Accident Rates of Novice Drivers with Simulator Training

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This presentation concerns results of a research project on Novice Driver Training that we are conducting for the US Centers for Disease Control. This presentation describes the accident history of simulator trained novice drivers in comparison to traditionally trained drivers.

Project Objectives

- Develop PC Based Training and Assessment System
- Train 500 Unlicensed High School Students
- Compare Violation and Accident History of Simulator Trained Subjects with Traditionally Trained Drivers (Transfer of Training)

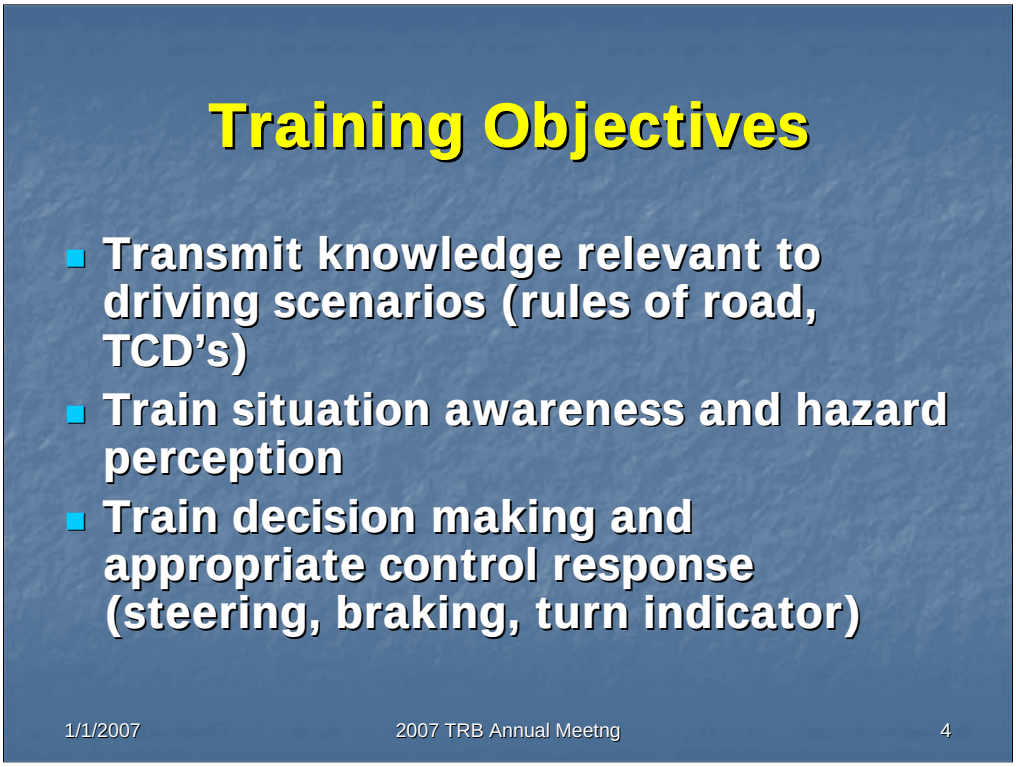
•Three phases to project: 1) develop training system; 2) train novice drivers; 3) analyze accident rates

•Just recently received accident data, this presentation includes preliminary results

Hypothesis:

Simulator Training Can Transfer to On-Road Performance and Reduce Novice Driver Accident Rate

Does simulator training reduce on-road accidents????



•A Power Point orientation was used to present information important for driving the simulation

•Information included background on TCD's (traffic control devices including markings, signs and signals), rules of the road and hazard scenarios.

•Driving scenarios contained a wide variety of hazards designed to train situation awareness, decision making and appropriate control response (steering, braking, turn indicator).

NOVICE DRIVER HARDWARE CONFIGURATIONS

Palos Verdes, San Diego

Hawthorne

Culver City

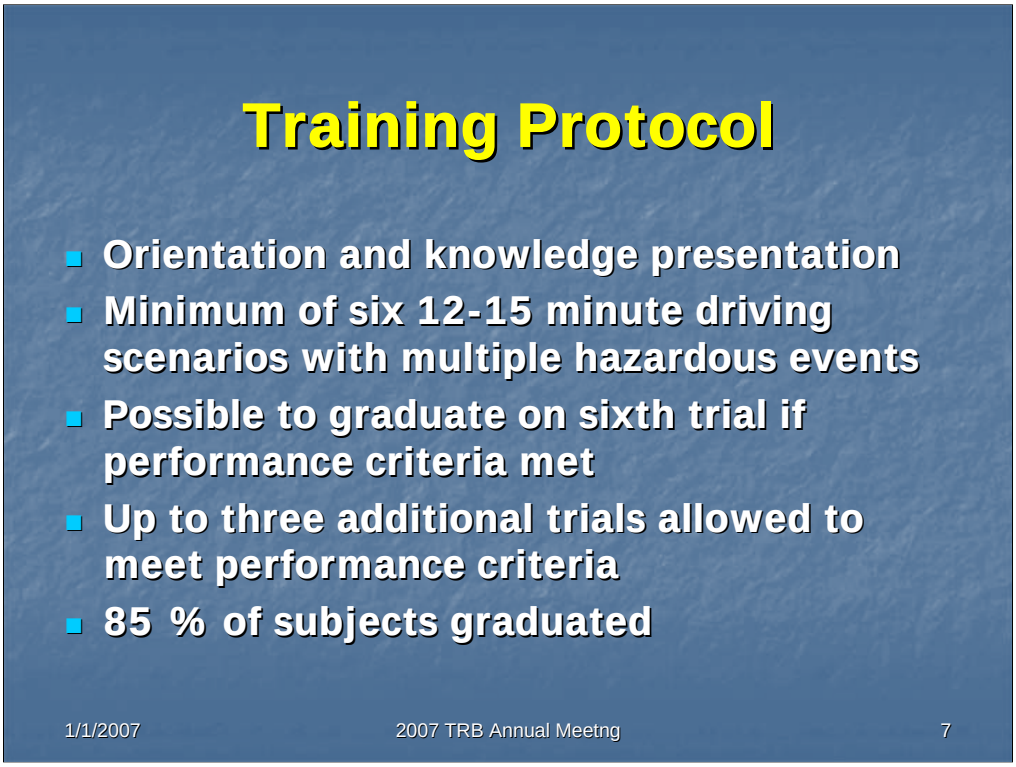
•Three levels of simulator fidelity: 1) High school computer lab, converted computers, low cost desk top set up; 2) Full cab, curved screen, high cost; 3) Desk top wide angle display, medium cost.

•Two settings: 1) research labs (Hawthorne and Culver City}; 2) High schools (Palos Verdes, San Diego).

