# Leveraging Web-Crawler Data to Develop & Evaluate Next Generation Energy Efficiency Programs

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# Moneyball Analogy

"Some of the scouts still believed they could tell by the structure of a young man's face not only his character but his future in pro ball."

-Michael Lewis, 2003. Moneyball.

"All I have is the box scores."

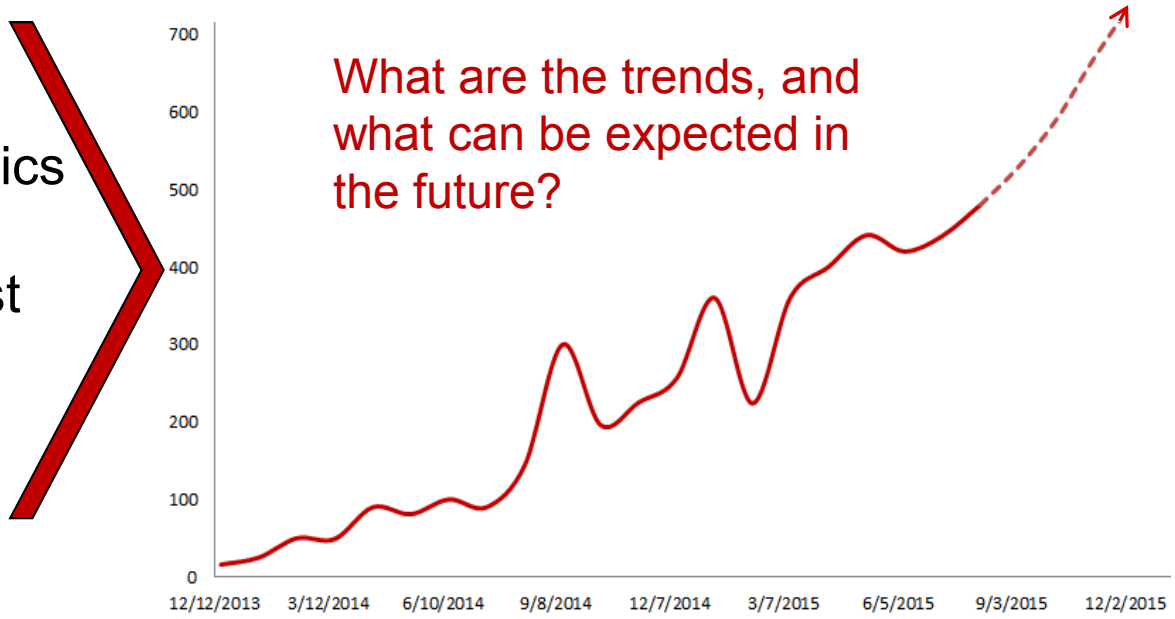
-Bill James, 1977. Baseball Abstract. Sabermetrics statistician.

**Conclusion:** We need data.

# The Need for Data to Support Program Design and Evaluation

The development and evaluation of successful efficiency programs and standards requires a LOT of data:

- product pricing
- product availability
- performance characteristics
- measure savings
- incremental measure cost
- measure life
- life cycle cost savings
- market adoption rates



# Treasure Trove of Product Data

LG Electronics | Model # LP0815WNR | Internet # 205649871

**8,000 BTU Portable Air Conditioner and Dehumidifier Function with**

★★★★☆ (266) | Write a Review + | Customer Images (9) | Questions & Answers (150) +

Open Expanded View + Click to Zoom

Pin it Share

**$279.00** /each

- Estimated Cooling Area Up to 200 sq. ft.
- Multiple Fan Speeds
- Installation kit included

Ship to Home
Estimated Arrival: AUG 11 - AUG 13
See Shipping Options +

Ship to Store FREE
Available for Pick Up: AUG 12 - AUG 1

1 ADD TO CART

OR Buy now with PayPal

Item cannot be shipped to the following state(s): AK

PRODUCT SOLD ONLINE (

RELATED ITEMS | PRODUCT OVERVIEW | SPECIFICATIONS | RECOMMENDED ITEMS | CUSTOMER REVIEWS | SHI

## DIMENSIONS

| | | | |
|---|---|---|---|
| Coverage Area (sq. ft.) | 200 | Product Height (in.) | 29.76 |
| Product Depth (in.) | 11.81 | Product Width (in.) | 13.86 |

