

PAD 504 Data, Models, and Decisions I Final Exam Fall, 2003

(Your Name)

Directions: I am most interested in your ability to set up problems. Do not spend time with computations. Show all work, partial credit is given. Good Luck!

1. Selecting Clients for the SECOND CHANCE Program (20 points). The SECOND CHANCE Program provides an alternative to detention for youthful offenders. Juveniles who have been convicted of crimes that would have otherwise required detention are given a second chance in this program run by the Capital Area Council of Churches (CACC). Since capacity in this program is limited, SECOND CHANCE only admits youth who have a good chance of not recitivating to the juvenile justice system. Research shows that younger persons and those with little or no previous court appearances have the greatest chance of not recitivating. In addition, each convicted youth has an evaluation by a probation officer. A score of 10 implies that they will benefit most from SECOND CHANCE. A low score indicates that they have low chance of success. The units for "Prior Record" are number of previous court appearances and the units for "Age" are years. Below is part of a spreadsheet that SECOND CHANCE wants to use to select its clients.

	A	B	C	D	E	F	G	H
1	Name	Prior Record	Age	Probation Evaluation	Normalized Prior Record	Normalized Age	Normalized Probation Evaluation	Final Score
2	Smith	0	13	9				
3	Gonzalez	3	15	2				
4	Hughes	1	16	6				
5	Sanderson	0	14	7				
	MANY MORE RECORDS							
97	Rank	3	2	1				
98	Raw Weight							
99	Normalized Weight							

What would be the appropriate spreadsheet formulas for this MAU model?

C98=

C99=

E4=

G3=

H5=

2. A Database for SECOND CHANCE. (25 points). The SECOND CHANCE Program provides an alternative to detention for youthful offenders. You have been asked to sketch the design of a database to support their operations. The program serves 155 youth who participate in one or more (usually 2 to 5) of the program's 12 structured activities. The program has 67 staff including counselors, caseworkers, volunteers, and support staff on its roster. Each youth has been assigned a management team consisting of a caseworker, one or more counselors, and other staff as appropriate. Each case management team consists of 3 to 5 staff members. In addition, the database should track information about the parents or guardians and home residences of both clients and their parents and guardians.

A. One of the reports to be generated by the database will show all of the activities in which each student participates. Another report will show all of the students who are participating in each of the programs. Discuss in detail below how you would operationalize the relationship between Clients and Activities in ACCESS.

B. In the space below, sketch the major entities and relationships that you envision being necessary to implement this database. Be sure to indicate an appropriate primary key for each table in your database and whether relationships are one-to-one, one-to-many, etc. Please show only those key attributes that will help to clarify relationships between the entities (that is, you do NOT need to show an exhaustive listing of attributes). Discuss what additional information, if any, you may need in order to complete this preliminary data model.

3. A Simulation of Caseload at SECOND CHANCE (25 points). The SECOND CHANCE Program provides an alternative to detention for youthful offenders. The program serves clients in both residential and day treatment settings. The data analysis department for the SECOND CHANCE program has analyzed with **weekly** flow of clients between Residential and Day programs. Their analysis is summarized in the Markovian state transition matrix shown below:

	Residential Placement	Day Placement	In the Community
Residential Placement	.85	.03	0
Day Placement	.13	.9	.12
In the community	.02	.07	.88

- A. The Director of SECOND CHANCE wants to set up a simulation model that can project patterns of client flow through the system based on these data. In the space below, create a sketch of a stock-and-flow model that could be used to construct a simulation model in either EXCEL or Vensim. Be sure to name all of the relevant variables and to show key parameters affecting the rate equations.

- B. In the space below, write out all of the difference equations associated with the Day Placement Stock. Be sure to include equations for all flows into and out of the stock along with all of the information that would be needed to create a model in EXCEL or Vensim. (But do NOT formulate equations as Vensim or spreadsheet equations rather in standard--Stokey and Zeckhauser--difference equation notation)

4. Transporting Day Placement Students to and from the Public Schools. (25 points). The SECOND CHANCE Program provides an alternative to detention for youthful offenders. The day placement portion of the SECOND CHANCE program provides transportation for students between the two residential sites for the overall program and client's home school districts. The two facilities are the Whitewood and Black Forest facilities. Students need transportation to and from three separate school districts—Ellenville Central School District, Brookside Central School District, and Mapleton District. The transportation times between the two facilities and three school districts are provided in the table below. A total of 50 students need transportation: 20 from Ellenville CSD, 14 from Brookside CSD, and 16 from Mapleton. The Whitewood facility can serve 40 clients and the Black Forest facility can serve 20 clients.

	Whitewood Facility	Black Forest Facility
Ellenville Central School	55	45
Brookside Central Schools	30	10
Mapleton Schools	25	30

Travel Time (in minutes) between Three School Districts and Two Facilities Associated with the SECOND CHANCE Program

Formulate a model that will minimize the overall transportation time for all students while traveling between schools and facilities for the SECOND CHANCE day programs. Be sure to clearly specify activity variables, objective function, and constraints.

6. Sensitivity Analysis, Value Judgments, and the MAU Admissions Model (5 points) The MAU Admissions Model that we discussed in class mixes allegedly objective measures of student performance such as GRE scores with subjective measures that reflect value judgments of persons managing the admissions process. Discuss how and why the model combines these subjective and objective data and parameters. Do you see any problems with the use of subjective measures in a decision support model such as this one? How might sensitivity analysis be used to possibly alleviate potential problems with the use of subjective value judgments?