Subject Recruitment

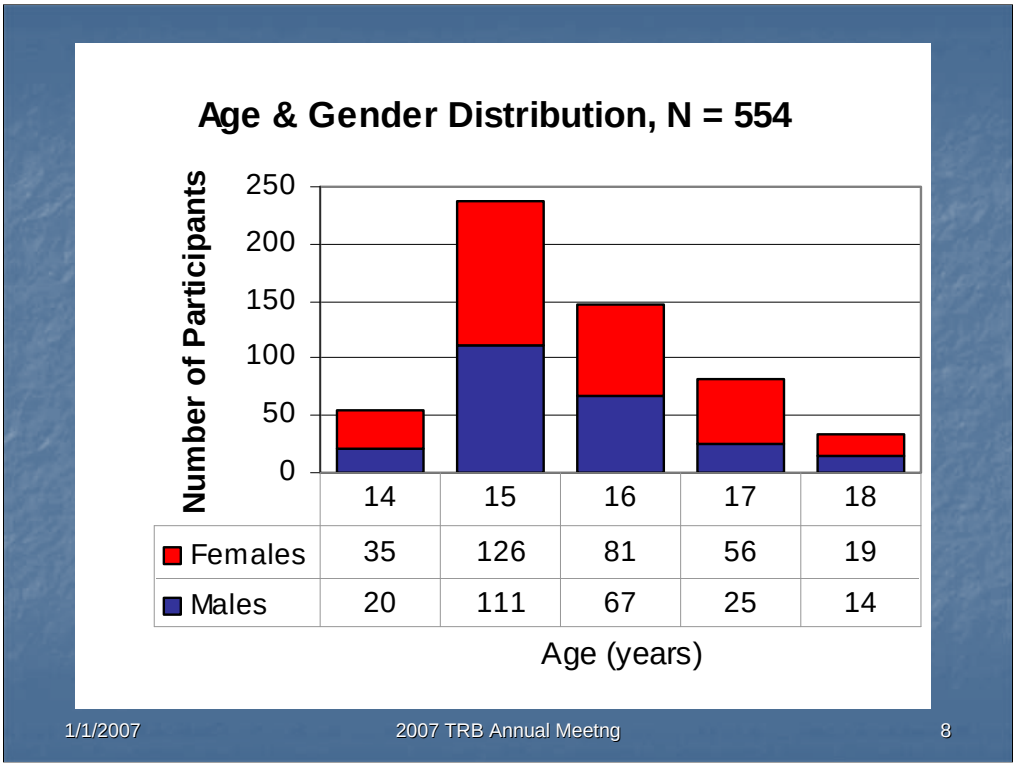
Geographic Region	Recruiting Method	Simulator Configuration	Number of Participants
Hawthorne, CA	DMV Office	Wide FOV Vehicle Cab	159
Culver City, CA	DMV Office	Wide FOV Desktop	180
Palos Verdes, CA	High School Drivers Ed.	Single Monitor Desktop	147
San Diego, CA	High School Drivers Ed.	Single Monitor Desktop	68

- **DMV (Dept. of Motor Vehicles) office: subjects randomly selected from line while waiting to get learner's permit. Given incentives to participate.**
- **High School Driver's Education classes at high schools: all students in class were recruited.**

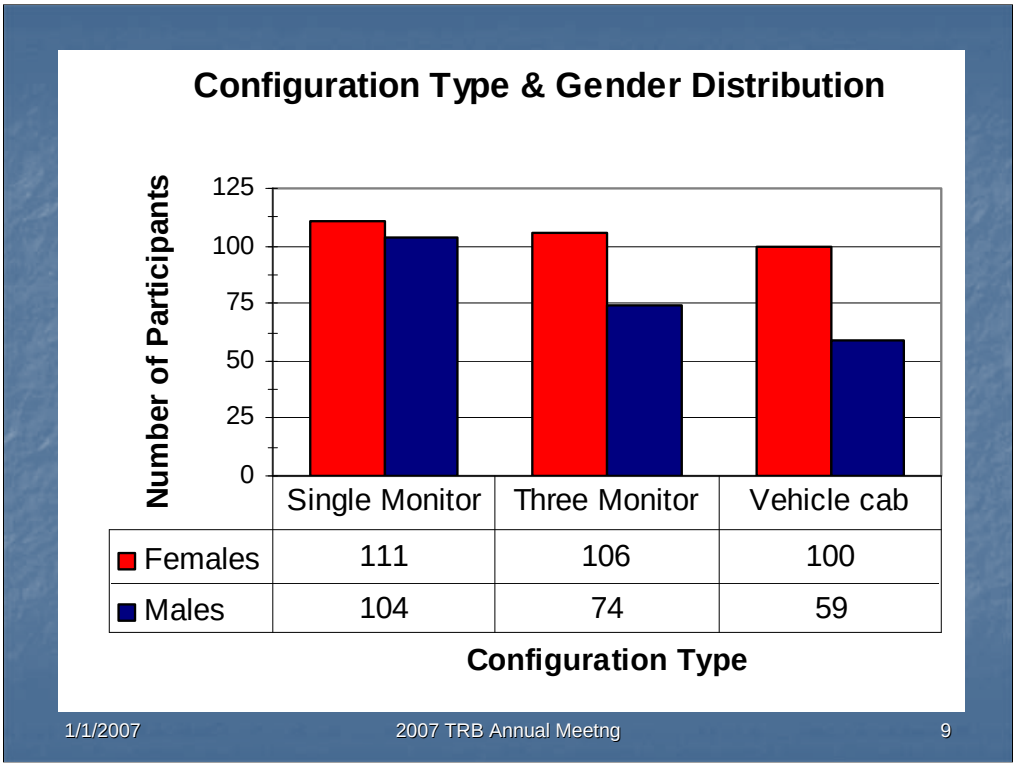


•Training protocol designed to be consistent with traditional driver education curricula.

•Presentation varied somewhat at each geographical location.