## DETAILS

| | | | |
|---|---|---|---|
| A/C Cooling Rate (BTU/hr) | 8000 | Filter Type | Washable |
| A/C Coverage Area (sq. ft.) | 200 | Filter light reminder | No |
| Air Conditioner Product Type | Portable Unit | Heater included | No |
| Air direction/circulation | 4-way | Hose Exhaust | Single |
| Amperage (amps) | 8 | Moisture removal capacity (pints/day) | 48 |
| Automatic shutoff | No | Number of Fan Speeds | 2 |
| BTU Cooling Rating | 8000 | Number of cool settings | 2 |
| Casters | Yes | Product Weight (lb.) | 48 lb |
| Color | White | Remote Control | Yes |
| Color Family | White | Returnable | 90-Day |
| Controls | Digital | Self-diagnostic tools | No |
| Cord Length (ft.) | 6 | Sleep setting | No |
| Decibel Rating | 55 dBA | Timer | Yes |
| Decibel Rating (Indoor) | 55 dBA | Vent hose configuration | Single |
| Drain hose connection | Yes | Voltage (volts) | 115 |
| Energy Efficiency Ratio (EER) | 9.0 | Window venting kit included | Yes |

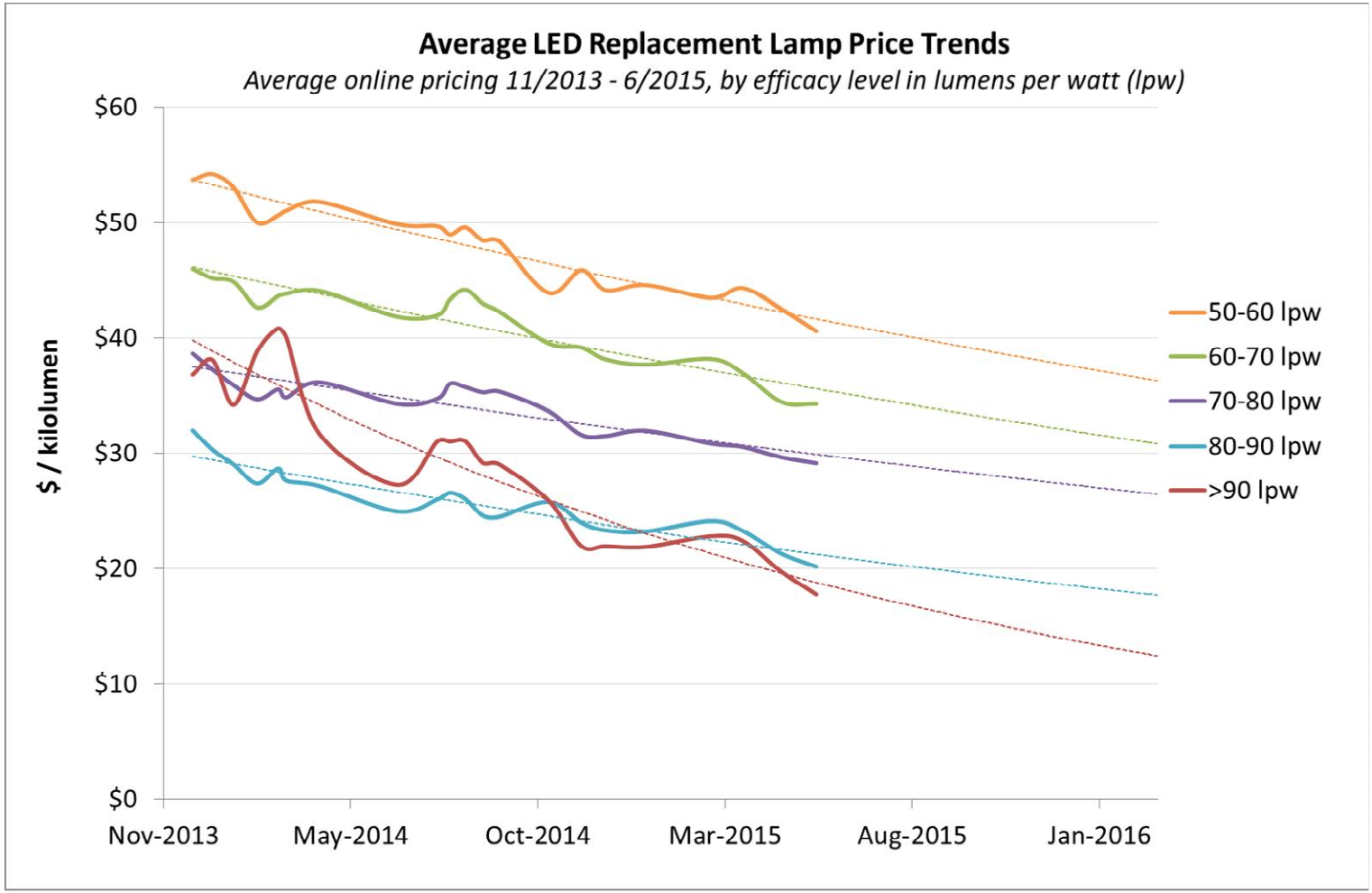
# Enter Web-crawlers

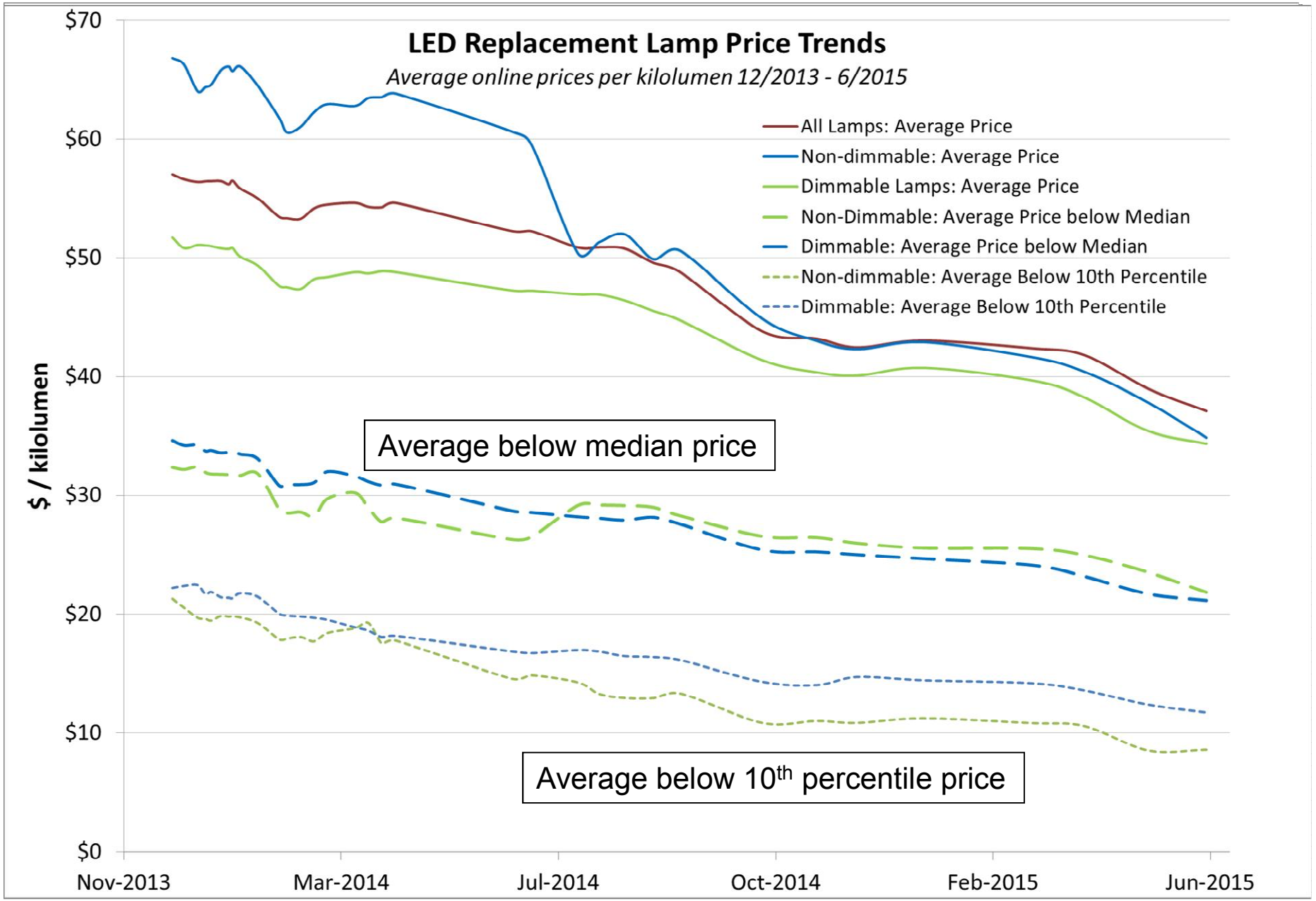
- Custom web-crawlers
  - Designed to pull granular data from online retailers at regular intervals
  - Augments traditional data collection methods:
    - Greatly expands the pool of data at lower cost and with lower time investment
    - Allows for better tracking of trends and projections
    - Allows for much more robust, precise analysis

