, (4) broaden project impacts beyond SENCER by offering national dissemination through workshops, online webinars, publications, presentations at local, regional, and national venues, and catalytic site visits, and (5) develop assessment tools to monitor students' perceptions of the usefulness of mathematics, interest and confidence in doing mathematics, growth in knowledge content, and ability to apply mathematics to better understand complex civic issues.

Updates and resources developed throughout the initiative will be available online at www.engagingmathematics.net. Follow the initiative on Twitter: @MathEngaging.

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Section 1: Introduction

People come in contact with statistical data on a daily basis in contemporary society. We are inundated with data and conclusions drawn from that data in numerous areas including the media, politics, health care and finance. It is very important for citizens in today's society to properly evaluate the claims made from data so that they may make informed decisions. Knowledge of the discipline of statistics gives people the tools necessary to evaluate and analyze claims so that they can be more informed and involved citizens.

Incorporating semester long community-based projects into an introductory statistics course, Statistics I, at Metropolitan State University was an attempt to connect the discipline of statistics to students' lives and to increase their awareness of the powerful tools that statistics can provide to better understand their world. Statistics I is a general education math course required by majors in mathematics, business, biology, social work and nursing. However, students majoring in many other disciplines regularly take the course to meet a general education requirement. This leads to a very diverse group of learners whose strengths contribute well to the group project format.

The goals for the course are for students to

- Read and understand statistical presentations in the media
- Think critically about social issues
- Increase their awareness that statistics and mathematics are useful tools for understanding complex social issues
- Have a basic knowledge of both descriptive and inferential statistics
- Determine what is reliable data and examine statistical studies critically

To achieve these goals, the course was developed around the semester long community-based projects with topics chosen by the students, in-class group activities highlighting social/environmental issues and daily presentations by students of current events in the media. The theme of connecting social issues with the learning of statistics was begun on the first day of class and carried on throughout the semester.

Section 2: The Course

STAT 201 Statistics I is a 4-credit, 15-week course that meets the general education requirement for Goal IV: Mathematical/Logical Reasoning at all institutions in the Minnesota State Colleges and Universities (MNSCU) System. It is a required course for majors in Applied Mathematics, all disciplines in the College of Management, Biology, Social Work, Nursing and Mathematics Teaching. Many students whose majors are outside of these disciplines choose to take STAT 201 to fulfill their Goal IV General Education requirement. The course also serves as the prerequisite for all of the other courses in the statistics minor.

The class meets once per week for three hours and 20 minutes. This format best serves the non-traditional working students at Metropolitan State University. Prerequisites for this course are successful completion of Intermediate Algebra or college level math placement on the Accuplacer, Metropolitan State University's math placement exam.

A typical class period in Statistics with Student Designed Community-Based Projects begins with the students sharing articles that contain statistical content from the *New York Times,* local newspapers or discipline specific journals. The only requirement of the current event is that the article must have some statistical content. The article sharing is then followed by several short lectures with group work assignments dispersed between the lectures. These assignments focus on using the content learned during the short lectures to analyze data pertaining to social/environmental issues.

Table I below is a week-by-week schedule of the statistical topics covered in the textbook *Elementary Statistics* by Mario F. Triola, along with the stages of the community based project. The group projects are introduced in the first class so that the students understand the importance of these projects to their learning of statistics. It is also important for students to have project milestones to reach throughout the 15 weeks so that all of the work is not left for the last weeks of the semester.

Table 1: Weekly Schedule of Statistics Topics and Group Project Stages

Week	Topic
1	The statistical process, data types, designing samples and experiments ***Group Project Stage 1: Brainstorming Topics and Group Formation***
2	Graphical display of data, frequency distributions, misleading graphs ***Group Project: Students hand in preference sheet for topics***
3	Summary statistics, relative locations
4	Probability, Law of Large Numbers, addition and multiplication rules, conditional probability and independence ***Group Project: Groups and topics for projects announced***
5	Random variables, binomial distribution, normal distribution ***Group Project Stage 2: Proposal Instructions, Sample Proposal and Rubric Handed out to Class***
6	Normal distribution, sampling distribution, Central Limit Theorem
7	Midterm Exam
8	Estimates of sample sizes – estimating population proportion and population mean ***Group Project: Proposal due***
9	Hypothesis testing concepts and basic hypothesis testing for proportion
10	Hypothesis testing for mean, matched pairs ***Group Project Stage 3: Data collection due***
11	Two sample inference ***Group Project Stage 4: Rough draft guidelines and rubric distributed to class***
12	Correlation, and Least Squares Regression ***Group Project: Rough draft for poster presentation due***
13	Goodness of fit tests and contingency tables
14	Cumulative Final Exam
15	***Group Project Stage 5: Poster presentation of community-based projects and action letter due***

