ENCE 360 Project

Police Patrol in College Park

Greg Cavanaugh
Christine Cline
Jordan Wilson

Overview

- Evaluate the police patrol system in College Park
- Analyze statistically high-crime areas
- Suggest a solution

Contributing Factors

- specific locations
- time of day
- day of the week
- type of crime committed
- different degrees of severity

Main Objective

- To maximize the effectiveness of the police force in College Park

Principle

To maximize the safety of the town,
while doing so with the least amount of officers

Course Applications

- Limited Resource Allocation
- Linear Programming
- Probability
- Supply & Demand

Research Police Patrol

Lieutenant Brian Lintz

- **Officers Available**
- Six squads
- 50 patrol officers
- 5 patrol commanders
- 6 shift supervisors
- 2 on limited duty (injury or pregnancy)

Shifts

Approximately 10 hours each

- **Sunday – Thursday:**
  - 10 pm – 8 am
  - 7 am – 5 pm
  - 3 pm – 1 am
  - Overlap times to have additional coverage and smooth shift transitions
- **Friday – Saturday:**
  - 10 pm – 8:30 am
  - 7 am – 5:30 pm
  - 4 pm – 2:30 am

More info from Lt. Lintz

Officer works 40 hours a week

- Minimum

4 Patrol Officers

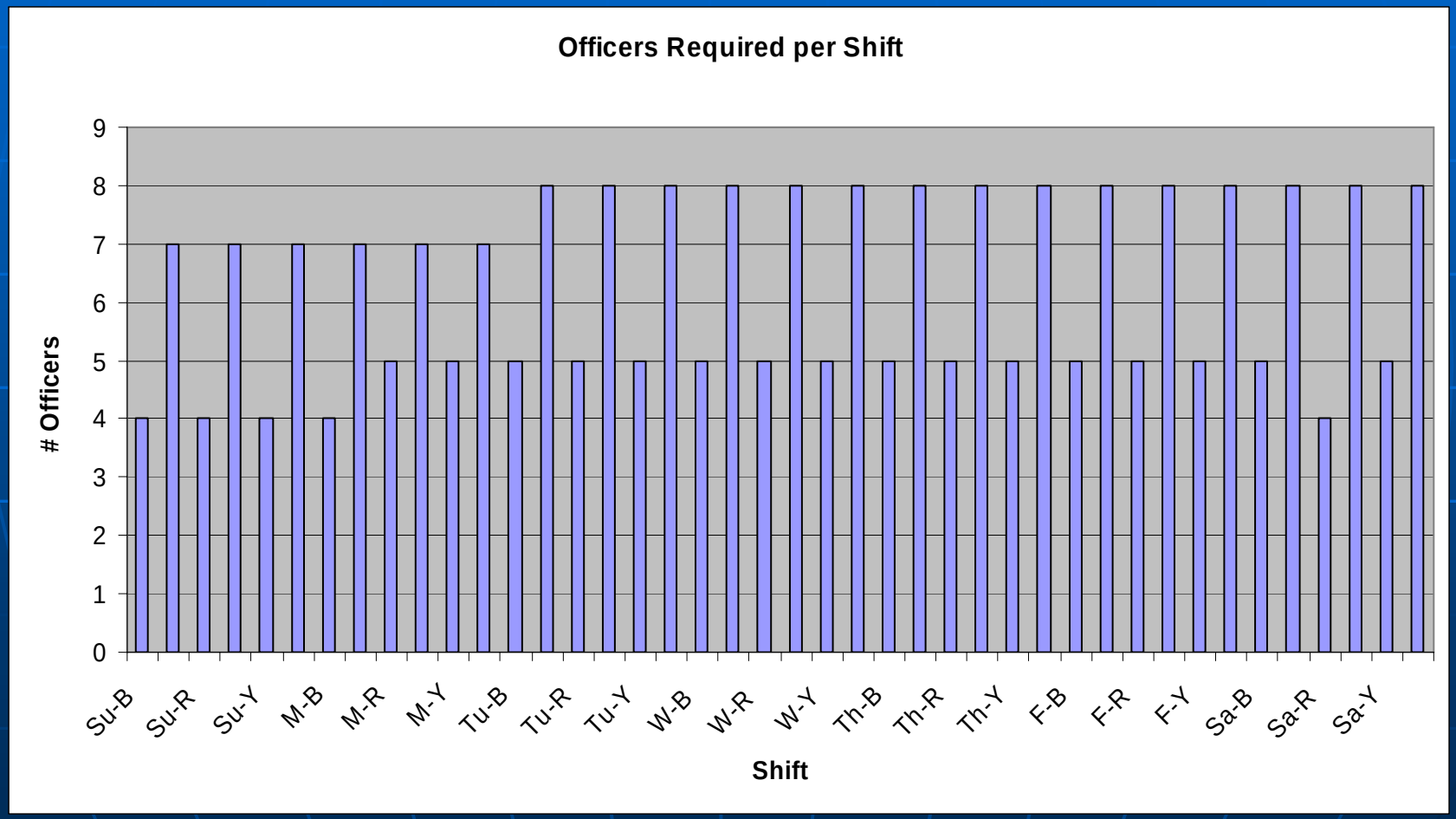
2 Supervisors

- Maximum (Overlap Shifts)

8 Patrol Officers

3 Supervisors

Excel Graph

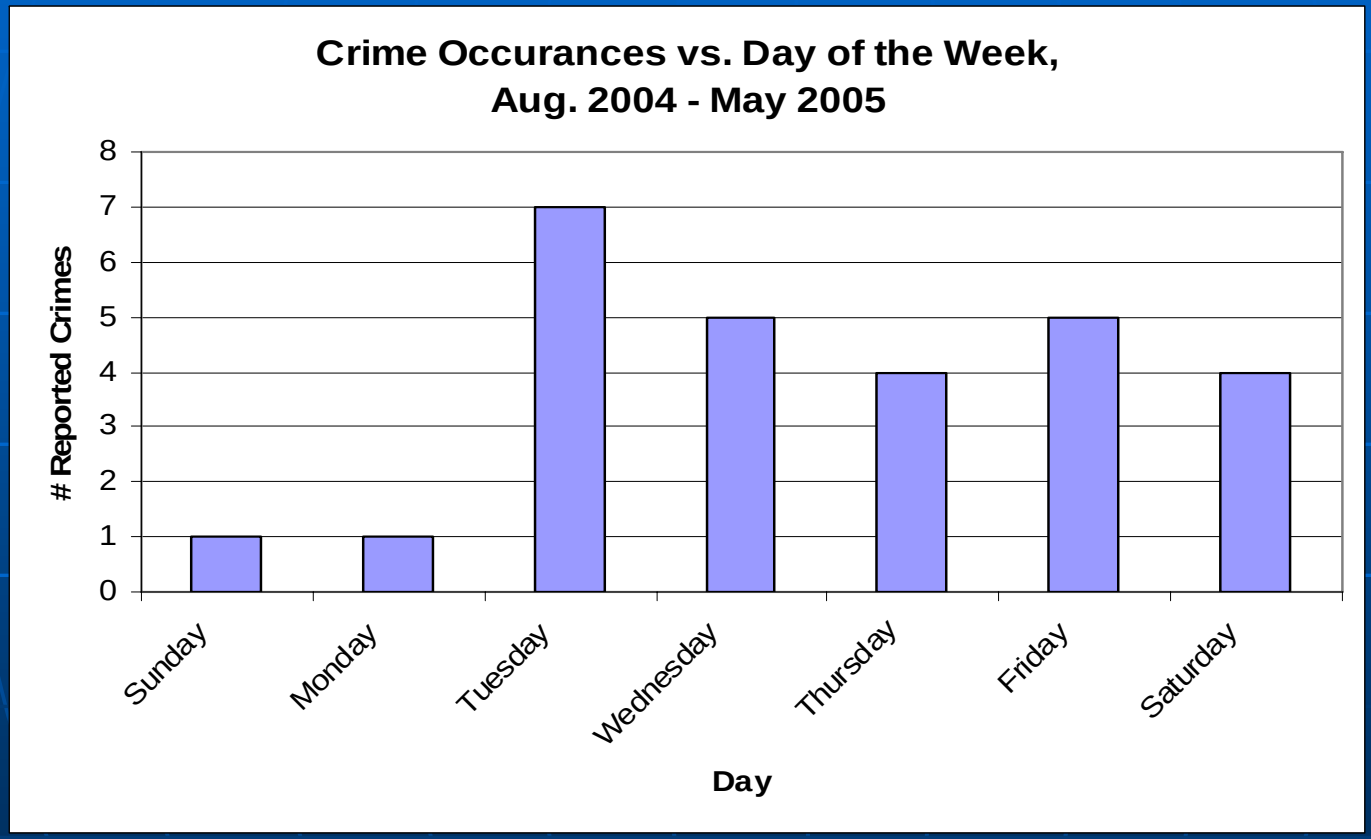

Officers Required per Shift
Officers
9
8
7
6
5
4
3
2
1
0
Su-B
Su-R
Su-Y
M-B
M-R
M-Y
Tu-B
Tu-R
Tu-Y
W-B
W-R
W-Y
Th-B
Th-R
Th-Y
F-B
F-R
F-Y
Sa-B
Sa-R
Sa-Y
Shift