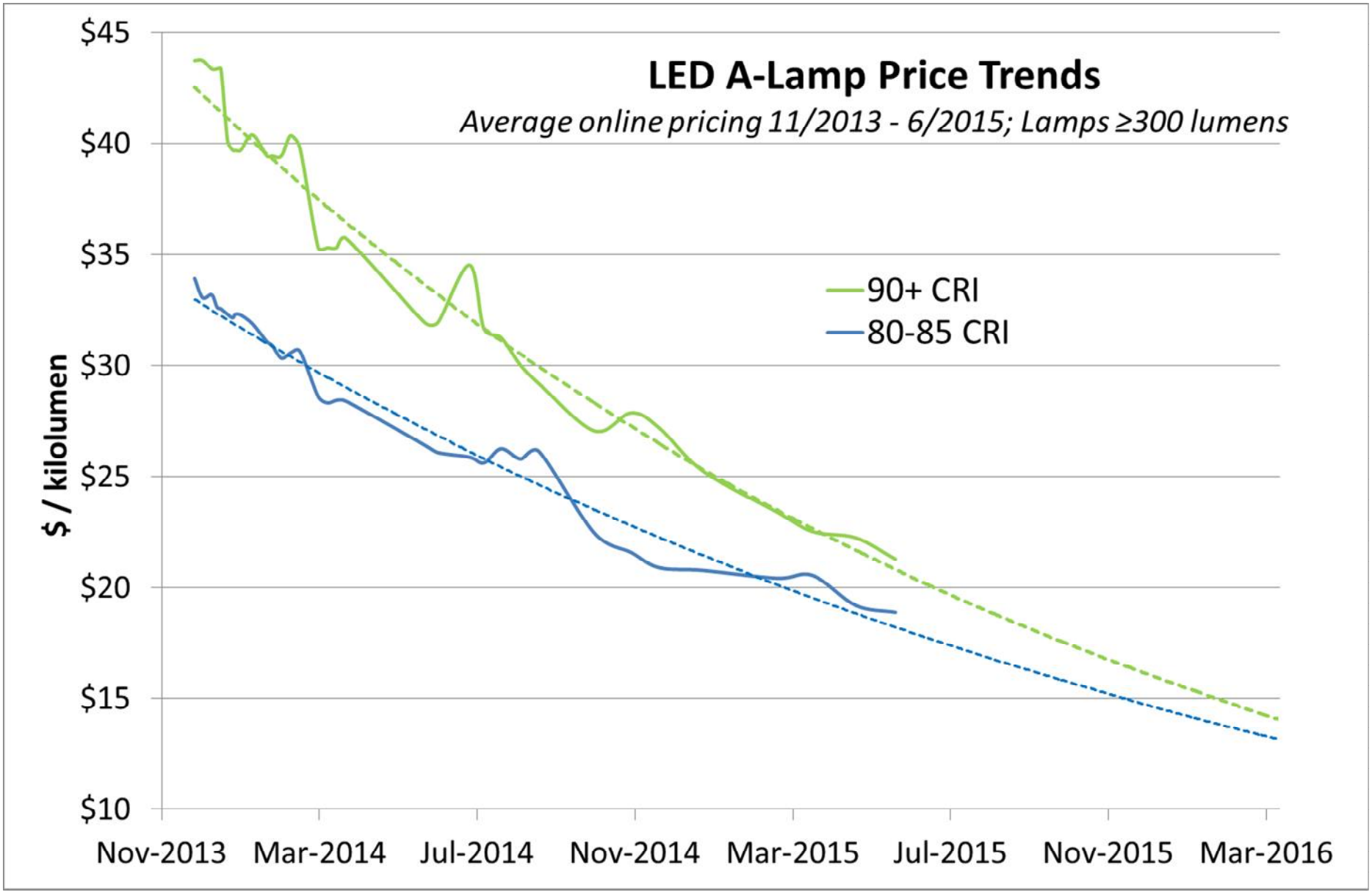
# Working through the limitations

- Not all products are sold online
- Not all retailers have websites
  - At least capture the majority
- Data are not sales weighted
  - Amazon “Best Sellers” may indicate sales weights
  - Lower prices ….suggest higher sales
  - Opportunity to combine with sales data
- Online prices are not necessarily the same as store prices
  - Calibration opportunity with in-store survey
- Retailers may not provide all relevant performance metrics
  - Combining with other public databases, like the ENERGY STAR QPL
- Some prices could be rebated