Section 3: Student Designed Community-Based Group Projects

The student designed community-based group projects are the heart of this course and what makes this an *Engaging Mathematics* course. As a model for the student projects, the instructor and students work together on a class project throughout the entire semester, performing the needed statistical analysis as the appropriate topics in the course are covered. The model project, "*Does Racial Profiling Exist in Minneapolis?"*, is adapted from Lily S. Khadjavi's *Driving While Black in the City of Angels* (see Appendix A). Part I of the model covers descriptive statistics and Part II of the model covers inferential statistics. Once students have seen a model of the project, they feel more comfortable working on their own projects and have clearer expectations for this portion of the course.

When doing projects in a course, you can choose to assign topics to the students or allow them to choose their own topic of interest. Allowing students to choose their own topics gives them more ownership of the project and increases their interest and engagement in the project. However, it does make a project-based course more difficult for the instructor. In a class of 32 students, with groups of at most four students, there may end up being eight or more different projects per class. By spreading the project milestones out over the entire semester, this approach is more manageable. Over the years that this course has been taught, there has been a broad range of topics chosen by students. Below are descriptions of a select few projects done by students in this course.

Sample List of Topics for the Community- Based Projects Chosen by Students

Crossing the Border: Online Drugs from Canada
Purpose: To investigate the difference in prescription drug prices between online pharmacies in the United States and Canada. A case study was performed for a 68-year-old retired man from Blaine, Minnesota. The man lives on a fixed income and currently takes ten commonly prescribed medications. A simple random sample of online pharmacies from each country was selected and a comparison of the prices was done.

Mercury in Minnesota Lakes and Fish Consumption Advisories
Purpose: To investigate mercury contamination in lakes within the Twin Cities metro area. Data from the Minnesota Department of Natural Resources and the Minnesota Pollution Control Agency was analyzed and summarized in a report.

Crime Rates per Capita Related to 2 Bedroom 1 Bath Rental Properties in Minneapolis
Purpose: To investigate the relationship between apartment rental prices and crime rates in 12 communities of Minneapolis, Minnesota.

Unemployment on the State and National Level
Purpose: To investigate the unemployment trends within the state of Minnesota and the United States over the past 20 years. The relationship between unemployment rates, race and educational attainment were examined.

The Uninsured in the State of Minnesota
Purpose: To examine characteristics of the citizens of Minnesota without health insurance in 2007. The characteristics that were examined were race, age, employment status, level of education, and income.

Domestic Abuse: Gender, Race and Language
Purpose: To identify characteristics of perpetrators and victims of domestic abuse in Minneapolis in order to gain a better understanding of this crime in the community. The characteristics examined were race, gender, whether or not perpetrators/victims

understood English and were allowed an interpreter, type of crime alleged, type of legal proceeding and the relationship between the abuser and the victim.

Housing Foreclosures in Ramsey County
Purpose: To investigate the relationship between housing foreclosures in Ramsey County and unemployment rates, subprime loan rates and housing costs in 2007.

In the group projects, students are required to include concepts from statistics at all four of the following levels:

Level	Concepts
Basic	• Organizing data in tables and graphs that include frequency tables, histograms, bar graphs, and pie charts • Describing distributions using mean, median, mode, quartiles, standard deviation • Indicating outliers and their effects on the distribution • Simple random samples, stratified random samples, convenience samples, quotas • Describing populations and samples • Percentages
Intermediate	• Normal distributions • Z-scores • Scatter plots • Correlation • Linear regression • Probability and probability distributions • Random variables • Expected value and standard deviation
Advanced	• Confidence intervals • Margin of error • Hypothesis testing • Statistical significance

Breaking the project up into stages helps to keep the students on track throughout the semester. A detailed description of each stage in the weekly schedule table is given below.

Group Project Stage 1: Brainstorming Topics and Group Formation

Week 1 – The first stage of the project is the brainstorming session during the first class meeting. After the instructor introduces the concept of the community-based projects, the

class will brainstorm together to come up with lists of possible topics for the projects. You may find that at the beginning of the brainstorming session, the topics suggested by the students are very broad in nature, such as the topic of "Education in Minnesota". With some prodding by the instructor, the students will be able to come up with much narrower subtopics, such as "The Amount of Public Money Spent on Early Childhood Education in Minnesota Compared to the National Average".

