



An Analysis of Automated Speed Enforcement in Charlotte, North Carolina





Acknowledgements

- ITRE – Institute for Transportation Research & Education
- Chris Cunningham – research team leader





Objective

- Answer the questions
- “Do Automated Speed Enforcement Cameras change driver behavior?”
- “How can this be measured?”





Outline

- *Background – Why photo speed enforcement?*
- *Overview of Charlotte's speed enforcement program – How it Works!*
- *Data and Results*
 - Speed studies
 - Collision study
 - Findings





Background

- Interesting National statistics
 - Estimated cost of speed related crashes is \$40.4 billion/yr
 - High speeds are related to nearly 30% of all reported crashes
 - 86% of speeding related fatalities occurred on non-Interstate roadways.





Background

- Interesting Local statistics
 - Over 26,000 collisions during 2003
 - More than 5,000 speed related collisions
 - 2,771 persons injured in speed related collisions.
 - 26 speed related fatalities in 2003.





Charlotte's Program

- Mobile speed enforcement
- Utilizes three camera equipped vans
- Trained officer monitors system
- Program limited to 14 designated corridors
- \$50.00 citation mailed to the registered owner of the vehicle





Charlotte's Mobile Unit





Charlotte's Mobile Unit





Data & Results

- Measuring the effects of a photo speed enforcement program.
 - Crash data
 - Speed data
- Collision data needs
 - Minimally 3 years before, 5 years is becoming preferred.
- Speed Data needs
 - Before and after 24 hour speed studies, longer speed studies desirable, but expensive.





Data & Results

- Charlotte collision data
 - Collision data available from 1997-2006.
 - Collisions are validated and geo-located by CDOT staff.
 - Minimal data elements needed for a meaningful before and after study;
 - Collision type
 - Injury status of driver and occupants
 - Contributing circumstances
 - Time of day
 - Weather conditions





Data & Results

- Charlotte speed data
 - Developed a list of 80 locations based on the 14 enforcement corridors
 - Also selected 40 additional locations to serve as “control locations
 - Speeds were collected using road tube counters over 24 hours
 - Hired consultant to complete the work over the course of 30 days.
 - Done to limit seasonal effects for future studies.
 - Counts conducted annually since 2003





Results

- **Variances**
 - *Treatment and Comparison* sites showed “significant” differences in variances.
- **Median Speeds**
 - Treatment sites decreased “significantly” by 0.88 mph.
 - Comparison sites decreased “non-significantly” by 0.28 mph.
- **85th Percentile Speed**
 - Treatment Sites decreased “significantly” by 0.99 mph
 - Comparison sites decreased “non-significantly” by 0.3 mph





Results....cont.

- Mean Speeds – Posted Speed Limit
 - Treatment sites decreased “significantly” by 0.91 mph
 - Comparison sites decreased “non-significantly” by 0.29 mph
- Total Mean Speeds
 - *Treatment* sites declined “significantly” by 0.91 mph.
 - *Comparison* sites declined “non-significantly” by 0.29 mph.