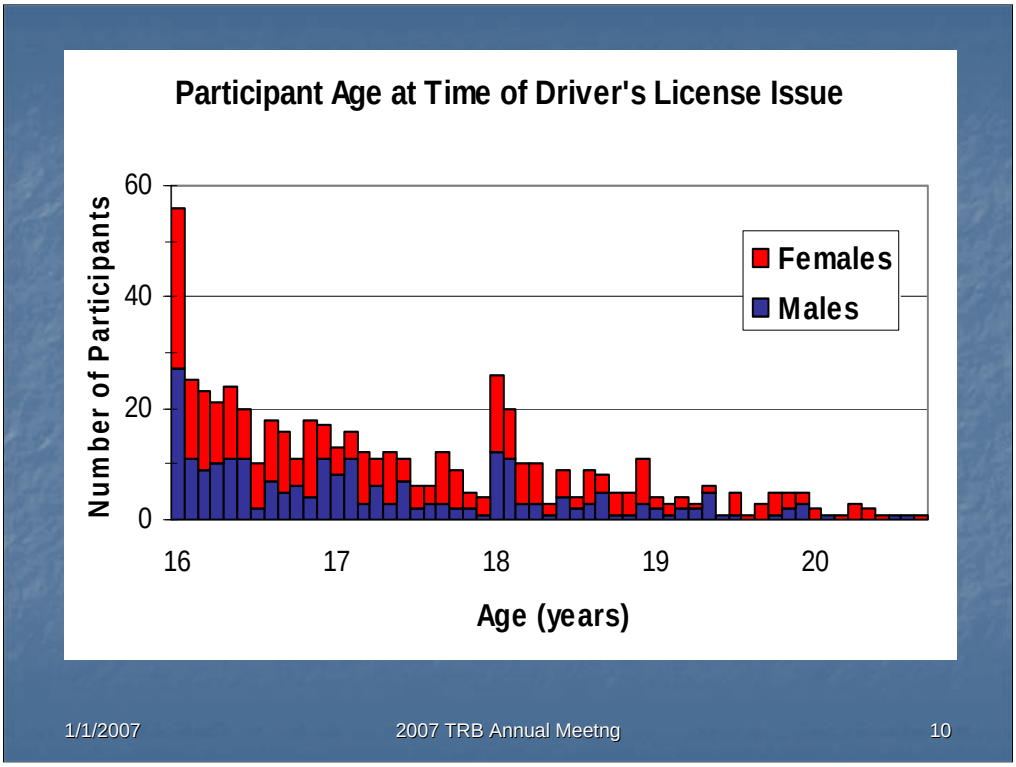


- **Median age 15 (eligible for learners permit)**
- **Slightly more females**
- **Majority are 16 and under**

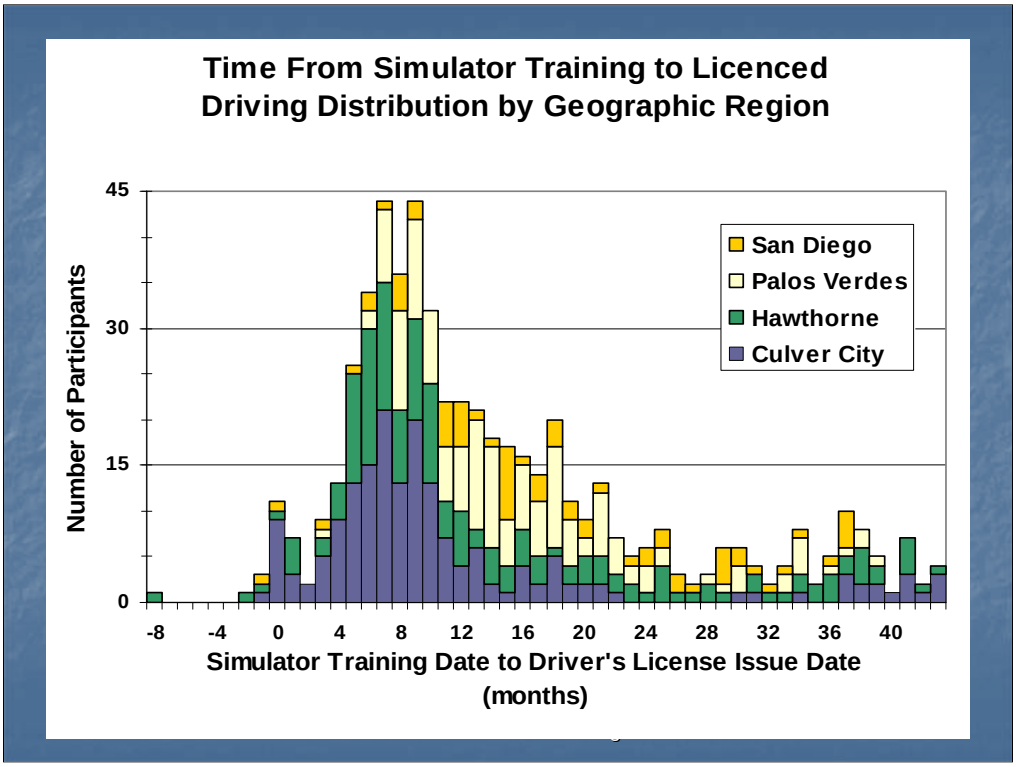


•Gender distribution about even for single monitor system (high schools)

•More females in laboratory groups (three monitor and vehicle cab)

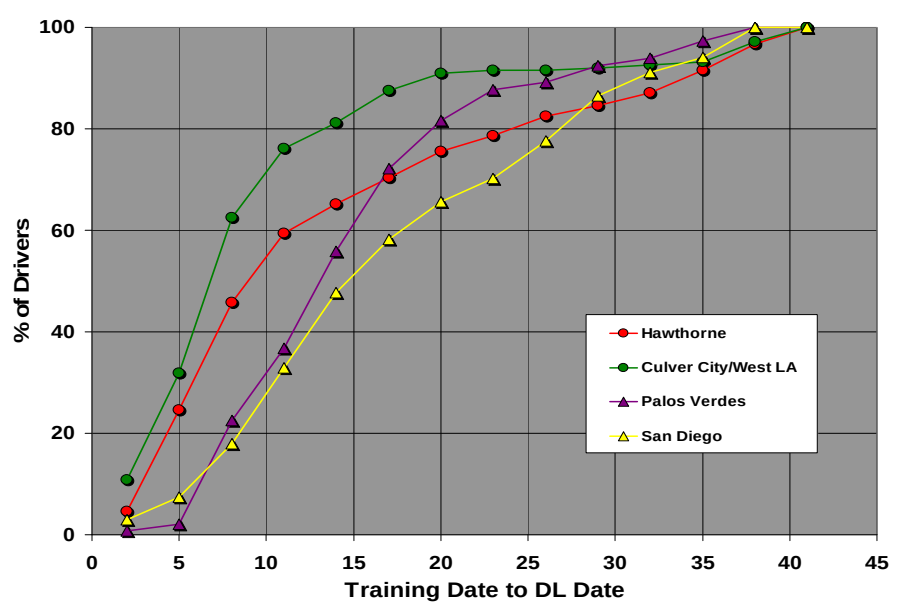


- **Significant licensure at age 16**
- **Another spike at age 18 (many students wait to age 18 to avoid GDL restrictions)**