In past semesters, a few students have found it difficult to come up with social issues for which they had a personal interest. For example, there were a couple of students who were disinterested in the concept of group projects based on social issues. After finding out that one student was a fisherman and the other enjoyed baseball, the instructor suggested the topic of mercury levels in lakes and public financing of baseball stadiums. Both topics were chosen for group projects and led to very good final reports. It is very important to make sure that the students are interested in the topics they select.

Week 2 – The instructor distributes the suggested topics from the brainstorming session and hands them out to the class. The topics have been narrowed down by the instructor based on the feasibility of completing the project during one semester and the data available on the topic. Students are then given a preference form for preferred topic (see Appendix B) and preferred group partners to complete and hand in by the next class period.

Week 4 – The instructor forms the groups for the projects based on the preference sheets completed by the students. At the end of the class period, the groups meet for the first time and exchange contact information.

Group Project Stage 2: Proposal

The second stage of the project is the proposal. In week 5 of the semester, the instructor distributes the group project proposal instructions (see Appendix C), a sample proposal *Does Racial Profiling Exist in Minneapolis? A Study on Vehicle Stops and Searches by the Minneapolis Police Department* (see Appendix D) and the grading rubric for the proposal (see Appendix E). In week 8, the proposals are due.

Group Project Stage 3: Data Collection

During stage three of the group projects, students gather data for their investigation and organize the data in tabular and/or graphical format. During week ten of the semester, each group gives a five-minute presentation to the class on the methods and references used to gather data for their projects. If a survey was conducted, a copy of the survey instrument is shared with the class. Each member of the group participates in this mini oral presentation and describes their personal contribution to the project so far.

Group Project Stage 4: Rough Draft

During stage 4 of the group projects, students write and submit a rough draft paper that will be used to create their final project, which is a poster. Students are given guidelines for the rough draft (see Appendix F) along with a grading rubric (see Appendix G).

Group Project Stage 5: Poster Presentation and Action Letter

This first time this course was taught, the final product of the group projects was an eight-ten page paper. The second time this course was taught, the final product of the group projects was a PowerPoint presentation. The third time and every semester since then, the final product of the group projects has been a poster presentation. By doing poster presentations, students in the course can see and evaluate their peers' work. It also provides an opportunity for the university community (including faculty, advisors, department chairs, deans and even provosts) to attend the presentations. Poster presentations provide a more relaxed atmosphere for the students while allowing for more engagement between the presenters and attendees to occur. In addition, poster presentations do not take as much class time as PowerPoint presentations. A copy of the grading rubric for the poster presentation is given in Appendix H.

In addition to the poster presentations, students are required to write an action letter to a person, group, company or organization that would benefit from the information in their projects. This letter should explain their project and the results of their statistical analysis, with contact information.

Appendix A: Sample Group Project

Does racial profiling exist in Minneapolis?
PART I

(Adapted from Lily Khadjavi's *Driving While Black in the City of Angels*)

In 2001, the Minnesota legislature enacted a statute to study racial profiling in the state. Thirty-three county sheriff's departments and thirty-one city police departments participated in the study and collected traffic stop data from January 1, 2002 through December 31, 2002. The Minneapolis Police Department was one of the city police departments that opted to participate in the study. At each traffic stop, police officers recorded the following information:

- Location of stop
- Date and time of stop
- Age of driver
- Gender of driver
- Race/ethnicity of driver (the officer's perception)
- Traffic violation or reason leading to stop
- Disposition of the stop – arrest, citation, warning, or no action
- Whether a search was conducted of the driver, passengers or vehicle
- If a search was conducted, the authority for the search
- If a search was conducted, whether any contraband was discovered, and if so, the nature of the contraband
- Whether the officer knew the race/ethnicity of the driver prior to the stop
- Officer's law enforcement agency

Each police department was given the choice on how to submit the data. In the first option, officers filled out a paper form, the police department compiled the data and then mailed the results into the Department of Public Safety (DPS). In the second option, officers filled out a paper form and then entered the forms' contents directly into a DPS database. In the third option, officers entered the traffic stop data directly into a DPS database via computers located in their squad cars. *** The police departments of the city of Minneapolis chose option 3.

Question 1: List one pro and one con for each of the three options that police departments had for submitting data to DPS.