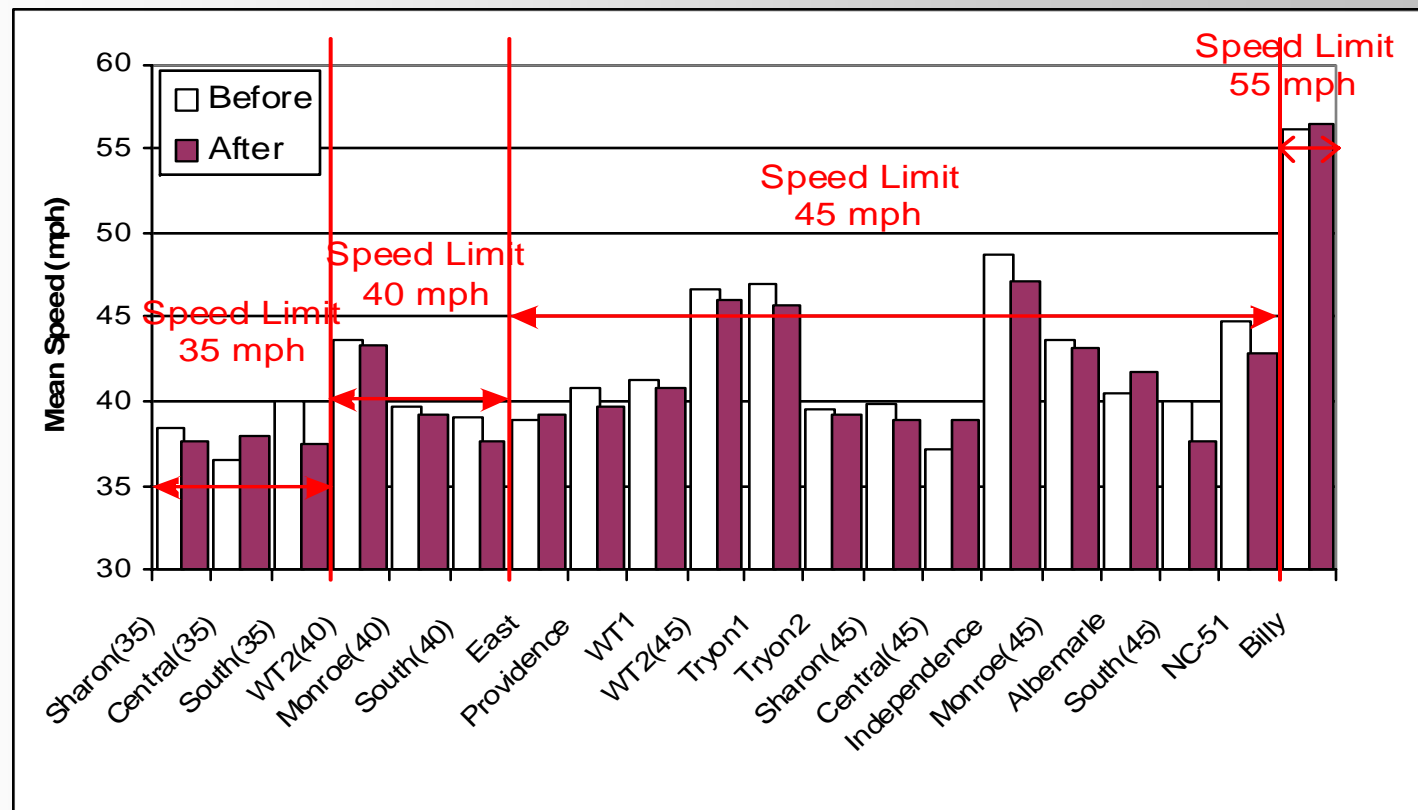




Results....cont.

• Mean Speeds by Site

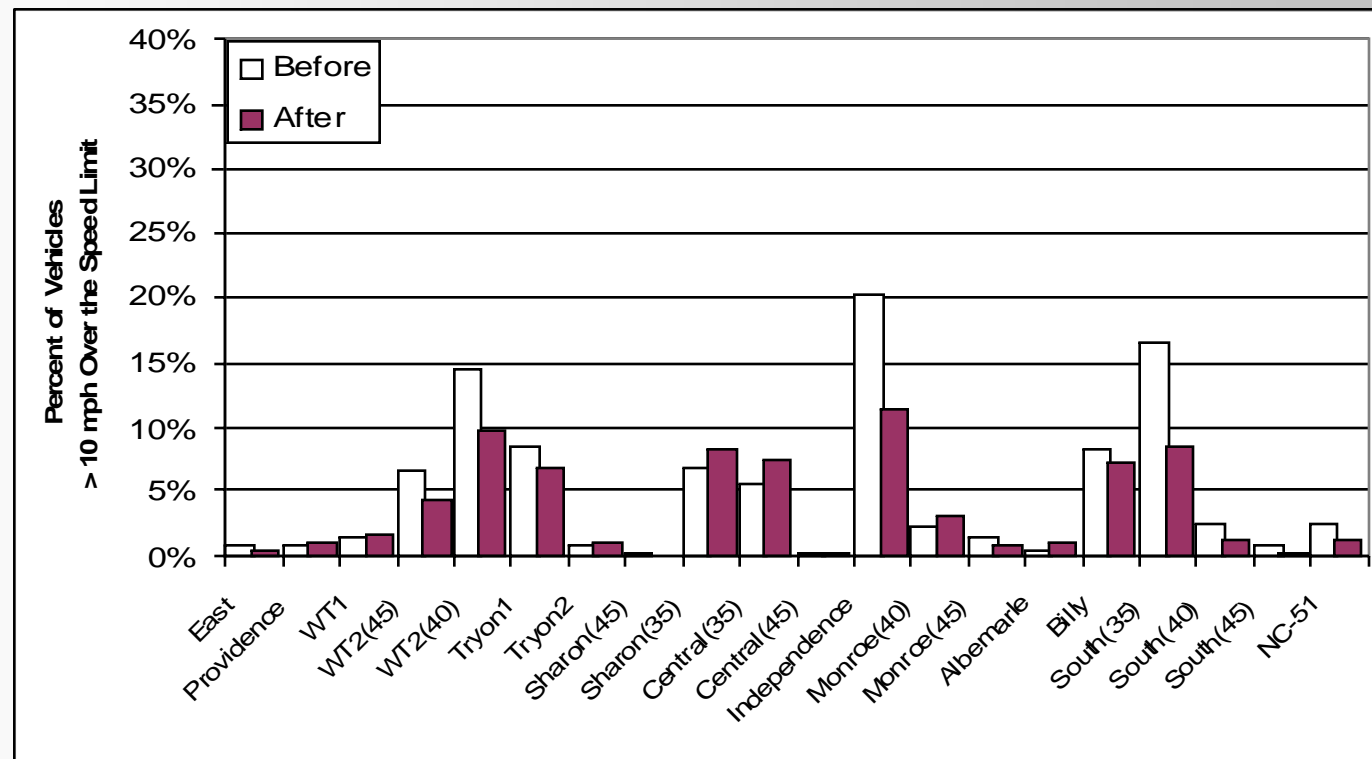
- 70% of *Treatment* sites had “significant” mean speed reductions (, with 25% “significant” increases in mean speed, 5% no change.





Results....cont.

- % of vehicles exceeding speed limits by 10 mph
 - Treatment sites decreased “significantly” by 55%.
 - Comparison sites increased “non-significantly” by 0.7%.