- **Median time between training and licensure is about 8 months.**
- **Majority of subjects licensed within 18 months.**
- **Some subjects have significant delays in licensure (beyond 2 years)**

Training Date to Licensure Distributions



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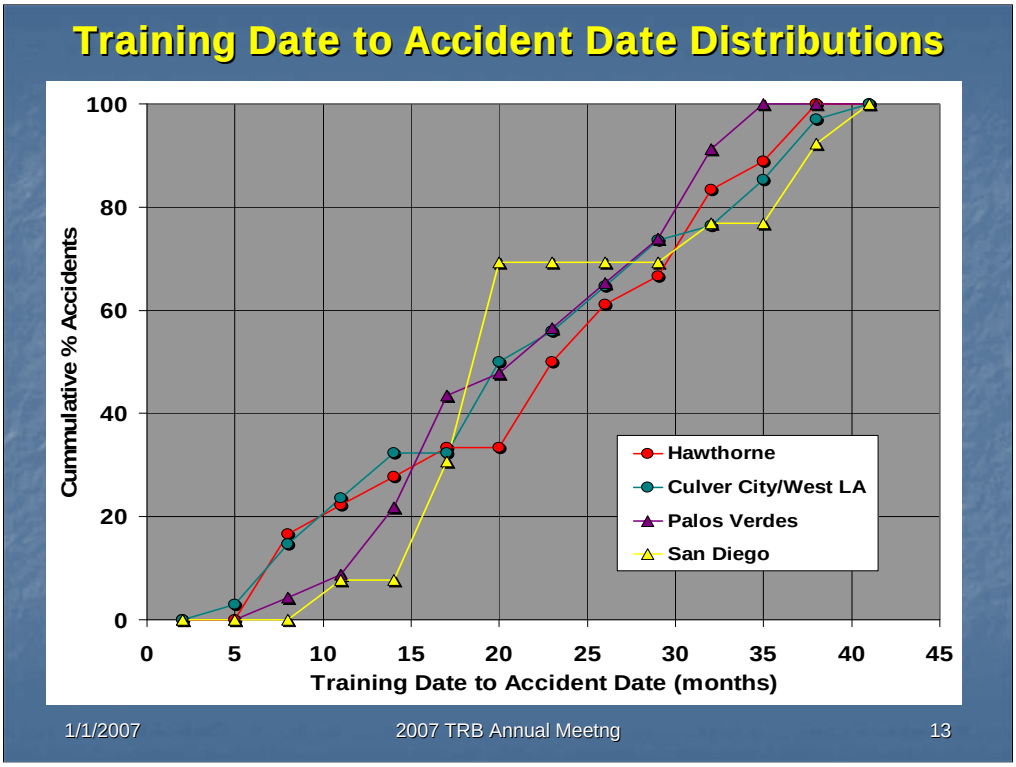
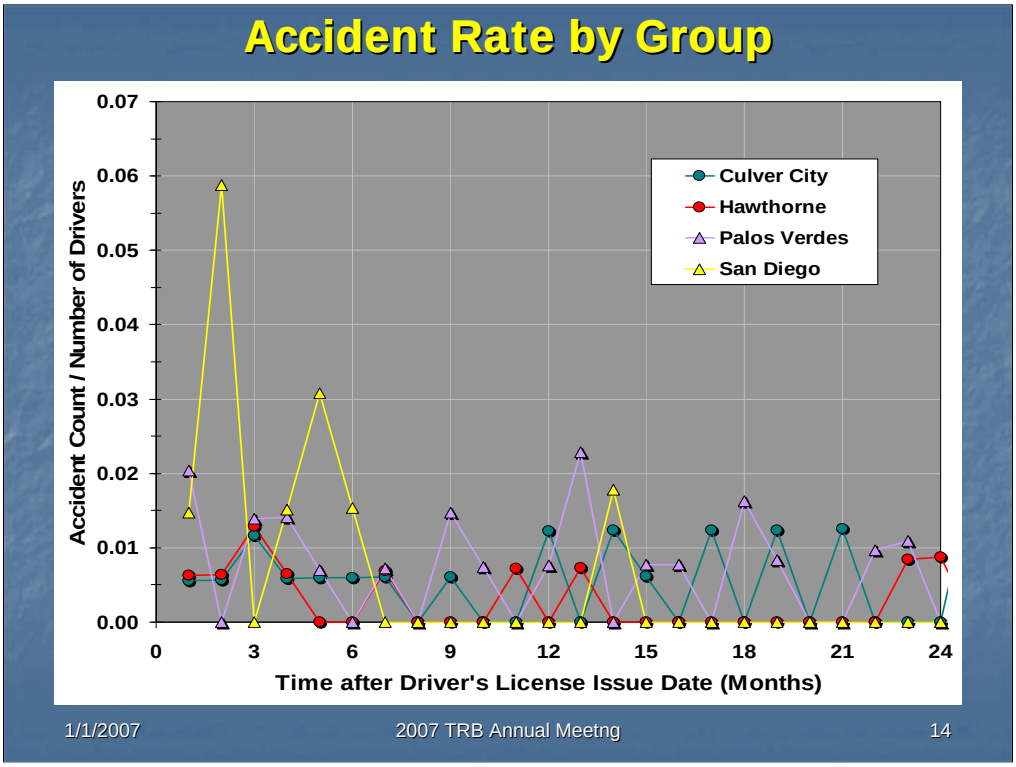
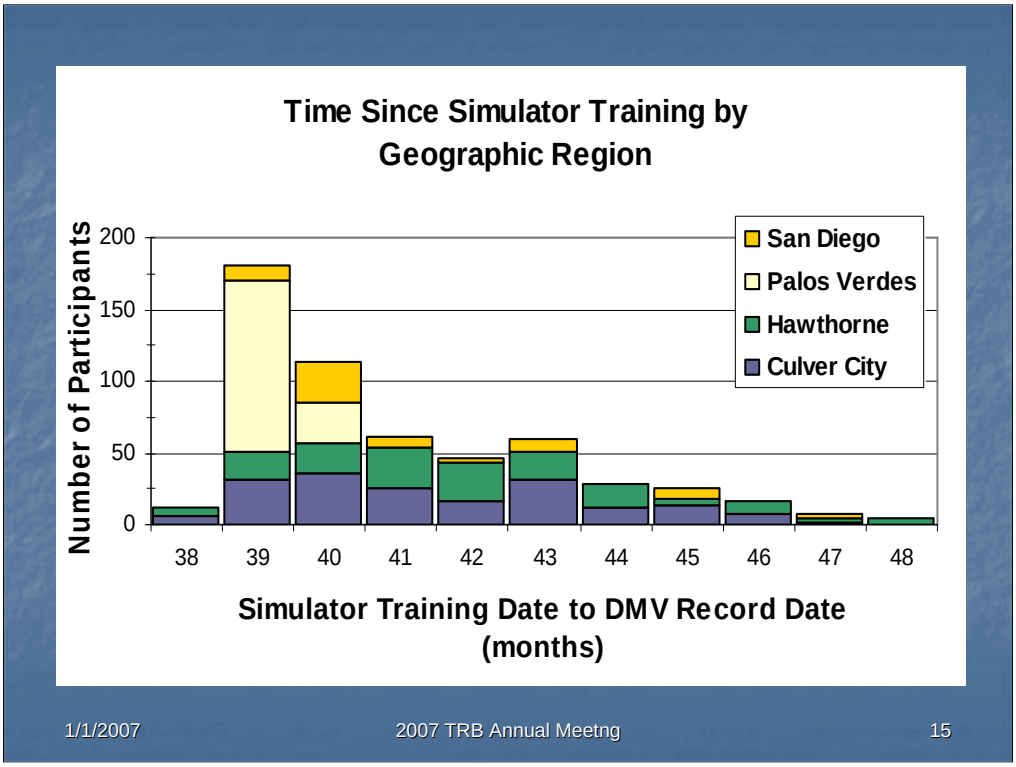
- **Licensure delayed most for schools (Palos Verdes, San Diego).**
- **Culver City (lab) fastest licensure.**
- **Some Hawthorne recruitment came from announcements at local high schools. This may be responsible for licensure delay over Culver City.**