The focus of the study was to determine if there was evidence of racial bias in two areas: the decision to stop drivers and the decision to search drivers and/or their vehicles once stopped.

A benchmark is the population that you are comparing to your sample. In this case, two possible benchmarks are: (1) U.S. Census data for the city of Minneapolis and (2) data from the department of motor vehicles for the city of Minneapolis.

Question 2: What are the pros and cons of using U.S. Census data as the benchmark?

Question 3: What are the pros and cons of using information from the Department of Motor Vehicles as the benchmark?

In the study conducted by the city of Minneapolis police department, 2000 Census data was used as a benchmark (total population of Minneapolis 382,618). Below is a table of population data on race/ethnicity from the 2000 Census in Minneapolis.

Table I: 2000 Minneapolis Census data on Race/Ethnicity

Race/Ethnicity	Population
White	249,186
African/African American	68,818
American Indian/Native Alaskan	8,378
Asian	23,455
Hispanic/Latino	29,175
Pacific Islander	289
Other	15,798

Question 4: Compare the sum of the populations in the table to the total population as reported by the Census data. Give reasons for the differences in the totals.

The table above gives the U.S. Census data for the entire population of Minneapolis. Since not every person counted in the population of Minneapolis is a driver, a better benchmark would be members of the population who are 16 years old to 85 years old. This is the U.S. Census benchmark that the city of Minneapolis police department used in their study (the total population who are 16 to 85 years in Minneapolis is 298,394) and these values are given below in Table II.

Table II: 2000 Minneapolis Census Data on Race/Ethnicity for 16 to 85 year olds.

Race/Ethnicity	Population aged 16 to 85 years
White	208,279
African/African American	47,146
American Indian/Native Alaskan	6,863
Asian	16,710
Hispanic/Latino	19,694

Question 5: Give one disadvantage of using the above table of information as the benchmark for this study.

Table III below gives the data collected from the 2002 Minneapolis study of 53,555 traffic stops:

TABLE III: Data from 2002 Minneapolis Police Department Study of 53,555 Traffic Stops

DESCRIPTION OF ITEM	White	African American	American Indian	Asian	Hispanic
NUMBER OF DRIVERS	208279	47146	6863	16710	19694
NUMBER STOPPED FOR TRAFFIC VIOLATION	23939	21261	803	1821	5731
INITIAL REASON FOR STOP					
Dispatched	120	234	10	11	27
Driving Violation	14914	11183	414	1073	2986
Equipment Violation	5267	5826	230	457	2029
Registration Violation	1628	1595	48	131	258
Other	2010	2423	101	149	431
DISPOSITION OF STOP					
Arrest	1288	2700	156	93	905
Citation	10672	8760	291	723	2504
No Action	541	659	23	54	116
Warning	11438	9142	333	951	2206
SEARCH					
Total searches	2253	5666	234	224	1634
Discretionary Searches *	1169	3094	103	144	633
CONTRABAND FOUND IN DISCRETIONARY SEARCH					
Contraband found	156	340	13	15	30
AUTHORITY FOR SEARCH					
Consent to Search	162	339	10	21	44
Contraband Observed	8	16	1	2	2
Incident to Arrest – Discretionary	680	2044	77	71	516
Incident to Arrest – Non Discretionary	1079	2554	131	78	1000
Officer Safety	324	713	15	52	72

- Discretionary searches are ones where the driver consents verbally to a search, or officer safety is an issue. Non-discretionary searches are ones prompted by the observation of contraband or searches incident to arrest.

Question 6: Sometimes it is helpful to look at percentages instead of raw numbers. Complete Table IV by comparing the percentages of people of each race in Minneapolis

to the percentage of people of each race stopped for a traffic violation. Write a few sentences describing the data in this table.

Table IV

	White	African American	American Indian	Asian	Latino
Population percentage					
Traffic Stop Percentage					

Question 7: Does Table IV in Question 6 give results that you would mathematically "expect" to happen? What would you expect the results to look like? To answer this question, fill in the Table V below.

Row 1: The actual number of traffic stops for each race
Row 2: The expected number of stops (e.g. total # traffic stops X percent of whites in population)
Row 3: The absolute difference (actual stops – expected stops)
Row 4: The relative difference (absolute difference/expected stops)

Table V

	White	African American	American Indian	Asian	Latino
Actual stops					
Expected stops					
Absolute Difference					
Relative Difference					

Question 8: What do the negative and positive signs represent in the relative difference values in your table above? What would a relative difference of 0% mean?