UMPD issued “Crime Alerts”

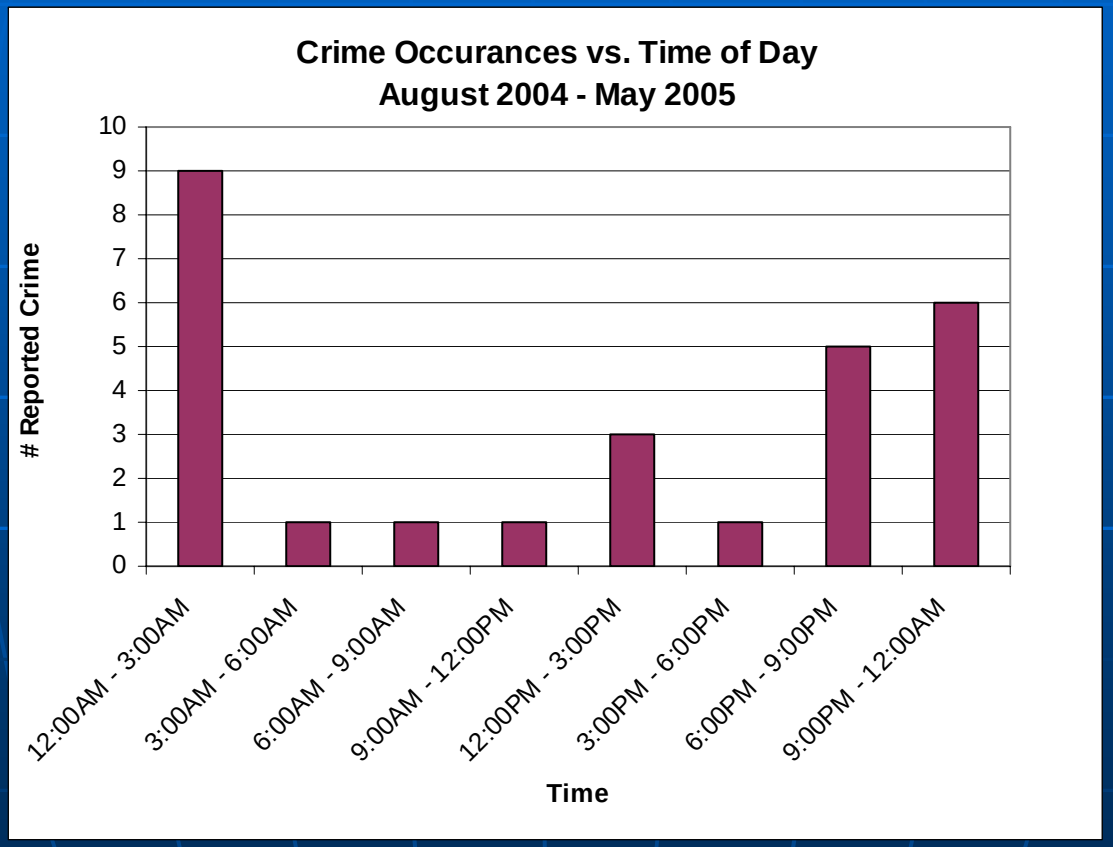
- Past 2004-2005 school year
- 27 reported crimes have occurred since August 26, 2004
- Out of these 27 crimes, 21 of them are some form of robbery or burglary
- Other crimes: assault, arson, homicide, “Peeping Tom”, carjacking, and destruction of property