  - Understand the utility incentive structure for the product class

# Exploring the Potential: LED Lamps



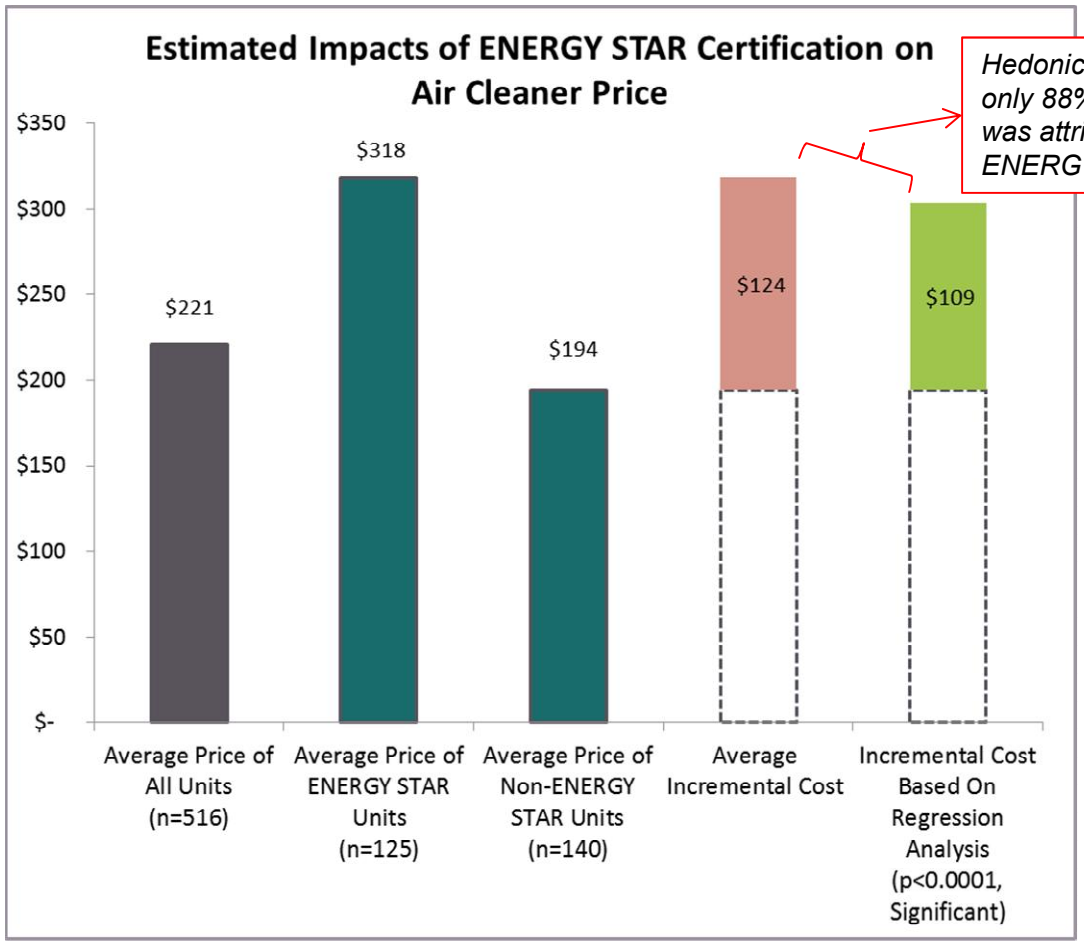

LED Replacement Lamp Price Trends
Average online prices per kilolumen 12/2013 - 6/2015
All Lamps: Average Price
Non-dimmable: Average Price
Dimmable Lamps: Average Price
Non-Dimmable: Average Price below Median
Dimmable: Average Price below Median
Non-dimmable: Average Below 10th Percentile
Dimmable: Average Below 10th Percentile
$ / kilolumen
$70
$60
$50
$40
$30
$20
$10
$0
Nov-2013
Mar-2014
Jul-2014
Oct-2014
Feb-2015
Jun-2015
Average below median price
Average below 10th percentile price