Question 9: Which other variables from Table III could you compare using percentages? What information would you get from these comparisons?

Does racial profiling exist in Minneapolis?
PART II

As you read in Part I of this activity, in 2001, the Minnesota legislature enacted a statute to study racial profiling in the state. This was enacted due to concern that minority drivers were being stopped for traffic violations at a much higher rate than white drivers, a practice sometimes referred to as "driving while black or brown". However, as seen in Part I of this activity, it is difficult to determine a benchmark population for comparison. For example, U.S. Census data tends to undercount minorities and thus may not be representative of the population we are studying.

Fortunately, the data collected by the Minneapolis Police Departments, indicated not only that a driver was stopped but also whether a search was conducted and whether contraband was found in the search. In this activity, we avoid the problem with determining a benchmark by not only analyzing whether or not a person was stopped but also what occurred once the driver was stopped. We will focus on comparing two populations in Minneapolis: African Americans and Whites. We can easily expand the activity to compare any of the populations for which we have data in Table III.

TABLE III (Repeated here for student handouts)

DESCRIPTION OF ITEM	White	African American	American Indian	Asian	Hispanic
NUMBER OF DRIVERS	208279	47146	6863	16710	19694
NUMBERS STOPPED FOR TRAFFIC VIOLATION	23939	21261	803	1821	5731
INITIAL REASON FOR STOP					
Dispatched	120	234	10	11	27
Driving Violation	14914	11183	414	1073	2986
Equipment Violation	5267	5826	230	457	2029
Registration Violation	1628	1595	48	131	258
Other	2010	2423	101	149	431
DISPOSITION OF STOP					
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Citation	10672	8760	291	723	2504
No Action	541	659	23	54	116
Warning	11438	9142	333	951	2206
SEARCH					
Total searches	2253	5666	234	224	1634
Discretionary Searches *	1169	3094	103	144	633
CONTRABAND FOUND IN DISCRETIONARY SEARCH					
Contraband found	156	340	13	15	30
AUTHORITY FOR SEARCH					
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Contraband Observed	8	16	1	2	2
Incident to Arrest – Discretionary	680	2044	77	71	516
Incident to Arrest – Non Discretionary	1079	2554	131	78	1000
Officer Safety	324	713	15	52	72

Fill in Table VI below with the data collected by the Minneapolis police department from January 1, 2002 to December 31, 2002 in Table III.

Table VI

	White	African American	Total
Searched			
Not Searched			
Total			

I. In this exercise, we are going to learn how to do hypothesis testing when comparing two proportions. We will do a two-sample proportion test at the 1% significance level to test the claim that the proportion of African American drivers searched after being stopped for a traffic violation is greater than the proportion of white drivers searched after being stopped for a traffic violation.

Background: We want to compare two groups, Population 1 and Population 2. We have a separate simple random sample (SRS) from each population. Here is the notation:

Population	Population Proportion	Sample Size	Sample Proportion
1	p_1	n_1	$\widehat{p_1}$
2	p_2	n_2	$\widehat{p_2}$

Let p_1 be the population of drivers who are African American and searched after a traffic stop in Minneapolis, and p_2 be the population of drivers who are white and searched after a traffic stop in Minneapolis. To test the claim, state the null and alternative hypothesis:

H_0:

H_a:

Step 1: Find the z statistic

$$z = \frac{\widehat{p_1} - \widehat{p_2}}{\sqrt{\widehat{p_c}(1-\widehat{p_c})\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

Where $\widehat{p_1}$ is the sample proportion of drivers who are African American and searched after a traffic stop in Minneapolis, $\widehat{p_2}$ is the proportion of drivers who are white and searched after a traffic stop in Minneapolis, and $\widehat{p_c}$ is the combined sample proportion given by:

$$\widehat{p_c} = \frac{\text{total number of white and African American drivers who are searched in Minneapolis}}{\text{total number of white and African American drivers in Minneapolis}}$$

$\widehat{p_1} =$

$\widehat{p_2} =$

$\widehat{p_c} =$

$n_1 =$

$n_2 =$

And

$z =$

Step 2: What can you say about the corresponding P-value?

Step 3: What is your conclusion about the proportion of African Americans drivers who are stopped and searched in Minneapolis versus the proportion of white drivers who are stopped and searched in Minneapolis?

