

PAD 504: Data, Models, and Decisions I
Optional Take Home Exam
Spring 2000

***Instructions:** If you choose to complete this optional set of take home questions, they will be graded and used in a sensitivity analysis test on your final grade. In no case will taking this quiz hurt your final grade and it could help, if the grade on the optional questions are higher than the grade you receive on the in-class exam. You must work on this exam alone, receiving help only from the course instructor who can clarify questions. The completed exam should be turned in no later than the time of the in-class exam (Wednesday Evening, May 17). You must sign and return the statement below stating that you have worked alone on the exam.*

***Certification:** I have worked alone on this take home exam. I have neither given nor received any help on this exam.*

(your signature)

(1) **Purchasing a New Vehicle.** You are interested in purchasing a new or used car, truck, or van to replace your current mode of transportation. You have heard all the ads about new vehicles and you have access to the *Times Union* classified section on new and used vehicles. Before you start to shop around, you want to do some formal analysis based on what you have learned in 504.

A. Describe at least two modeling methods that have been covered in 504 and that could be of help in supporting a decision concerning which car to buy. Select the method that you would prefer to use and describe what problem you will solve using this method and why the method is appropriate to solve that problem.

B. Using the best technique that you have learned in 504, set up and execute an analysis that can support your decision concerning a vehicle purchase. The analysis that you produce should support your decision before you actually see and test drive any vehicles. This means that your analysis should use as input data information available from ads, the newspaper and your own subjective estimates of the vehicles or types of vehicles that you plan to purchase or the dealers or private owners who sell them.

C. Describe carefully and completely what you have done in Part B above including what conclusions you have come to, what assumptions you have made, and what are the limitations (if any) of the analysis that you have completed.

D. Describe how, if at all, you might be able to extend the analysis that you have done to support decision making after you have looked and test driven any vehicles.

(2) **Projecting School Enrollment Trends in Newtown** . You are the administrative assistant to the superintendent of schools in Newton. Newtown is presently experiencing an enrollment "bulge" in the classes entering kindergarten over the past several years. The school board is concerned that in several years the capacity at the middle school (grades 6-8) may be strained and that soon after that the capacity at the high school (grades 9-12) will be strained. There appears to be a lot of vacant space at the elementary level (grades K-5).

The superintendent has asked you to conceptualize a model that could help him project enrollments over the next 10 years as well as explore the possible impact of different "scenarios" on school population (for example one scenario would be rapid construction of new housing in the town, another moderate construction, another slow construction). You have decided to approach this as a stock-and-flow difference equation problem.

To answer this question, ghost draft an executive memo from your boss, the superintendent of schools, to the Chairman of the Board of Education proposing a method for projecting enrollment at the middle school and high school. Describe clearly what you would do, how the model would work, what types of data you would need to run the model, and what types of analysis you would be able to do with the model. Based on this memo, the board will decide whether or not to proceed with the project or try another approach.

In an appendix to your memo, enclose a very simple mock up of what such a model might look like with a mock up of sample output. Use a spreadsheet model to implement your mock up. Do not worry about getting exactly correct data values because detailed data needs should be discussed in the body of your memo and taken care of later.

To get a "ballpark" set of numbers to run the mock up, you should know that Newton has had about 200 students enter kindergarten for every year for the past 10 to 15 years. Students leaving the school roughly balances students entering the school. In the past two years, the number of students entering kindergarten has suddenly jumped to 250 students per year. No good data yet exist for the pre-kindergarten population who will be entering the schools in future years.

3. **Database for Case Management Services.** Case management Services (CMS) is a small not-for-profit agency that provides case management services to persons living in the community with a previous record of severe mental illness. CMS employs 8 case managers who manage the records for approximately 250 clients (the number fluctuates as clients enter and leave the system). CMS does not provide direct services, rather it monitors client progress at any of 23 community-based providers. Community providers may provide employment services, individual counseling services, group counseling services, job readiness services, or basic living skills.

CMS monitors the progress of all its clients, makes referrals when necessary, and reports back to the County Department of Mental Health on the status of all its clients. The county reimburses the community providers directly for their services after CMS has certified that services have been appropriately provided. The county reimburses CMS a fixed fee each month for each client that it serves.

The present Director of CMS is feeling overwhelmed by all the paperwork in the office. CMS maintains profiles on all 23 providers, keeps a demographic and treatment profile on all of its clients, maintains billing information on all of its clients, and generates compliance reports to the county that certify the performance of all 250+ clients in the 23 programs. In addition, CMS maintains employee records for its 8 case managers including demographics, wage and withholding information, information on sick days and vacation accruals, and a record of each case manager's case load.

As a newly graduated MPA, the Director has asked you to create a fast concept for how a computerized data base could help CMS manage all its paper files (at present, nothing is automated). You decide to create a data model that would show what major entities, attributes, and relationships might be in a database for CMS. The purpose of this data model is simply to educate the Director concerning what a database is and how it might help CMS. If the Director likes your presentation, she is prepared to move forward with a formal proposal that you would be able to bid on as a consultant.

Create an abbreviated data model for CMS with key entities and relationships shown and sample attributes for each key entity. Attach text that briefly describes to the Director what you have done and how a fully functioning database might work.