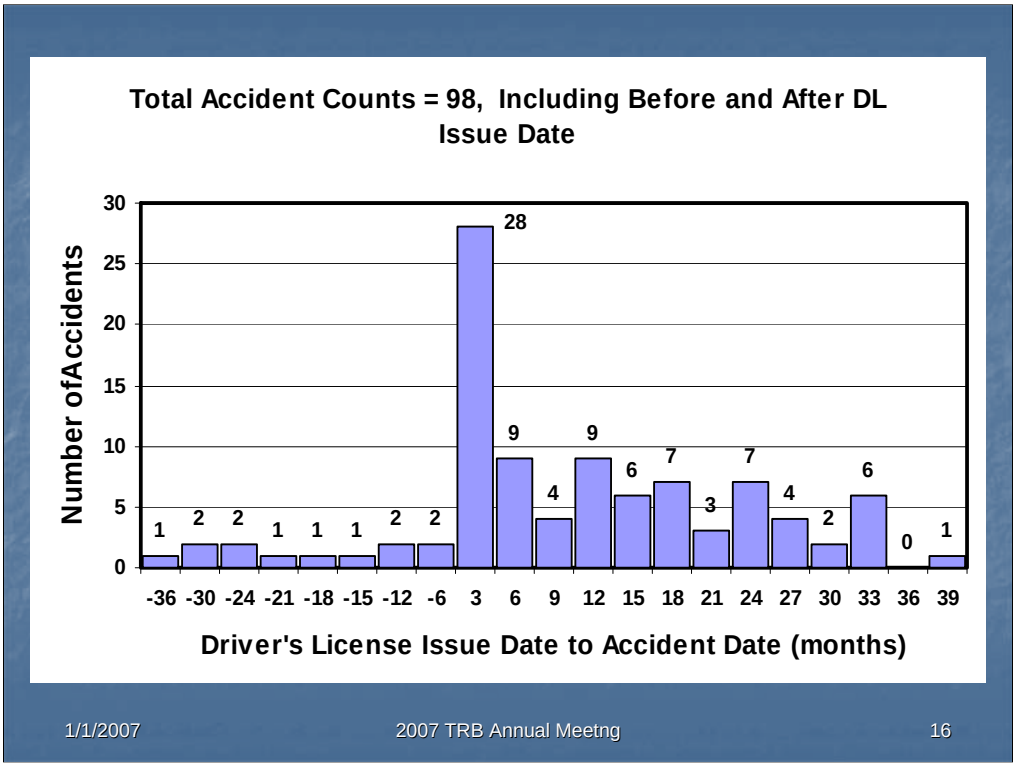
- **Accident accumulation distributions relative to training date are similar for each group.**
- **San Diego the most variable (smallest population).**



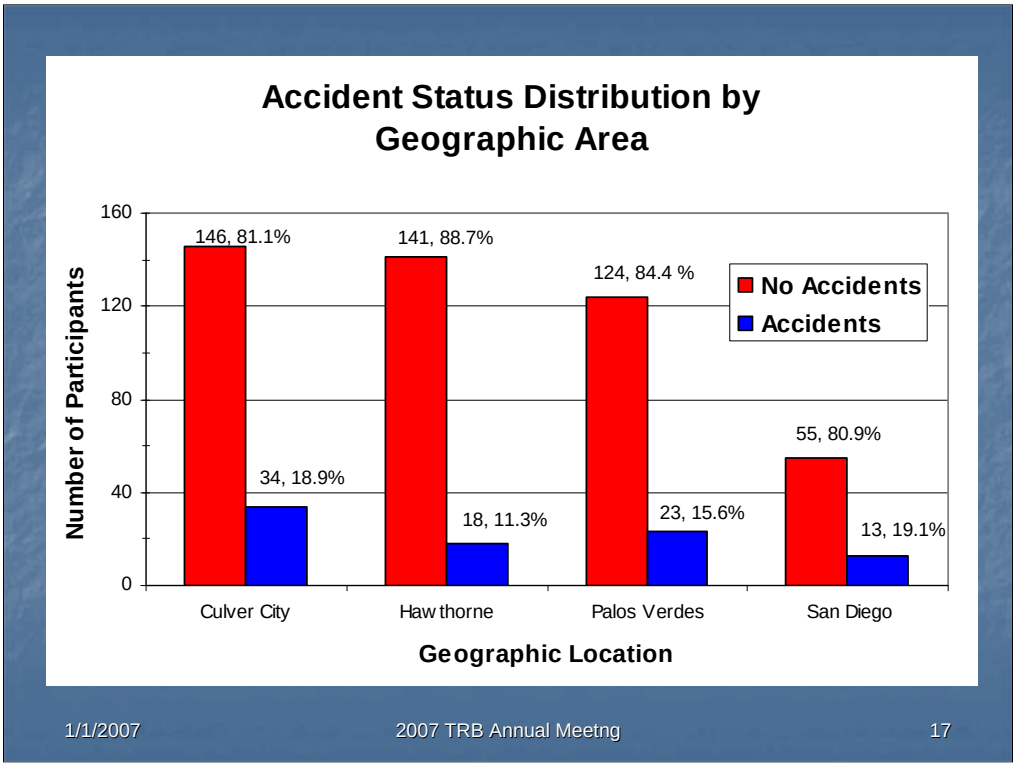
- **Accident rate somewhat sparse when segmented by geographic group**
- **Variability in San Diego group apparent**



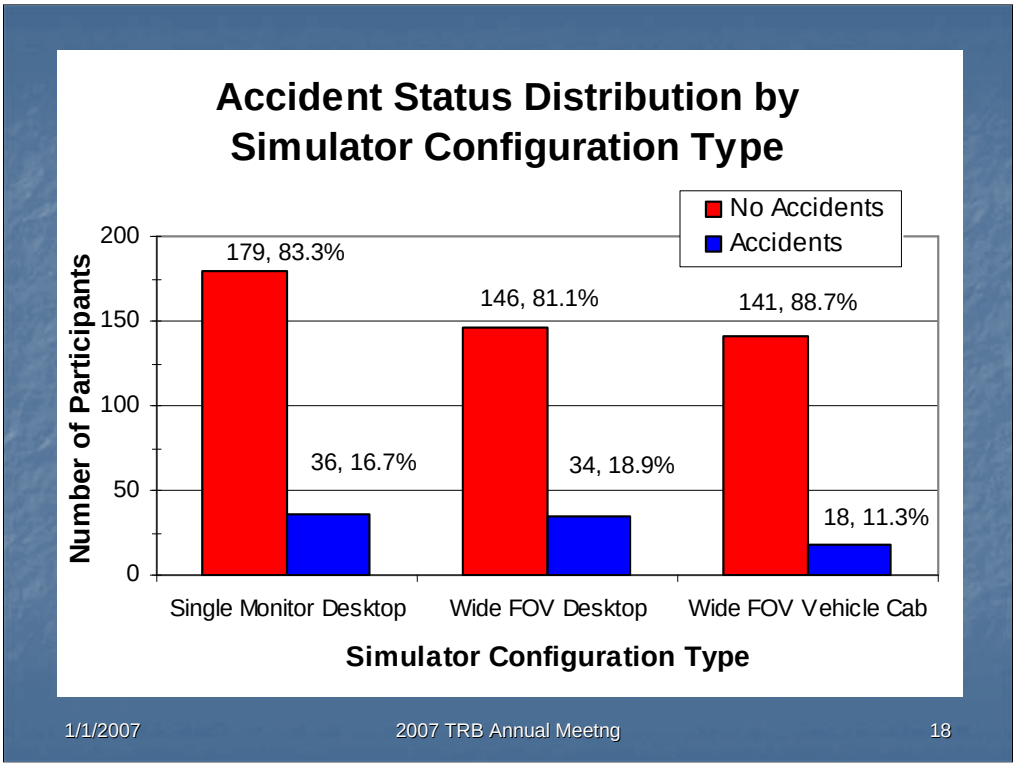
•DMV events (accidents and violations) occur over three years from training date



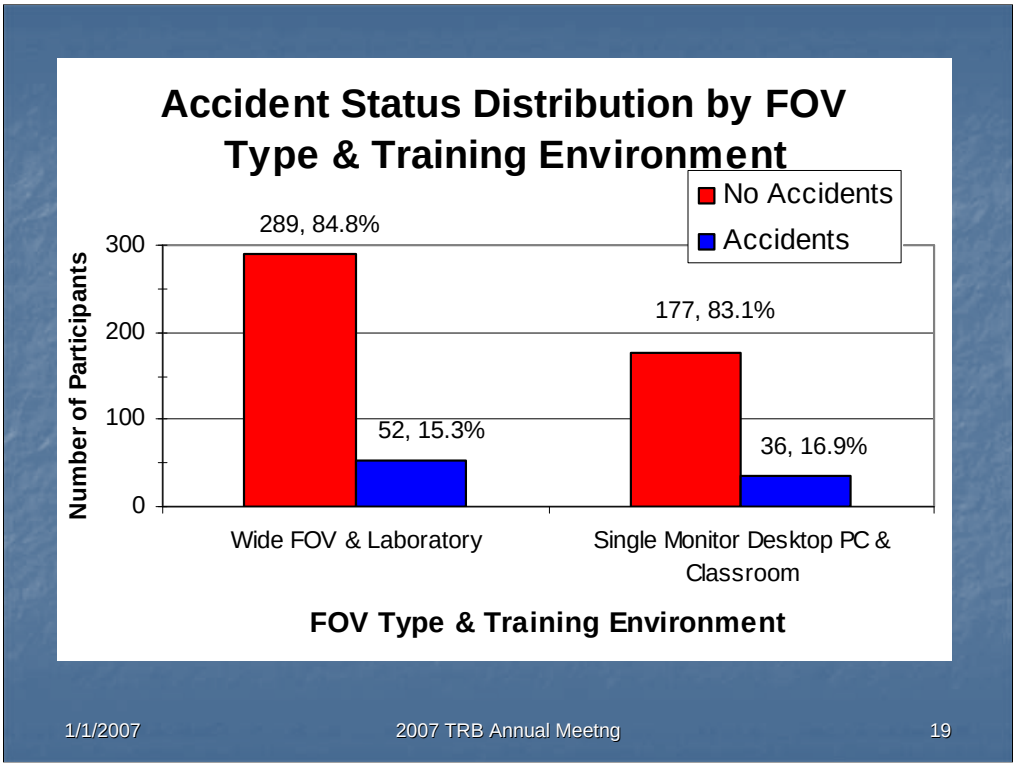
- **Accidents occurring before licensure**
- **Accidents peak in first three months of licensure**



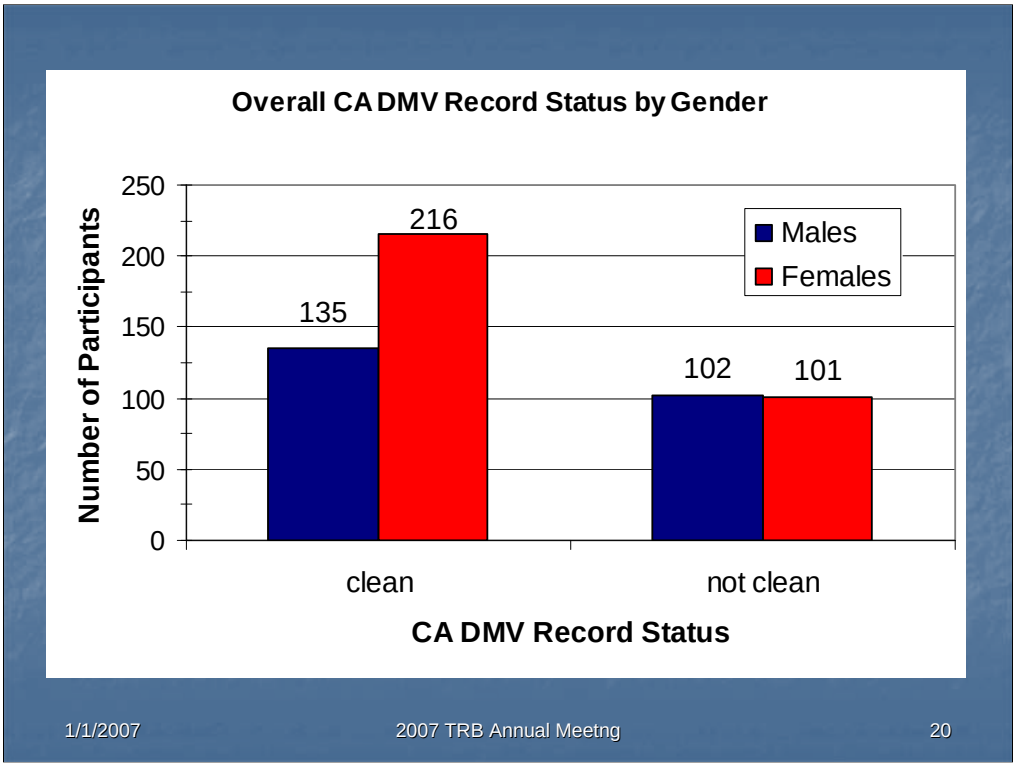
•**Hawthorne (lab) has lowest overall accident rate (11.3%)**



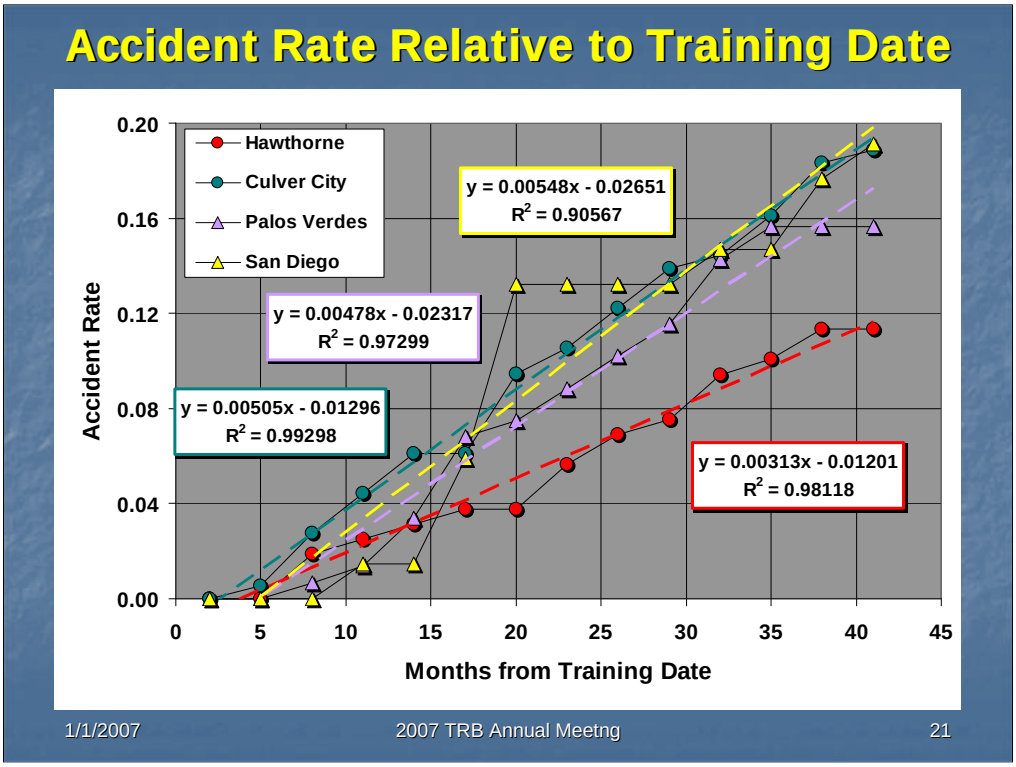
•**Wide FOV Vehicle Cab gives the lowest accident rate**



•**Wide FOV gives the lowest accident rate**



•**Males more likely to have DMV records (accidents and tickets)**

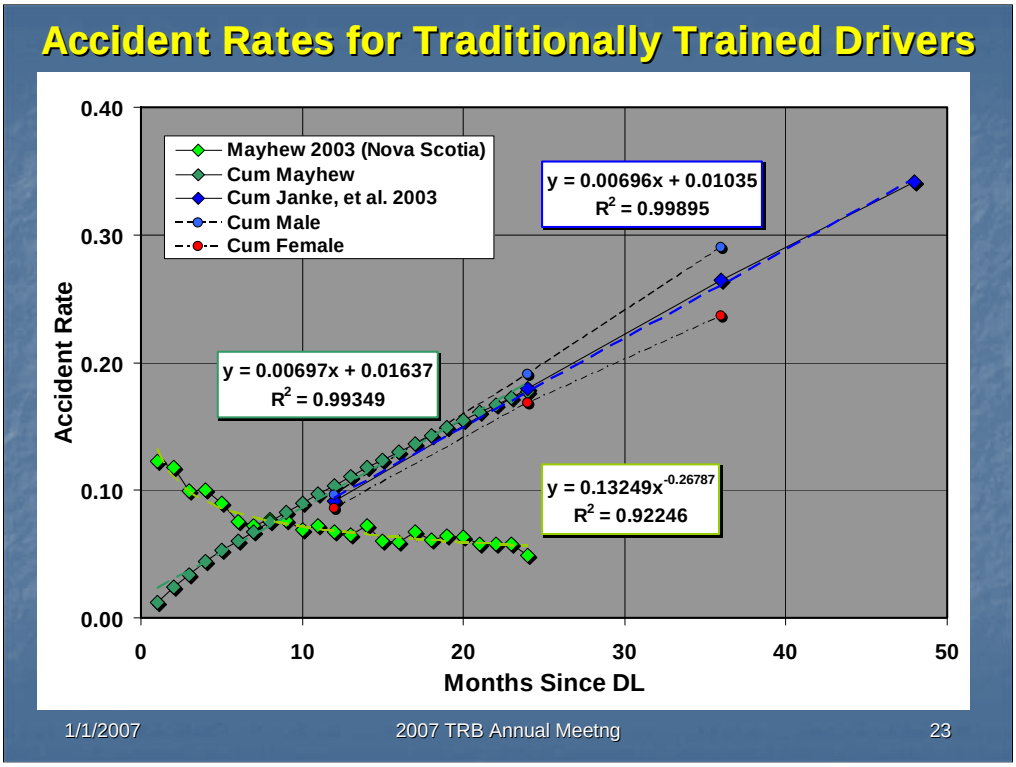


- **Consider cumulative accident rates to get fair group comparisons**
- **Each 3 month period rate computed as number of accidents divided by number of drivers**
- **Hawthorne group (wide FOV vehicle cab) gives lowest accident rate**