II. Criteria for a lawful search include voluntary consent, parole or probationary status of the driver, and the order or sight of contraband. Apply the test of Part I to the data below, which count when a search resulted in a discovery or seizure of illegal goods. Does this affect your conclusion about the imposition of searches?

	White	African American	Total
Discovery Made	156	340	
Nothing Found	1013	2754	
Total			

Appendix B: Group Project Preference Sheet

STAT 201 – Group Project Preference Sheet

Name: _____

On the lines below, list the project topics in order of your preference:

1. _____

2. _____

3. _____

4. _____

5. _____

List any student(s) in this class that you especially want to work with (make sure that their topic preferences match with yours):

Appendix C: Proposal Instructions

Group Project Proposal Instructions

Group Project Stage 2: Due date _____

What you should be doing in this next week: Email your group members and find times and locations that you are available to meet for the remainder of the semester. Talk about the project title and narrow down the focus as much as you possibly can. Spend a few hours this week looking up resources on the Internet and at the library. If you are having difficulty finding resources and data, email me and I will give you suggestions of websites to consider. Talk amongst the group members about each person's responsibilities for the project. At the end of the semester, you will grade your peers on their contribution to the project and that will factor heavily into each person's final grade on the project. Remember, this project is 25% of your grade. If you do not participate, you will most likely not pass the course.

The proposal should consist of the following:

1. Cover sheet with project title, course title, members' names, and date.
2. A one-page (minimum) single spaced, 12 point, typed proposal for your project, stating:
    - The purpose/focus of the project.
    - The connection of the project to the community. Clearly state what community you are addressing in the project.
    - The set of mathematical and statistical skills (ones that you have already learned in this course and other courses) the project may require.
    - Each group members' responsibilities clearly defined. Note that each group member must have some responsibility to each stage of the project. This includes the proposal, data collection, rough draft, final report, oral presentation and action letter.
3. An annotated bibliography of some preliminary resources.
4. A glossary of terms (both statistical/mathematical terms and content specific terms) pertinent to your project.

Appendix D: Sample Proposal

Does Racial Profiling Exist in Minneapolis?

A Study on Vehicle Stops and Searches by the Minneapolis Police Department

Proposal for Community-Based Project

STAT 201 – 04

By

John Smith, Sue Jones and Deb Larson

Racial profiling by police departments is a serious issue facing cities across the nation. There have been alleged cases of racial profiling in the past and more recently with the arrest of Henry Louis Gates, a Harvard University professor who was arrested for breaking into his own home. These high-profile cases are important to bringing awareness to the issue and also keeping a dialogue open about the issue of racial profiling. One area of racial profiling that has surfaced in Minneapolis, Minnesota in recent years is that of racial profiling in connection with motor vehicle stops and searches. This paper will analyze data collected by the city of Minneapolis in compliance with Minnesota Statute §626.951, which provided for a racial profiling study to be conducted optionally by law enforcement agencies throughout the state in 2003. This is the most recent public data available on motor vehicle stops and searches for the city of Minneapolis. Since a report to the Minnesota Legislature has been completed, this analysis will look at statistics and additional analyses not addressed in the original report to the Minnesota Legislature so that we do not repeat work that has already been completed. In particular we will analyze data collected by the Minneapolis police department in 2003 on vehicular stops, the reason for those stops, the outcome of the stops, and the inclusion of a search of the vehicle, all based on race/ethnicity.

An analysis of the data collected on vehicular stops and searches by the Minneapolis police department has a strong connection to the community of Minneapolis, in addition to surrounding communities. Since the 2003 study has already been completed, distributed and analyzed by the police department of Minneapolis, this paper will attempt to do different analyses and comparisons of this data and present the results in a less formal and more readable manner. When the study is completed, it is the intention of the authors to send letters to the editors of *Insight News* and *La Prensa de Minnesota*, both newspapers serving communities of color in Minnesota.

Our group has three members who will be working closely together to make sure this is a successful project. All three of us will begin by studying the data obtained by the Minneapolis police department through Minnesota Statute §626.951. We will begin by understanding how the data was obtained and what data was obtained, and then laying out a plan for what additional analyses can be done to understand the issue of racial profiling in Minneapolis more clearly. In addition to researching the data obtained by the Minneapolis police department, John will research other data obtained in the U.S. during similar studies. Sue will begin organizing the data and determining the best methods for displaying the data graphically, numerically and in table format. Deb will begin looking ahead in the book at some more advanced statistical methods that may be useful in the analysis of the data so that when those topics come up in class we can easily determine if they would be valuable in our analysis. The writing of the project will be broken into three equal parts and each of us will be responsible for writing one section. Each of us will review the other two group members' sections for both content and grammar and then John will be in charge of putting the completed sections together into one cohesive rough draft. After the rough draft is graded and handed back to us, we will meet as a

group to determine the layout of the poster and what data and results should be included in the poster presentation. Then we will work together to put the poster in its final format.