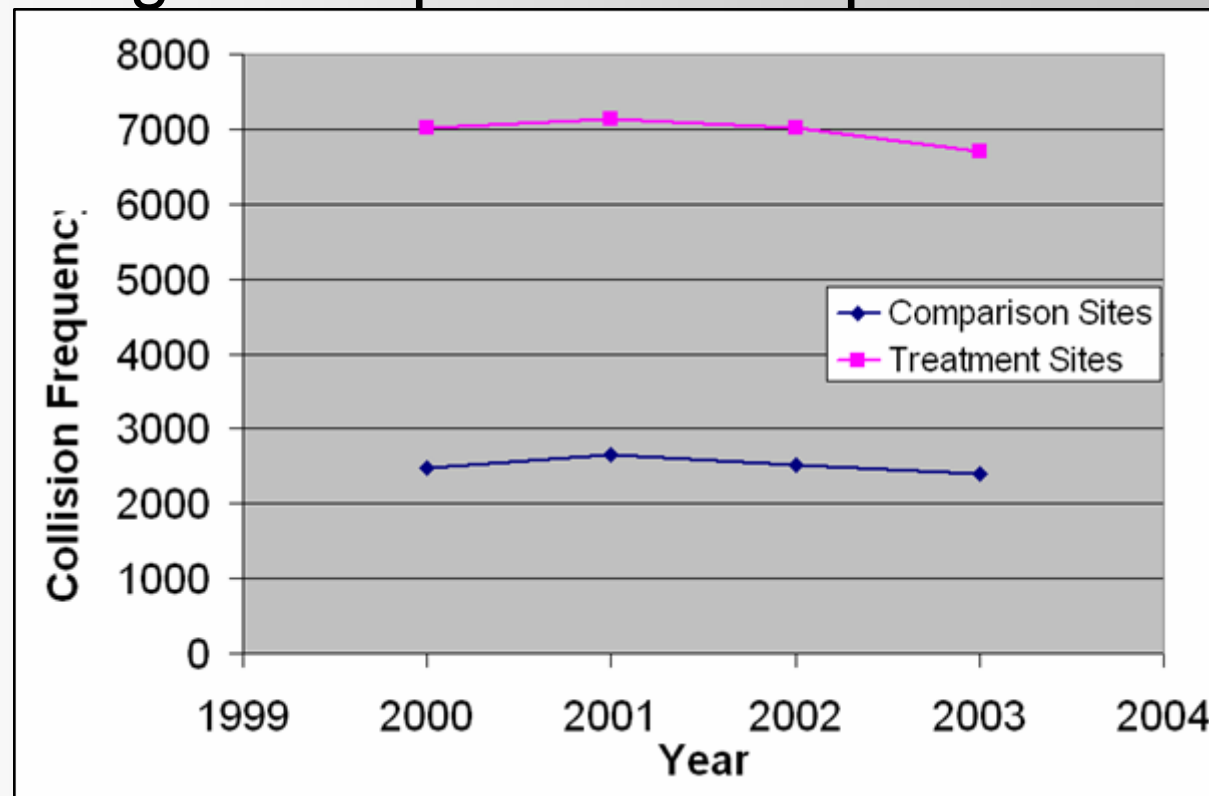
Treatment Sites – Day Time





Analysis 2: B/A Collision Study

- Hauer's "Observational Before-After Studies in Road Safety", Chapter 9: Using a Comparison Group





Analysis 2: B/A Collision Study

CHAP 9 - USING A COMPARISON GROUP

	Treatment	Comparison		Sample Odds Ratio	
K	31185	11275	M	$m(o) =$	1.0047
L	1767	725	N	$s^2(o) =$	0.001985
				$s(o) =$	0.022276
				$VAR(\omega) =$	0.000

Estimates		Effect on Safety	
$\lambda_{\text{treatment}} =$	1767	$\delta =$	238.1
$\Gamma_c =$	0.064	$\Theta =$	0.880
$\pi =$	2005	$\sigma(\delta) =$	88.3
$VAR(\lambda) =$	1767	$\sigma(\Theta) =$	0.040
$VAR(\pi) =$	6031		

