Predictive Policing: What Can We Learn from Wal-Mart and Amazon about Fighting Crime in a Recession?
By Charlie Beck, Chief of Detectives, Los Angeles Police Department, and Colleen McCue, President and Chief Executive Officer, MC2 Solutions, LLC, Midlothian, Virginia

In the current economic climate, police departments are being asked to do more with less. In some localities, significant budget reductions are requiring police managers and command staff to consider reductions in the retention of sworn personnel. Personnel costs represent the single largest budget line item in most public safety organizations. The ability to use this resource more efficiently has become absolutely essential to police managers under current budgetary restrictions. Now, new tools designed to increase the effective use of police resources could make every agency more efficient, regardless of the availability of resources.

As these new budgetary restraints and limitations are faced, the question to ask with more urgency is "Why just count crime when you can anticipate, prevent, and respond more effectively?" Predictive policing allows command staff and police managers to leverage advanced analytics in support of meaningful, information-based tactics, strategy, and policy decisions in the applied public safety environment. As the law enforcement community increasingly is asked to do more with less, predictive policing represents an opportunity to prevent crime and respond more effectively, while optimizing increasingly scarce or limited resources, including personnel.

Reporting, collecting, and compiling data are necessary but not sufficient to increase public safety. The public safety community relies heavily on reporting what has happened already. Annual crime reports, monthly summary reports, and year-to-date reports all focus on events in the past. Even alerts focus almost exclusively on incidents that occurred in the past, albeit with increasing speed and efficiency. The predictive-policing vision moves law enforcement from focusing on what happened to focusing on what will happen and how to effectively deploy personnel and resources to prevent it.
WHAT IF YOU COULD STOP A CRIME...
STOP A CRIME...
SS# 000-37-2816  SS# 954-11-2593

BEFORE IT HAPPENS?
Predictive Policing Time Horizon

Frequency of Statistical Review

- 1990: Annually
- 1995: Monthly
- 2000: Near Real Time
- 2005: Real Time
- 2010: Forecasting

Part I Crime Trend
Predictive Policing, Our Definition

“A place-based approach to crime analysis that utilizes algorithm-driven crime forecasts to inform decision making to prevent crime”

• Not individual-based
• Not arrest-based
• Risk-based Deployment of patrol resources
• Builds on community policing
• Builds on Hot Spots
• Offers more specificity
• Sets us up for better long term strategic analysis
How is this different?

- Evidence-based rather than heuristic
- Forecasting versus Retrospective Compstat Look
- Reduces tendency to “chase the dots”
- Offers more specificity in time and space
- Should eliminate biases (arrests are not used)
- Leverages existing real-time data
- Not a massive multivariate model
- Uses Date, Time, Place and Type of crime
- Allows cops to problem solve in right place at right time
- Dosage findings should increase efficiency
The Los Angeles Predictive Policing Experiment

Questions to be answered...
Questions to be answered...

Is it possible to predict crime?
If we predict it, can we prevent it?

If we prevent it, how can we measure that?
Jeff Brantingham
UCLA Anthropology

George Mohler
Santa Clara Mathematics

George Tita
UCI Criminology, Law and Society
Repeat Victimization

repeat crime is much more likely to happen in a short interval of time after the first event.
Research Design: The LAPD Experiment

- Rigorous examination of both forecasting value and of dosage
- Careful design of experiment is crucial to determine if Predictive Policing “works”
- Several designs possible, but only one – randomization – represents the “gold standard” of scientific design
Daily Randomization

- Foothill Division serves as both the treatment and control area (seamless to the subjects)
- On random treatment days, the “daily mission” is determined by the Predictive Policing model; otherwise, mission is determined using existing methodology
- Experiment will run for a minimum of 6 months and evaluate whether total crimes lower on days when Predictive Policing model used
ALL WATCHES / ALL BASIC CARS

Be mindful that Residential Burglaries have increased across the entire division during all watches. Tools, jewelry and any type of small valuables that can be hand carried out by suspects are being taken. When time allows, all basic cars please provide extra patrol in residential areas. Be aware of any suspicious vehicles parked in neighborhoods with people or person occupied that may appear to be “casing” locations. Pedestrians that appear to be out of place walking around, conduct consensual encounters, traffic stops, want warrant checks, verify their residences in the area.

Foothill Area - Watch 2 & Watch 4
Thursday - 09/22/11

Watch 2 (0615-0815hrs)
All units, when available, will conduct crime suppression in RDs 1651 and 1653 high visibility, ped stops and traffic stops. Issue cites, want warrant checks and good FIs.

Watch 4 (1000-2000hrs)
Deploy one unit to the area of RDs 1656, 1637 and 1638 for crime suppression and high visibility, ped stops and traffic stops. Issue cites, want warrant checks and good FIs.

Watch 4 (1000-2000hrs)
Deploy one unit to the area of RDs 1684 and 1685 for crime suppression and high visibility, ped stops and traffic stops. Issue cites, want warrant checks and good FIs.

Watch 2 (0615-1815hrs)
Basic Car A77, please provide extra patrol in RDs 1672 and 1673.

7DAY_DOW (62)
Day of Week
Sunday (4)
Monday (5)
Tuesday (5)
Wednesday (11)
Thursday (11)
Friday (15)
Saturday (12)

Legend

Crime Data (62)
- ROBB PM2 (2)
- AGG AM1 (2)
- AGG AM2 (2)
- AGG PM1 (1)
- AGG PM2 (1)
- BURG AM1 (4)
- BURG AM2 (3)
- BURG PM1 (8)
- BURG PM2 (3)
- GTP PM1 (1)
- GTA AM1 (5)
- GTA AM2 (4)
- GTA PM1 (3)
- GTA PM2 (1)
- BTFV AM1 (4)
- BTFV PM1 (2)
- BTFV PM2 (3)
- THEFT AM1 (2)
- THEFT AM2 (4)
- THEFT PM1 (5)
- THEFT PM2 (2)

Map prepared by FOOTHILL Area Crime Analysis Detail on 09/21/11. For internal distribution only.
Forecasting Tool Interface v 1.0

LAPD Predictive Policing Experiment

Map

Desktop
Close-up View of Mission "Boxes"

Pierce St and Borden Ave
RD1613

Carl St between Borden & Chivers Ave
RD 1613
The Timeline

• **October 19, 2011:**
  Training on production of forecasts and methodology begins

• **November 6, 2011:**
  Three month randomized study begins

• **March 2012:**
  Evaluation results

Continued iterative process to test both the algorithm as well as the dosage and interventions.
Initial Observations...

- Bottomline:
- How accurate are the forecasts?
- Versus random and versus state of the art
- How effective in crime fighting
- Crime numbers time series
- Dosage discussion
- Weekend vs. weekday finding
- Ease of use improvements
- 4 times per day by watch
- Roll out plans
Preliminary results

- soft numbers pending completion of statistical study
- focusing on weekdays only
  - accuracy of PredPol algorithm vs. best-practice
    - PredPol vs. independent control group: 10.6% vs. 9.8%
    - PredPol applied to control group: 11.4% vs. 9.8%
- PredPol is 8-16% more accurate compared to best practice
Predictive Policing is promising in historical data analysis.
Crime Numbers (Burg, BFMV & GTA)
Test Period Weeks 1 thru 5 - 2010 v. 2011

2010 avg. = 60
2011 avg. = 50

Test Period 2010 avg. = 60
Test Period 2011 avg. = 42
Playing the Probabilities.

Sean M. Malinowski, Captain, Commanding Officer, Foothill Patrol

Today, November 7, 2011, is historic.

Thanks to the hard work of Foothill area personnel over the past year we have experienced the last two months of 2011 with record low crime totals. We are down more than 13% in Part I crimes versus last year. That translates into about 80 fewer people being victims because of your crimefighting efforts.

Now we have an opportunity to reduce crime even further. By utilizing cutting edge forecasting technology, UCLA Mathematicians have developed a software program that uses the past three years of Foothill property crime data to make daily predictions about the areas within the division with the highest probability for property crime to occur. We will use these forecasts to produce a new kind of crime zone map for patrol. The map will show the daily patrol route specific 500 square foot spatial zones that represent areas with the highest likelihood for the occurrence of a burglary.

We will use the information you provide to improve the effectiveness of our crime prevention efforts. When you see crime moving into your community, please call our Crime Hotline at 1-800-672-9111.

Let's put this in perspective.

That is 60 fewer people waking up the morning to find their car smashed and their property missing or coming home after working all day to find their house ransacked by a burglar going out on a crime spree.

I want to thank all of you who live here in Foothill and in terms of cost efficiency.

By preventing these crimes from occurring we have had to spend less time taking reports. If you were to look at the crime reports over the last three years, that translates into what?...somewhere between 60 and 130 hours of personnel time if we had to invest the time addressing these very specific situations so we should save time scrutinizing reports and I know that all of you would rather not have the crime reports be back at the station writing.

Let's put in perspective.

We are reaching a tipping point, so let's keep it going.

What we are doing is making a huge difference and can change the way we fight crime in the future.

Thanks for your continued support of this predictive policing effort.

~ Sean M.
Patrol Activity (addressing forecasted mission areas)
Test Period Weeks 1 thru 5

Avg Hours in the Box per Week = 35 hrs
Avg Checks per Week = 71 checks

= Hours “in the Box” per Week
= Checks per Week

Occupy LA

1 2 3 4 5

18 27 47 18 18
40 47 72 51 42
20 40 60 80 100
10 20 30 40 50

0 10 20 30 40 50
60 70 80 90 100
110 120 130
140

120
New Version of Software...

- Weekend vs. weekday finding
- Ease of use improvements
- 4 times per day by watch
- Roll out plans
WHAT IF YOU COULD STOP A CRIME...
STOP A CRIME...

BEFORE IT HAPPENS?
NOW YOU CAN
Additional Slides if Needed
Foothill “dosage” evidence:
Number of Unique Boxes Patrolled
Santa Cruz

- Very basic crime analysis prior to Predictive Policing
- Updated daily, the prediction maps identify “boxes” to be patrolled “when free”
- Promising results, but limited ability to do careful evaluation
  - is this because Santa Cruz is now doing crime analysis where before they were not?
  - no controlled comparisons
P = 0.0207
Pveh = 0.702, Pres = 0.297
TW: 13:00, 15:00

P = 0.0199
Pveh = 1, Pres = 0
TW: 12:00, 13:00