Bibliography

Fridell, L. (2004) *By the Numbers: A Guide to Analyzing Race Data from Vehicle Stops*. Washington, DC: Police Education Forum.

Harris, D. (2002) *Profiles in Injustice: Why Racial Profiling Cannot Work*. New York: New Press.

Ramirez, D., McDevitt, J., and Farrell, A. (2000) *A Resource Guide on Racial Profiling Data Collection Systems: Promising Practices and Lessons Learned*. Washington, DC: U.S. Department of Justice.

Glossary of Terms

Content Terms

Race/Ethnicity – Race and ethnicity are social, not biological constructs, referring to social groups, often sharing cultural heritage and ancestry. Race and ethnicity are not valid biological or genetic categories. The minimum categories for race are: American Indian or Alaska Native; Asian; Black or African American; Native Hawaiian or Other Pacific Islander; and White. The minimum categories for ethnicity are: Hispanic or Latino and Not Hispanic or Latino.

Racial Profiling – The discriminatory practice by law enforcement officials of targeting individuals for suspicion of crime based on the individual's race, ethnicity, religion or national origin.

Disposition – The manner in which a legal case is settled or resolved. In the case of the disposition of a stop, it means the outcome of the stop; an arrest, citation, warning or no action.

Contraband – Goods or merchandise whose importation, exportation, or possession is illegal.

Racial Bias – Any distinction, exclusion, restriction or preference based on race, color, descent, or national or ethnic origin which has the purpose or effect of nullifying or impairing the recognition, enjoyment or exercise, on an equal footing, of human rights and fundamental freedoms in the political, economic, social, cultural or any other field of public life.

U.S. Census – A count of everyone living in the United States which is completed every ten years and mandated by the U.S. Constitution.

Statistical Terms

Sampling Bias – A sampling method is biased if it systematically favors certain outcomes.

Relative Difference – Evaluation of difference in measures in context with a base measure.

Mean –The mean of a list of numbers is the sum of all of the list divided by the number of items in the list.

Standard Deviation –A measure of the variability or dispersion of a data set.

Median – The number separating the higher half of a sample from the lower half.

IQR – The difference between the third and first quartiles.

Mathematical and Statistical Skills Needed for the Project

Proportions

Percentages

Absolute Difference

Relative Difference

Histograms

Bar Graphs

Pie Charts

Hypothesis Tests

Null Hypothesis

Alternative Hypothesis

Test Statistics

Sample Size

Probabilities

Two-proportion Z Test

Appendix E: Grading Rubric for Proposal

Grading Rubric for Group Project Proposal

The following components must be included:

- Cover page
- One page (minimum) proposal
- Bibliography
- Glossary of terms

One page proposal requirements:

- A clear statement of the purpose/focus of the project
- The connection between the project and the community and which community the project addresses.
- The set of mathematical/statistical skills needed for the project.
- Each group member's responsibilities for each stage of the project.

If all four components are present and all four requirements are satisfied, the grade will be as follows:

- Excellent/Outstanding: 9 or 10 points
- Good/Substantial: 7 or 8 points
- Adequate: 5 or 6 points
- Fair/Minimal: 3 or 4 points
- Poor/Nonexistent: 1 or 2 points

For each page missing, subtract one point. For each requirement not met, subtract one point.

Appendix F: Rough Draft Guidelines

Rough Draft Guidelines

The rough draft for your group project is due on _____. Rough drafts will be collected at the **beginning** of class on this date and no late papers will be accepted. Your rough draft should be exactly that, a rough draft of your final project. I will grade the rough draft carefully so that you can make changes, if necessary, before starting your poster. If you do a good job on the rough draft then creating the final project, a poster, will be much easier.