LED A-Lamp Price Trends
Average online pricing 11/2013 - 6/2015; Lamps ≥300 lumens
$ / kilolumen
$45
$40
$35
$30
$25
$20
$15
$10
90+ CRI
80-85 CRI
Nov-2013
Mar-2014
Jul-2014
Nov-2014
Mar-2015
Jul-2015
Nov-2015
Mar-2016

# Statistics Analysis to Estimate Incremental Costs: Air Cleaners

Regression model:

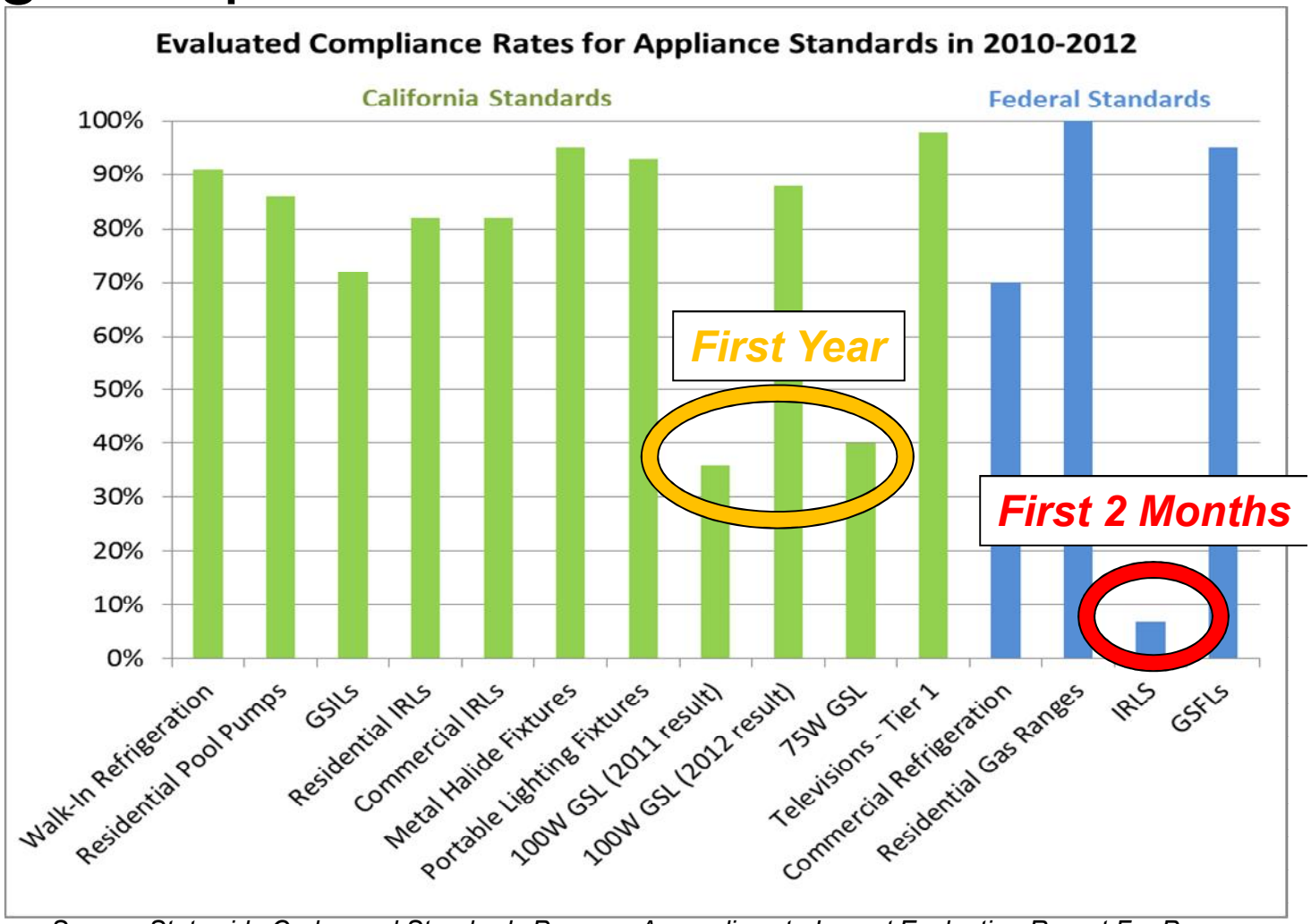
- Remove the impact of other performance features that may be impacting price
- Isolate the incremental measure cost




*Hedonic model found that only 88% of the average IMC was attributable to the ENERGY STAR certification*

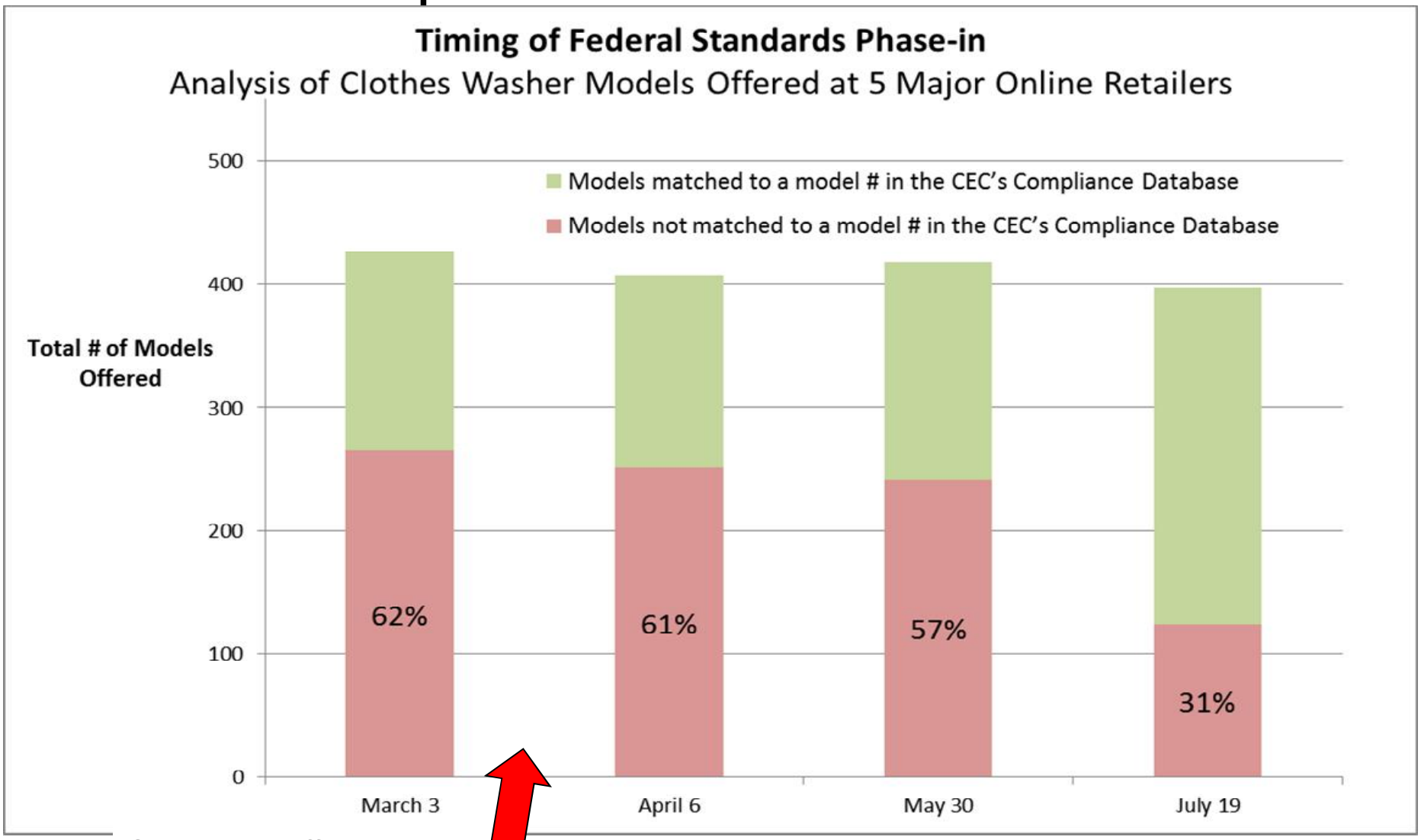
# Appliance Standards Evaluations:
## Assessing Compliance Rates