11-Mar	2:25 PM	Robbery	Near University Courtyard Apts.
11-Feb	6:20 - 6:30 PM	Assault, Robbery	Graduate Hills Apt. Complex Parking Lot, Tulane Dr.
28-Jan	6:00 PM	Robberies, Stolen Vehicle	University Courtyards/Greenmeade Dr.
21-Jan	9:45 PM	Assault, Robbery	College Ave near Rhode Island Ave
8-Oct	6:30:00 PM - 5:00 AM	Robbery	South of McKeldin Mall
31-Jan	7:40 - 9:10 AM	Multiple Burglaries	Centreville and Hagerstown Hall
30-Apr	4:29 AM	Arson	7500 block, Princeton Ave.
13-Nov	1:40 AM	Robbery	Metro Station
25-Sep	2:00 AM	Attempted Robbery	4300 block Knox Road (near Rossburg Drive)
4-Sep	2:45 AM	Robbery	Parking lot front of Courtyards building 100, Boteler Ln.
7-May	11:02 PM	Arson	8900 block, Azalea Ln.
14-Apr	1:30 - 2:00 AM	Attempted Robbery	Baltimore Ave. & Hartwick Rd.
24-Mar	9:10 - 9:41 AM	Robbery	Graduate Hills Apt. Complex Parking Lot, Tulane Dr.
13-Jan	7:55 PM	Assault, Robbery	University Courtyard Parking Lot
2-Sep	2:45 AM	Robbery	Parking Lot 16B (South of Leonardtown on Norwich Rd)
26-Apr	7:55 PM	Aggravated Assault	near HHP
1-Mar	10:55 PM	Attempted Robbery	Parking Lot EE
1-Mar	1:46 - 1:50 AM	Robbery	Sidewalk near Chestertown Hall
4-Jan	10:53 PM	Robbery	4500 block College Ave.
30-Nov	2:35 PM	Robbery	Parking Lot A
12-Oct	3:55 - 4:10 PM	Carjacking	Parking Lot 1D
26-Aug	8:15 PM	Homicide	4800 block Berwyn House Rd
11-May		"Peeping Tom"	LaPlata Hall
27-Apr	2:30 - 2:55 AM	Robbery	Football team building & Lot 3
13-Apr	10:39 PM	Robbery	8200 block Baltimore Ave.
9-Mar	1:10 - 1:15 AM	Robbery	Between Harford Hall & Frederick Hall
15-Sep	11:45 PM	Robbery	River Road in front of College Park Metro