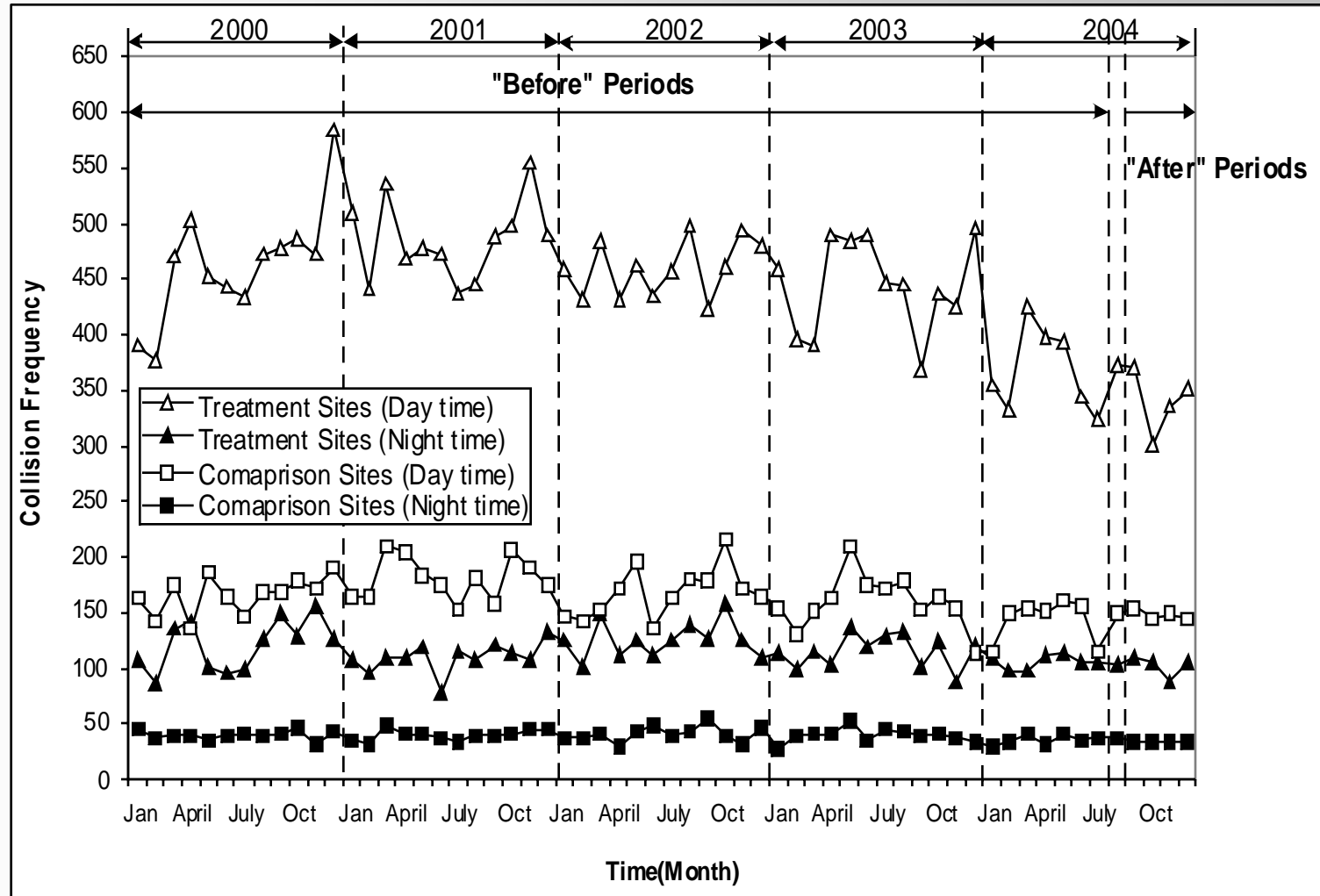
Reduction of 238 +/- 88.3 collisions or
 reduction of 12% +/- 4.0% from the
 expected # of collisions

OR =	0.881	Using the Odds Ratio test, treatments sites were found to significantly decreased collisions by using a 95% Confidence Interval	12%
T =	2.783		
x =	-11.9		