- Standards apply to date of manufacture, and it takes time for product to move through the distribution chain
- The observed compliance rates will depend a lot on how and *when* you assess compliance




*Source: Statewide Codes and Standards Program Appendices to Impact Evaluation Report For Program Years 2010-2012, Prepared for CPUC*

# Using Web-crawlers to Track Appliance Standards Impacts in Real Time



# Moneyball Analogy

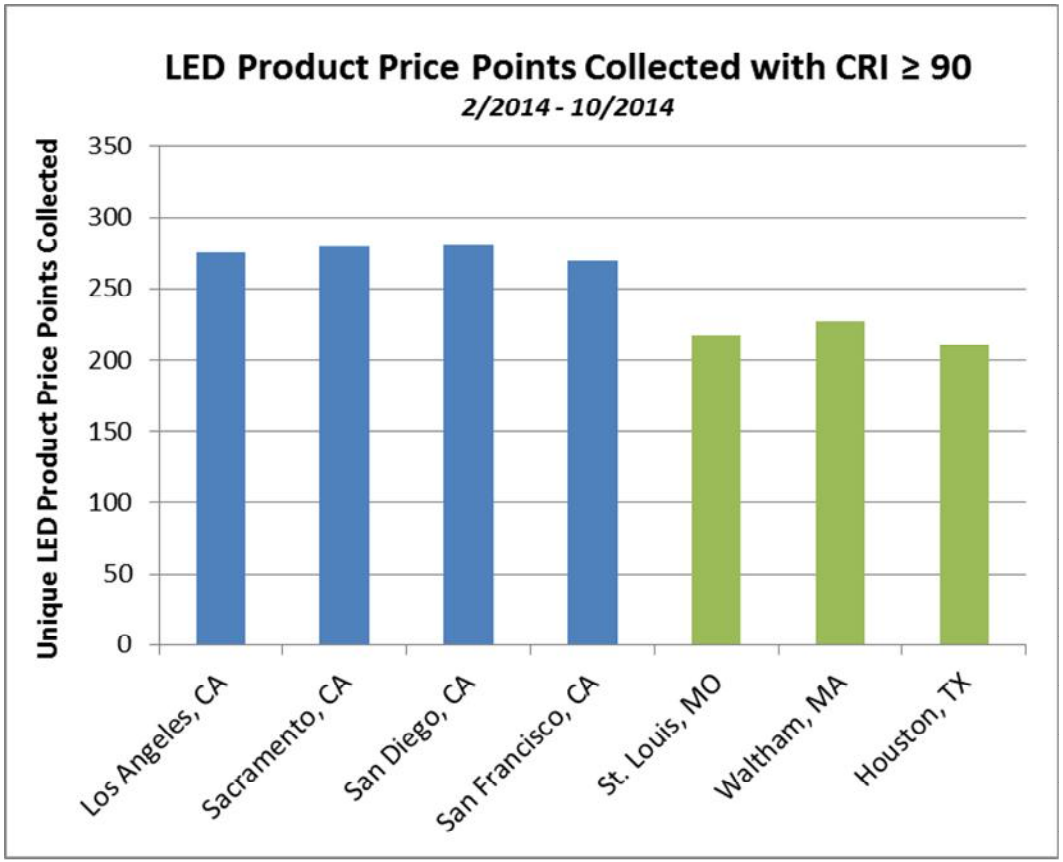
"Statcast, a 3-D tracking system that provides detailed metrics on the locations and movements of the ball, the players, and even the umpires…will proliferate not just through the ranks of all professional sports but to youth sports, affecting everything from how games are taught to the statistical nomenclature of sport"

-Billy Beane. July 7, 2014. "A Tech-Driven Revolution." Wall Street Journal

**Conclusion:** The opportunities for *big data* have just begun.

# Other opportunities for Web-crawlers

- Location analysis
  - Web-crawlers can be programmed to collect data from specific zip codes
  - Potential to track program impacts by region
- Include time as a variable in regression models
- Customer rating scores
- International Data
- Others…



Thanks!

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