Analysis by Day

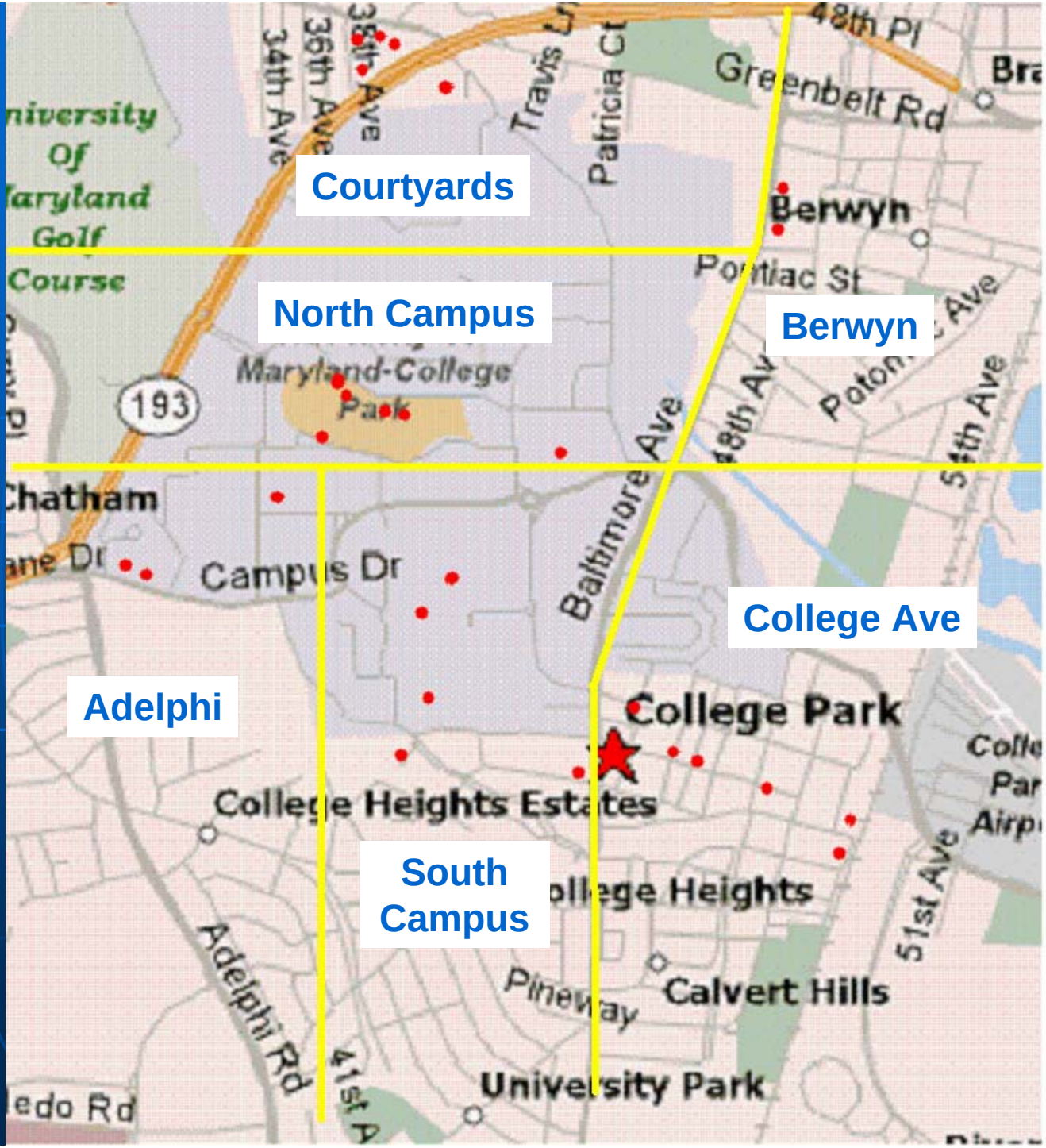


Analysis by Time of Day



Sections of College Park

- Separated patrol area into 6 sections of approximate equal area and varying levels of crime
  - University Courtyards
  - North Campus
  - Adelphi
  - South Campus
  - College Avenue
  - Berwyn


Courtyards
North Campus
Berwyn
College Ave
Adelphi
South Campus
Greenbelt Rd
Berwyn
Pontiac St
Maryland-College Park
193
Chatham
Campus Dr
Baltimore Ave
College Park
College Heights Estates
Calvert Hills
University Park
Adelphi Rd
Pineway
51st Ave
34th Ave
36th Ave
Patricia Ct
48th Pl
5th Ave

Locations/Regions

Location	# Crimes
Courtyards	5
Berwyn	2
North Campus	6
South Campus	5
Adelphi	3
Campus Drive	6

Linear Program Formulation

1. Set up our constraints
   - the number of officers - (1…n) officers
   - locations to which they are assigned -

2. Formulate four separate linear programs
   - four, five, seven, and eight on-duty officers

Officer constraint

- (1…n) officers could only be assigned to one location
- Thus the ∑ (1…m) for each n officer over m locations equaled 1 at all times

The constraints on the locations depended upon how many officers on duty.

Objective Function Values

- Obvious choice - # of crimes in each area

We chose…

(# of crimes)*(Severity of Crime)=

These result give a more accurate depiction as to which locations are more dangerous and in greater need of police patrol.

Crime Objective Function Value

- Peeping Tom
  - 1
- Attempted Robbery
  - 2
- Robbery
  - 3
- Robbery & Assault
  - 4
- Carjacking
  - 4
- Arson
  - 5
- Homicide
  - 5

	"Peeping Tom"	Attempted Robbery	Robbery	Robbery & Assault	Carjacking	Arson	Homicide
Courtyards			2	1	1	1	
North Campus	1	1	3	1			
Adelphi			1	1	1		
South Campus		2	3				
College Ave			4	1		1	
Berwyn			1				1

Objective Function Values

Location	Objective Function Value
Courtyards	19
North Campus	16
Adelphi	11
South Campus	13
College Ave	21
Berwyn	8

LP Location Constraints

# Officers on Duty	Courtyards	N. Campus	Adelphi	S. Campus	College Ave	Berwyn
4	>=1	<=2	<=1	<=2	<=2	<=1
5	>=1	<=2	<=1	<=2	<=2	<=1
7	<=2	<=2	>=0	<=2	<=2	>=0
8	<=2	<=2	>=0	<=2	<=2	>=0

LP Results

# Officers on Duty	Courtyards	N. Campus	Adelphi	S.Campus	College Ave	Berwyn
4	2	0	0	0	2	0
5	1	2	0	0	2	0
7	2	2	0	1	2	0
8	2	2	0	2	2	0

Unpatrolled Areas

- Areas with zero officers assigned to them will be covered by the officers at adjacent location
  - i.e. for four officers, 2 are at Courtyards
  - Courtyards police must periodically patrol Berwyn and North Campus
  - Based on total crime indices (# crime occurrences*severity)
- Result of zero-one LP

Conclusion

- Our model did not consider:
  - Actual coverage of PG County police
  - Trends of crime statistics over the years (if overall crime is increasing/decreasing)
  - If additional resources could be implemented

Conclusion

- Idea of having officers assigned to sectors has not been considered at UMPD
- This would be an effective way to optimally place officers in areas with highest, severe crime
- Does not require additional resources and could be implemented immediately