Keep these requirements in mind when typing up your rough draft:

STYLE

1. Type your paper on 8 ½ x 11 inch white paper using a 12 point font.
2. Type double-spaced on one side of the paper.
3. Include one separate title page that includes the title of your project, course number and name, date, and names of group members.
4. Number pages consecutively. Do not number the title page. Treat the first page of the paper as page two. Type the page number in the top right corner of the page.
5. Margins should be 1 ¼ inches for left, right, bottom and top margins on all pages.
6. At the beginning of each paragraph, indent five spaces. Do not add an additional line between paragraphs.
7. Direct quotations longer than four lines should be indented five spaces and must be single-spaced.
8. "Plagiarism is using another person's words or ideas and presenting them as your own without acknowledging the original source. This is a very serious offense and in many schools grounds for expulsion" (MSU Student Handbook). Make sure to properly acknowledge sources. The consequence of a plagiarized group project is a grade of "F" for the project for **all** group members.
9. Proofread and spell check your paper carefully before submitting it.
10. Always keep a copy of your paper.
11. Staple your paper in the upper left-hand corner.

CONTENT

Your basic task in the rough draft is to state the main purpose and subtopics of your project in an introductory paragraph, formulate the body of your paper in a logical order

with major points highlighted and support those major points with data, statistics and graphs. Documenting sources in the rough draft is required. The final paragraph should be the conclusion to the paper.

The rough draft of your group project should contain the following:

1. Introductory Paragraph: One good paragraph is sufficient as an introduction. The introductory paragraph should clearly state the purpose of the project and the main points that the paper will cover. This paragraph should be used only to state the main points; not to argue or support them--that should be covered in the body of the paper.

2. Body of the Paper: You should have at least one (but it may be more than one) separate paragraph for each of the major points and the supporting evidence of that point. The use of first (I, we, me) or second person (you, to refer to the reader) is not acceptable in this report. Each main topic should be summarized and there should be a logical lead in to the next paragraph.

3. Conclusion: This paragraph should be used to restate the purpose of your project and main points, and also to draw conclusions from the results of your data collection. Make it clear to the reader that you met your purpose of the paper.

4. References and Bibliography.

Appendix G: Grading Rubric for Rough Draft

Grading Rubric for Rough Draft

The grading of the final report will be based on the following items. Items that are checked indicate areas for which improvement was not made after feedback from the instructor was given on the rough draft.

Statement of Purpose:_____ Introduction:_____

Page Numbers:_____ Spelling:_____

Punctuation:_____ Conclusion:_____

Title Page:_____ Sources:_____

Plagiarism:_____ Bibliography:_____

Grammar, mechanics, word usage: _____ Statistics:_____

Evidence to support conclusion:_____

The final paper will be graded using the following rubric:

Assessment Area	10	9	8	7	6	5	4	3	2	1
Quality of research										
Focus/Organization										
Mechanics (Introduction, Body, Conclusion, References)										
Proper use of Mathematics/Statistics										
Use of statistical concepts from all four levels: basic, emerging, intermediate and advanced										
Proper conclusion based on evidence										
Participation as assessed by your group										
Total										

Appendix H: Grading Rubric for Poster Presentation

POSTER PRESENTATION ASSESSMENT

Evaluator's Name:

	1	2	3	4	Poster Title
Organization	Cannot understand poster presentation because there is no organization to the information.	Have difficulty following presentation because information jumps around.	Information presented in logical sequence which audience can follow.	Information presented in logical, interesting sequence which audience can follow.	
Statistics	Group has little or no statistics in the presentation.	Group occasionally uses statistics at the most basic level – histograms, bar graphs, pie charts.	Group uses statistics at the basic level and at the intermediate level (scatter plots, linear regression and prediction and marginal/conditional distributions).	Group uses topics in statistics from the beginning, intermediate and advanced level, which includes hypothesis testing/confidence intervals.	
Subject Knowledge	Group does not have grasp of information; group cannot answer questions about subject.	Group is uncomfortable with information and is able to answer only rudimentary questions.	Group is at ease with expected answers to all questions, but fails to elaborate.	Group demonstrates full knowledge by answering all questions with explanations and elaboration.	
Graphics	Group uses superfluous graphics or no graphics.	Group occasionally uses graphics that rarely support text and presentation.	Group's graphics relate to text.	Group's graphics explain and reinforce text.	
Mechanics	Presentation has four or more spelling/grammatical errors.	Presentation has three spelling/grammatical errors.	Presentation has no more than two spelling/grammatical errors.	Presentation has no spelling/grammatical errors.	
Conclusion	Conclusion did not follow from the information presented.	Conclusion somewhat followed from the information presented.	Conclusion mostly followed from the information presented.	Conclusion followed directly from the information presented.	

Total Points out of 20: