

# Evaluation of Red Light Cameras using a Cost-Benefit Analysis

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AP Research 2017-2018

# What are red light cameras?

- Systems that take pictures during red timing intervals
- Often contracted out<sub>1</sub>



# Previous Research

- Red light cameras have been shown to reduce intersection crashes. <sup>2</sup>
  - However, few studies have evaluated the cost benefit of red light camera systems in preventing injury or death.

# Purpose of Research

The implication of red light cameras are effective at reducing red light related intersection collisions.

- Decrease in right angle collisions
- Increase in rear end collisions<sub>3</sub>

This project evaluates the cost benefit per injury or death avoided while accounting for ticket citation costs.

# Question:

- How cost effective are red light cameras in reducing intersection collisions?
  - How effective are they regarding cost per injury avoided?
  - How effective are they regarding cost per fatality avoided?

# Methods

- Texas red light camera systems information public data
- Cost data derived from NHI & local government websites<sub>4</sub>
  - Equipment costs (e.g, Camera/Maintenance - \$26,667 & \$60,000)
  - Vehicle costs (\$3,200)
  - Injury/Fatality costs (\$20,000)
- Pre- & Post- data
- Tickets issued from each camera

City	Mean value time to work (minutes) (2012-2016)	Land area in square miles (2010)	Medium income/household (in 2016 dollars)	Number of households (2012-2016)	Persons/household (2012-2016)
Denton, TX	24.0	87.95	\$50,487	44926	2.62
Ventura, CA	24.6	21.66	\$70,541	40653	2.64
Oxnard, CA	24.8	26.89	\$61,709	50839	4.00
Thousand Oaks, CA	25.8	55.03	\$101,045	45873	2.76
Fort Worth, TX	26.8	339.82	\$54,876	279426	2.86
Simi Valley, CA	29.5	41.48	\$91,196	42209	2.97
Frisco, TX	29.7	61.8	\$117,642	48664	2.99
Mesquite, TX	30.7	46.02	\$50,804	47086	3.04

# Data Analysis: Mesquite

Annual Cost: Mesquite for Municipality (4 Intersections)

	Before	After
camera	\$0	\$106,668
camera maintenance	\$0	\$240,000
vehicle cost/collision	\$25,600	\$3,200
injuries	\$160,000	\$20,000
fatalities	\$0	\$0
<b>TOTAL</b>	<b>\$185,600</b>	<b>\$369,868</b>

- Ticket costs are not accounted
- Reduced 7 injuries at cost of \$184,268
- Cost of \$26,324 per injury avoided



# Data Analysis: Mesquite

## Annual Cost: Mesquite for Citizens (4 Intersections)

	Before	After
camera	\$0	\$106,668
camera maintenance	\$0	\$240,000
vehicle cost/collision	\$25,600	\$3,200
injuries	\$160,000	\$20,000
fatalities	\$0	\$0
tickets	\$0	\$472,350
<b>TOTAL</b>	<b>\$185,600</b>	<b>\$842,218</b>

- Reduced 7 injuries at cost of \$656,618
- Cost of \$93,802 per injury avoided taking into account tickets

# Data Analysis: Fort Worth

## Annual Cost: Fort Worth for Municipality (35 Intersections)

	Before	After
camera	\$0	\$933,345
camera maintenance	\$0	\$2,100,000
vehicle cost/collision	\$304,000	\$51,200
injuries	\$1,420,000	\$540,000
fatalities	\$40,000	\$0
<b>TOTAL</b>	<b>\$1,764,000</b>	<b>\$3,624,545</b>

- Results are higher to smaller city of Mesquite
- Cost of \$40,447 per injury/fatality avoided (46 total avoided)

# Data Analysis: Fort Worth

## Annual Cost: Fort Worth for Citizens (35 Intersections)

	Before	After
camera	\$0	\$933,345
camera maintenance	\$0	\$2,100,000
vehicle cost/collision	\$304,000	\$51,200
injuries	\$1,420,000	\$540,000
fatalities	\$40,000	\$0
tickets	\$0	\$11,051,325
<b>TOTAL</b>	<b>\$1,764,000</b>	<b>\$14,675,870</b>

- 147,351 tickets were issued at an average cost of \$75
- \$280,693 per injury/fatality avoided
  - \$6,455,935 per fatality avoided (2 fatalities)

# Thresholds

WHO and ACC/AHA Criteria for Cost-Effectiveness Thresholds			
\$/QALY Thresholds			
WHO	“Highly cost-effective”	“Cost-effective”	“Not cost-effective”
	<1 XGDP per capita	1-3XGDP per capita	>3XGDP per capita
ACC/AHA	“High value”	“Intermediate value”	“Low value”
	<\$50,000	\$50,000 to \$150,000	>\$150,000

ACC: American College of Cardiology; AHA: American Heart Association; GDP: gross domestic product; QALY: quality-adjusted life year; WHO: World Health Organization

# Calculation of Potential Budget Impact Threshold

Item	Parameter	Estimate	Source
1	Growth in US GDP, 2017 (est.) +1%	3.20%	World Bank, 2016
2	Total health care spending, 2016 (\$)	\$2.71 trillion	CMS NHE, 2014
3	Contribution of drug spending to total health care spending (%)	17.7%	CMS National Health Expenditures (NHE), 2016; Altarum Institute, 2014
4	Contribution of drug spending to total health care spending (\$) (Row 2 x Row 3)	\$479 billion	Calculation
5	Annual threshold for net health care cost growth for ALL new drugs (Row 1 x Row 4)	\$15.3 billion	Calculation
6	Average annual number of new molecular entity approvals, 2015-2016	33.5	FDA, 2017
7	Annual threshold for average cost growth per individual new molecular entity (Row 5 ÷ Row 6)	\$457.5 million	Calculation
8	Annual threshold for estimated potential budget impact for each individual new molecular entity (doubling of Row 7)	\$915 million	Calculation

ICER (Institute for Clinical and Economic Review) Budget Impact Threshold

# Limitations

- Data only included positive outcome cities
- No controls on the yellow signal timing
- Cost was assumed fixed amongst cities
- Cost of insurance rates were not taken into account
- Cost of funereal services were not taken into account

# Further Research

- Spill over effect
- Conduct research on Oxnard, California
- Revenue & politics that affect camera effectiveness

# References

1. Retting R., Williams A. Farmer. C, Feldman A. (1998). Evaluation of red light camera enforcement in Oxnard, CA. *Elsevier*, 1 69-174. doi:10.1016/S0001-4575(98)00059-1.
2. Jack Lucero Fleck., Bridget B. Smith. (1999). Can we make red light runners stop?. *Transportation Research Record*, 2-8. doi: 10.3141/1693-08.
3. Richard Tay. (2009). The effectiveness of automated and manned traffic enforcement. *International Journal of Sustainable Transportation*. 178-186. Doi: 10.1080/15568310801915559.
4. [https://safety.fhwa.dot.gov/facts\\_stats/t75702.cfm](https://safety.fhwa.dot.gov/facts_stats/t75702.cfm)



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