

Revised December 18, 2000

## The New York City Police Department Patrol System

The City of New York is divided into 73 precincts. These precincts are the basic managerial units for the operation of the familiar police patrol cars (called radio mobile patrols or RMPs) we see on the City streets. For staffing purposes the Police Department divides the day into three eight-hour tours of duty: 12 midnight to 8AM, 8AM to 4PM, and 4PM to 12 midnight. A particular police precinct such as the 26th, in which Columbia University stands, may have 6 patrol cars in the field during the typical 8-to-4 tour. In New York about 1200 car-tours are fielded on an average day -- about 200 on the 12 to 8 tour, about 400 on the 8 to 4 tour, and about 600 on the 4 to 12 tour. Most cars are staffed with two police officers.

The primary tasks of the patrol cars are responding to emergencies that are phoned in by citizens via the 911 emergency telephone system and patrolling the streets. Annually, there are about 10 million calls received by the 911 system. Incidence of emergency calls is generally very unpredictable, but incidents are most prevalent in the early evening hours. Emergency incidents vary in severity and importance -- ranging from reports of crimes in progress to complaints about loud neighbors. Roughly 10% of calls are potentially serious and get high priority from the police. When not responding to 911 calls, patrol cars patrol in their assigned neighborhoods, referred to as sectors. Each precinct typically has 4 to 8 sectors.

"Back-office" operations for the 911 system are located in Police Headquarters in downtown Manhattan at One Police Plaza. Incoming 911 calls are handled by banks of telephone operators, grouped by borough. The operators screen the calls to determine whether or not they are legitimate police matters, and key in to the central computer system information about the time, location, and nature of the incident. If the incident was not previously reported, the information is electronically relayed to the police patrol dispatcher for the appropriate precinct.

Dispatchers are civilians who are responsible for assigning patrol cars to 911 incidents in the precincts they handle. They also monitor the status of incidents and patrol cars and input all relevant information to the central computer system. Dispatchers are typically responsible for 2 or 3 contiguous precincts. When a dispatcher receives a new incident, the information is automatically added to a computer screen for that precinct, and the job is added to the dispatch queue in priority order. When a patrol car from the precinct is available, the dispatcher will assign it to the next job in the dispatch queue. If the incident is a dangerous one, more than one car may be dispatched. All communications are via radio

When a car is dispatched to a job, it first travels to the scene of the incident. If the incident is still active, the officers perform whatever tasks are called for and, when done, write up required reports and radio to the dispatcher a final status code. The amount of service time per car per incident (including travel time) varies greatly from incident to incident, but overall it averages about 30 minutes.

Allocation of the 1300 car-tours among the precincts is a complex and sensitive issue. Precincts vary greatly in population, physical area, frequency of 911 calls, incidence, and type of crime and special needs. Moreover, the rate and type of 911 calls may vary by day of the week and by season. For these reasons, allocations must be adjusted regularly, and thus it is necessary to have a fast and efficient computer-based method to help determine allocations.

Fortunately, accurate data is readily available from the 911 computer system which records detailed information about each call. The table below illustrates the type of data that is collected and used to help determine allocations for each 8 hour tour of duty.

Though at any given point in time the total number of RMP's is fixed, occasionally the city decides to either increase or cut the number, usually as a reflection of the financial status of the city. The marginal cost of adding a fully staffed car for one tour-of-duty for a year is approximately \$300,000 (\$230,000 of which is for labor).

Suppose the city consists of only six precincts as shown in the table. Your assignment is to allocate patrol cars among these six precincts for the tour of duty described by these data. You may assume that, on average, a car spends 30 minutes on each call in each precinct. Furthermore, statistical analysis has shown that service times are well modeled by an exponential distribution.

<b>PRECINCT</b>	<b>AVERAGE NO. CALLS/ HOUR</b>	<b>PERCENT OF CALLS HIGH PRIORITY</b>	<b>TOTAL FELONIES PER YEAR</b>	<b>SIZE (SQ. ML.)</b>
A	6.4	8.2	10,600	1.9
B	3.8	7.7	6,600	.8
C	2.6	7.3	4,300	5.2
D	3.4	13.8	9,400	1.0
E	1.5	4.0	1,800	17.0
F	6.6	12.2	8,500	1.7