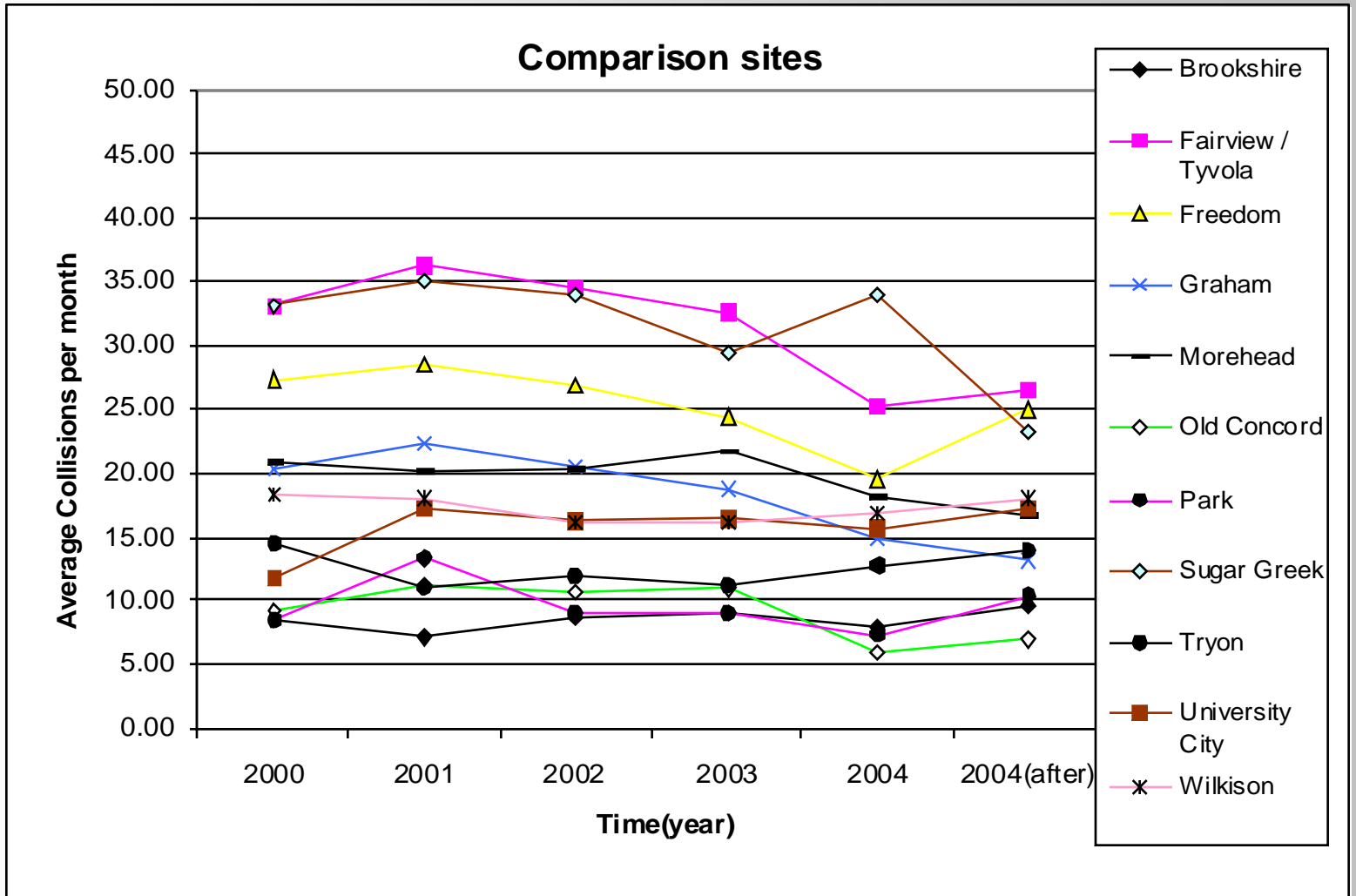


Collision Trends



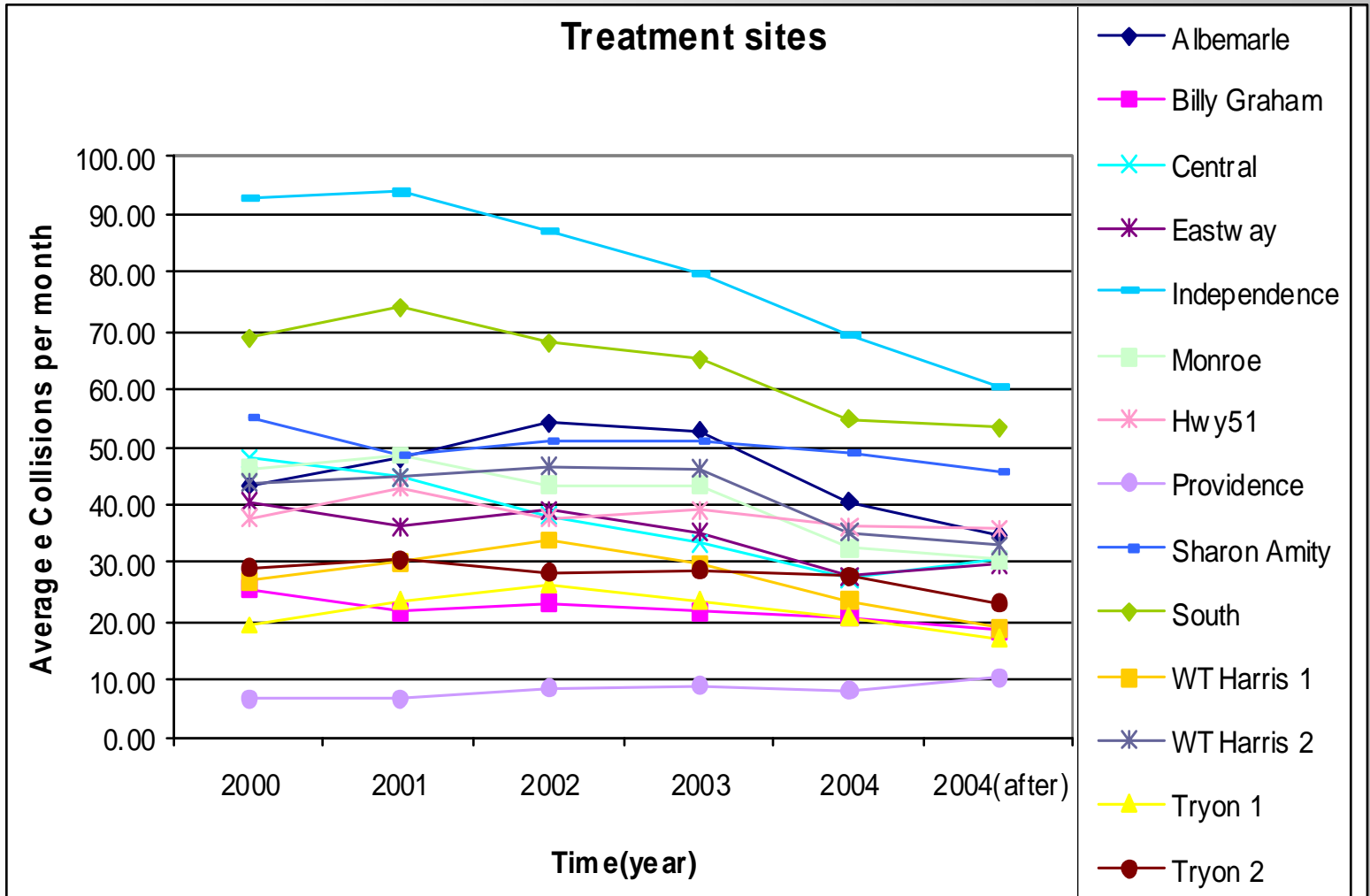


Collision Trends



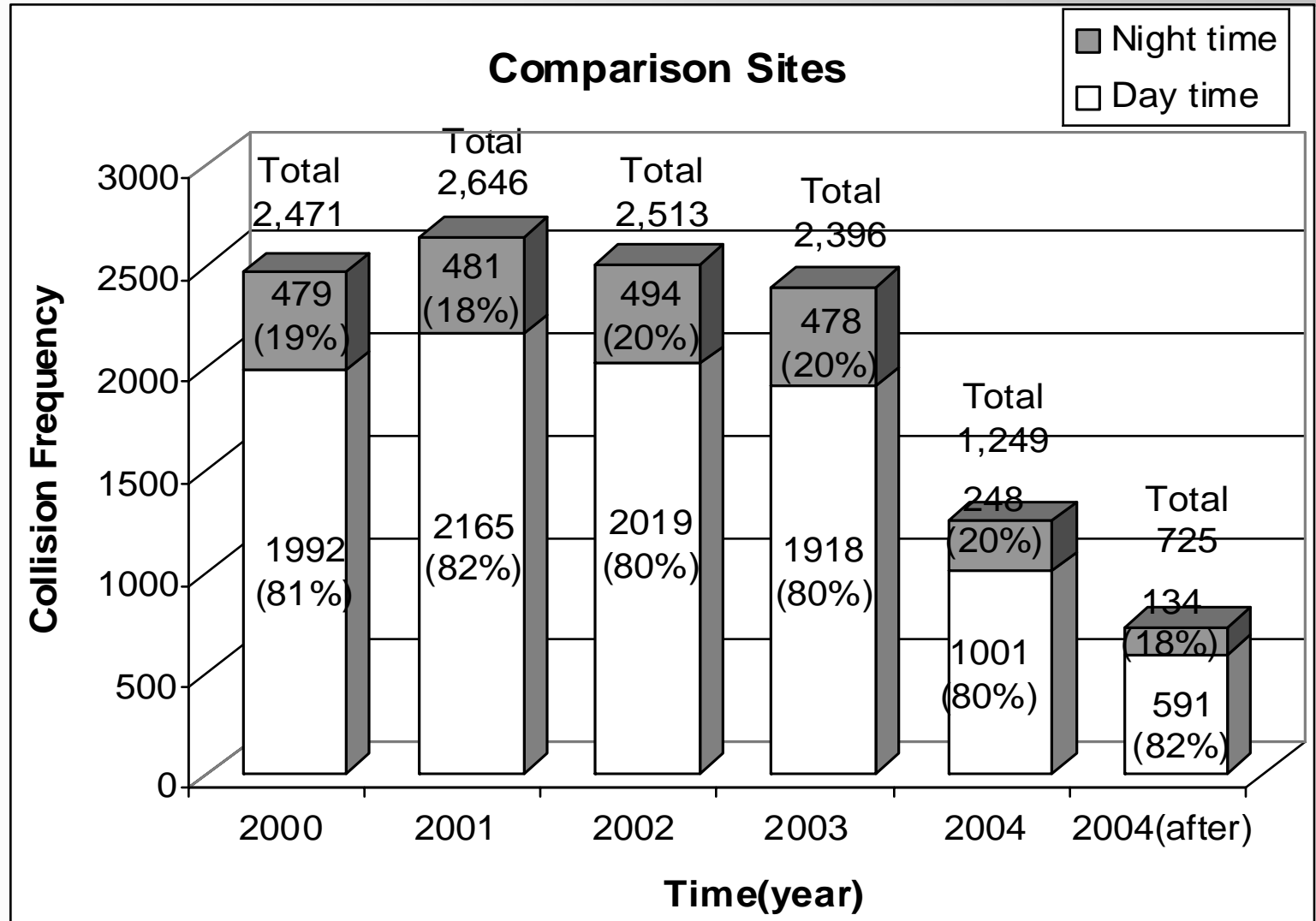


Collision Trends



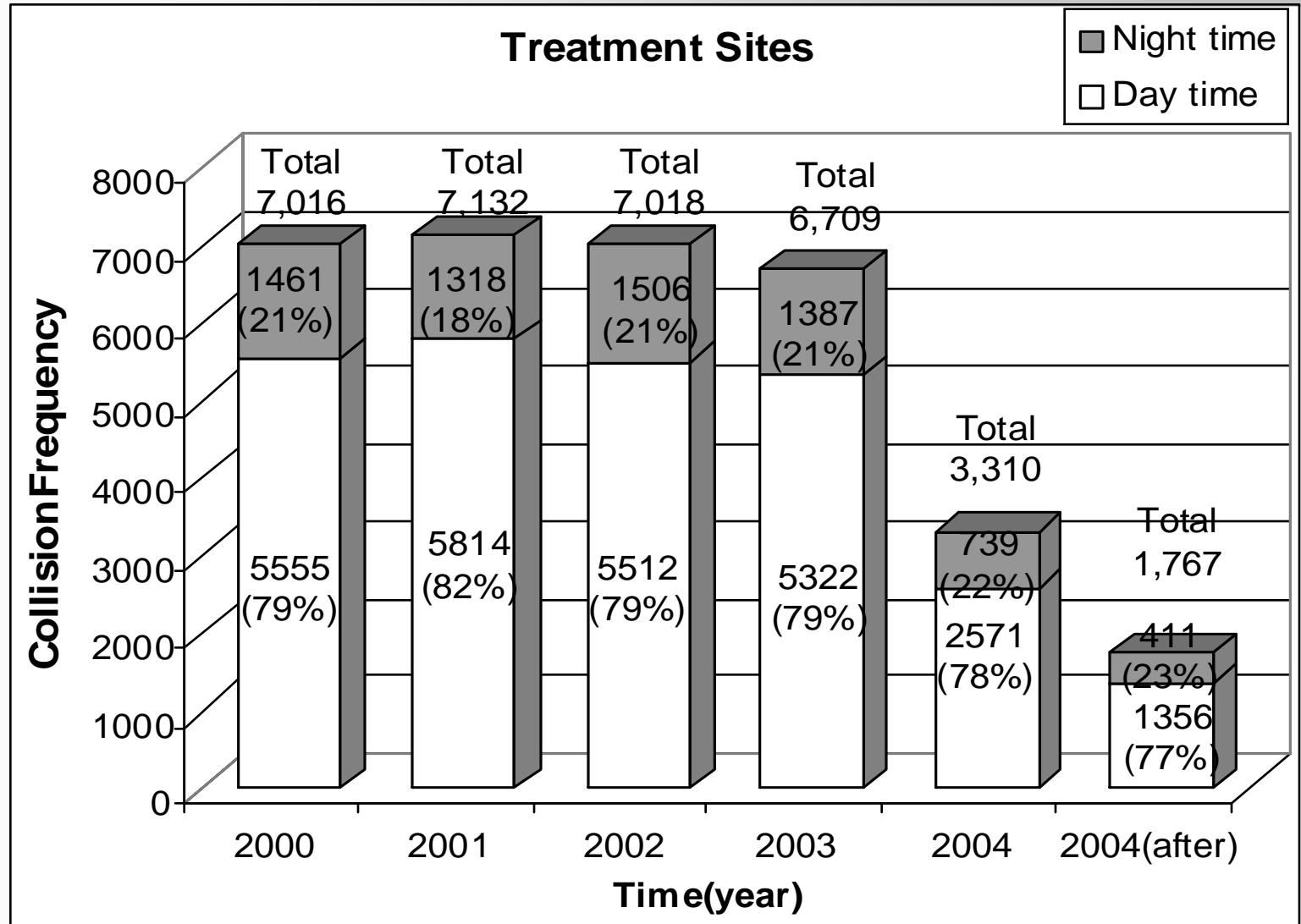


Collision Trends





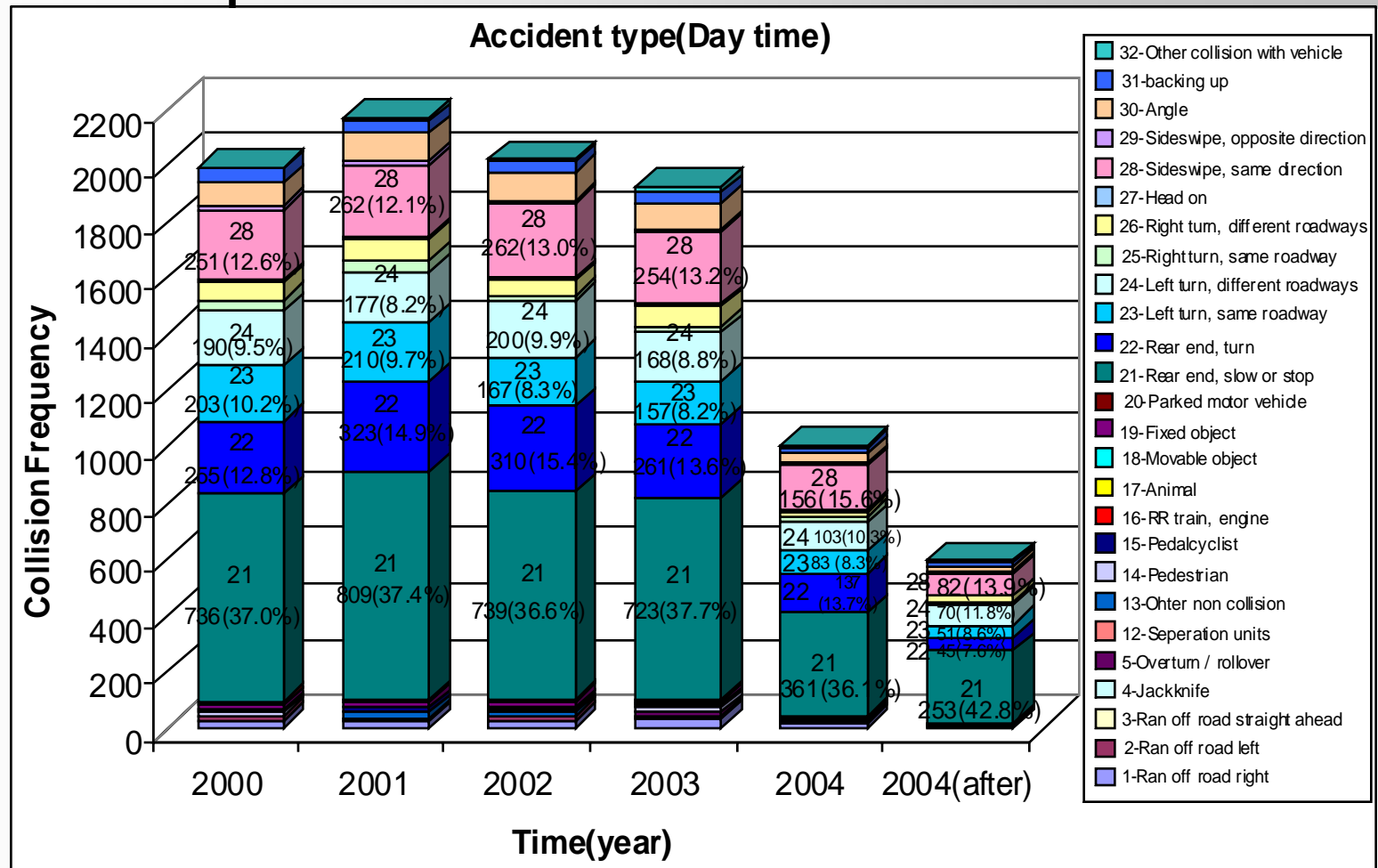
Collision Trends





Collision Trends

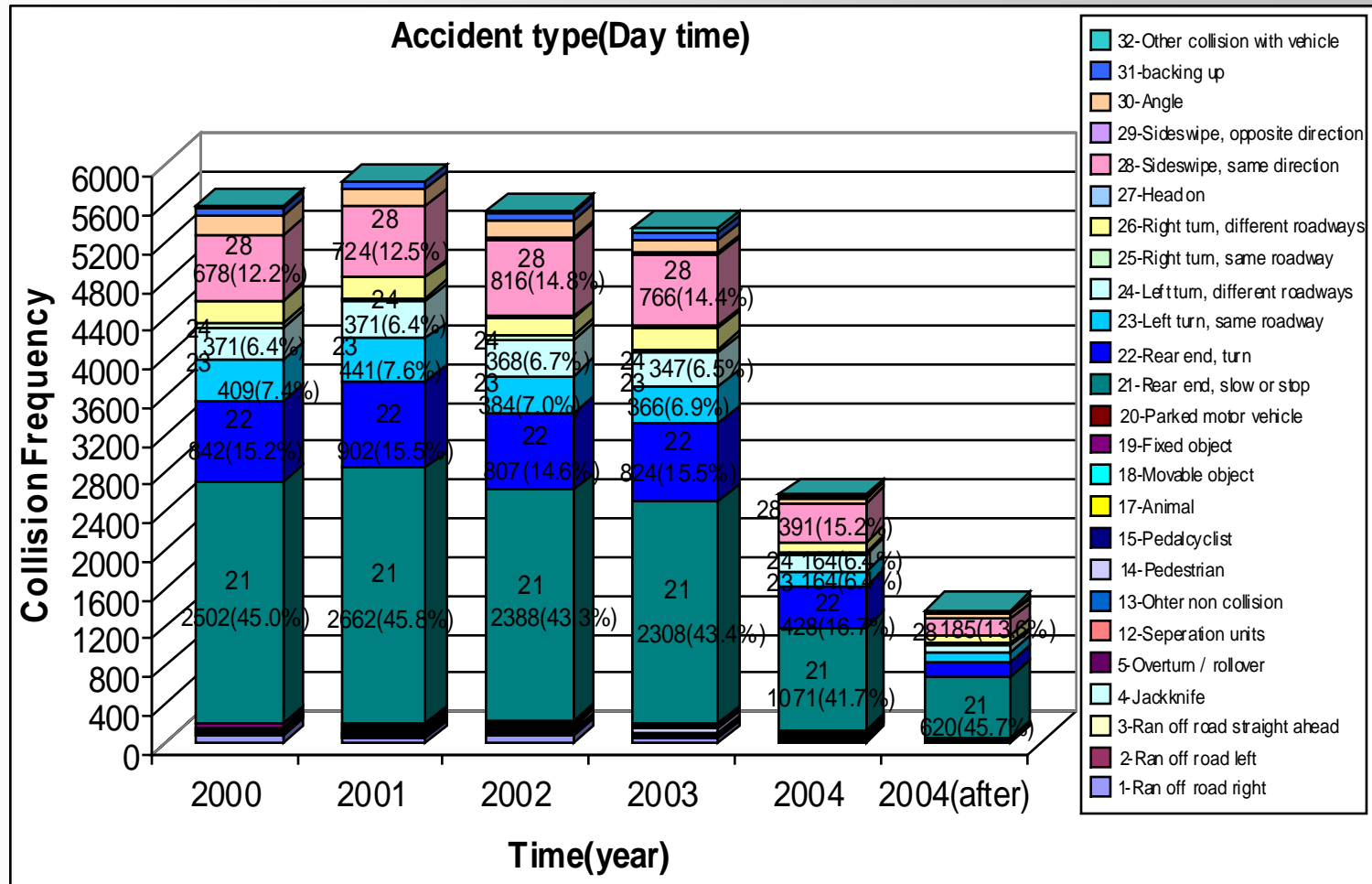
- Comparison Sites





Collision Trends

- Treatment Sites





Analysis Conclusions

- Speeds decreased significantly in most categories.
- Collisions decreased approximately 12% at treatment sites.
- Trends in speeds and collisions seem to show certain sites may have been enforced more heavily than others and more heavily during the day and night.





Analysis Conclusions

- Overall, automated speed enforcement indicates a change in driver behavior with decreased speeds and collisions at the 95% confidence interval.





Summary

- Charlotte DOT's collision and speed data allowed ITRE to conduct a meaningful Before and After study of the photo speed enforcement program.
- Based on prior studies, we expected a more significant reduction in speeds.
- Differences in data collection and study methodologies between jurisdictions are most likely the culprit.





Summary

- Charlotte's programs (red light and speed) are currently suspended.
- Results of a lawsuit involving the City of High Point, NC.
- Court ruling severely limits the amount of citations that local jurisdictions can retain to pay for the programs.





Summary

- Charlotte DOT plans to study the period after the suspension using similar methodology as in previous studies.
- Study will evaluate the effect of program suspension on motorist behavior at former treatment locations.





Questions

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