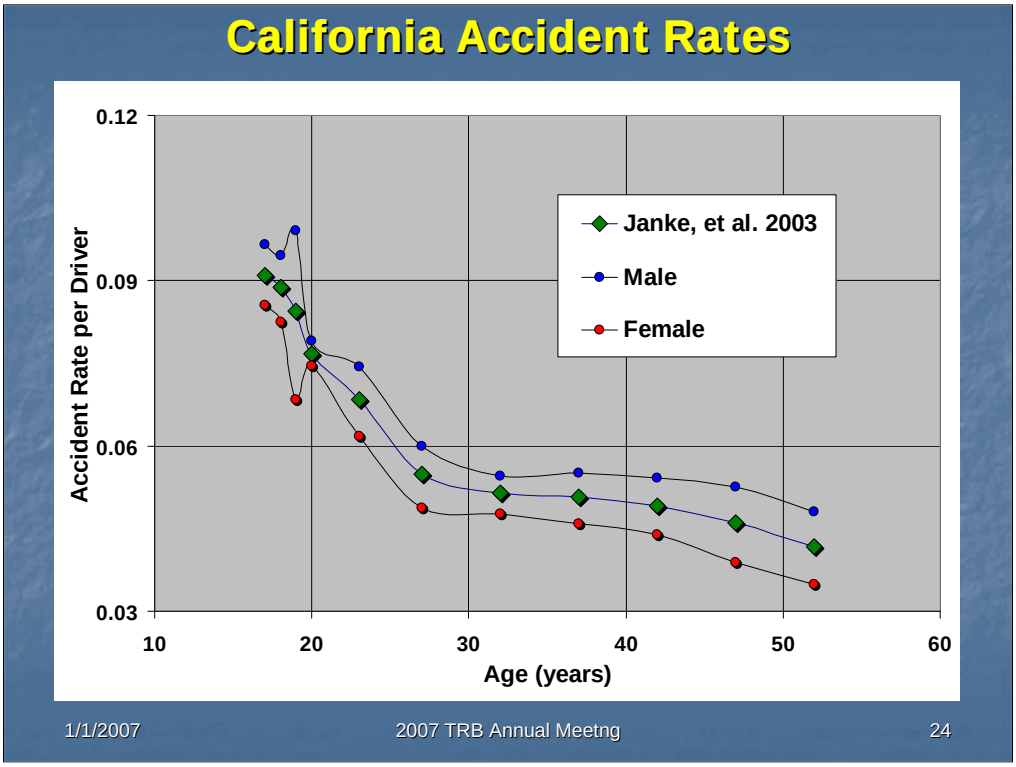
TD Regression Analysis Summary

Experimental Group	R^2	Slope	95% Lower Conf. Int.	95% Upper Conf. Int.
Hawthorne	.9812	.00313	.00286	.00340
Culver City	.9930	.00505	.00478	.00532
Palos Verdes	.9730	.00482	.00428	.00529
San Diego	.9057	.00548	.00437	.00660

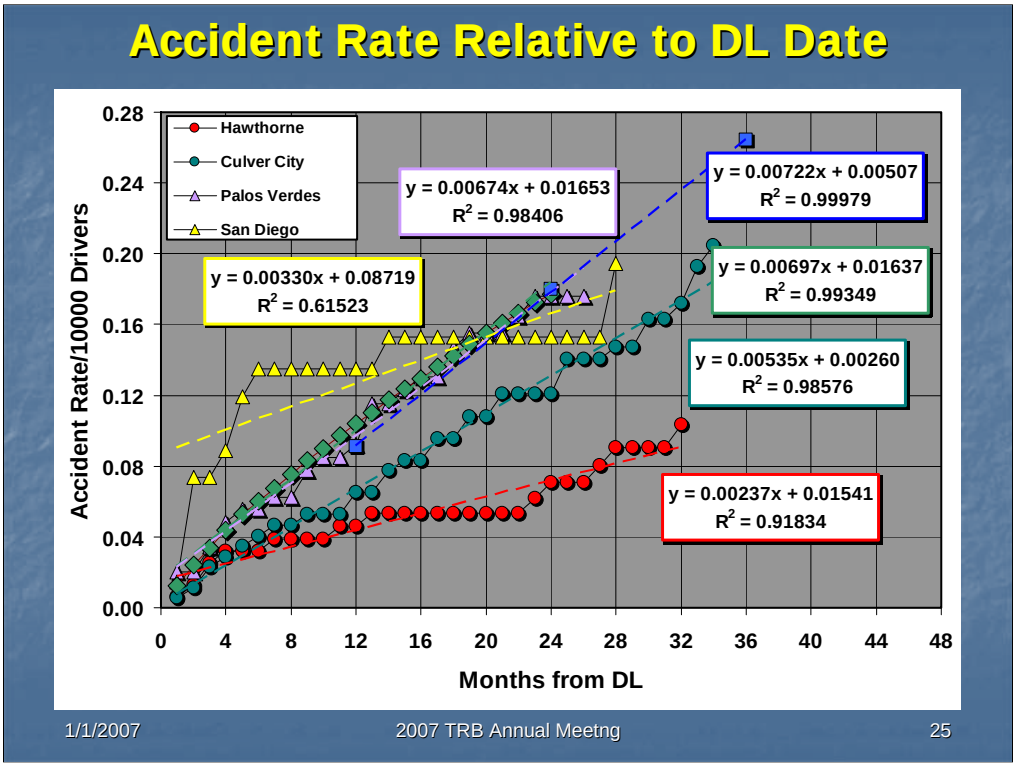
•**Confidence intervals show that Hawthorne group has significantly lower accident rate than other groups.**



- **Mayhew and Janke data give a good reference for typical accident rates of traditionally trained drivers**
- **Regression shows average accident rate is about 0.084 accidents per driver or 8.4% for novice drivers**



- **Novice driver accident rates over twice experienced driver rates.**
- **About 9% of drivers having accidents**



- **Now compare simulator trained driver groups with Mayhew and Janke data**
- **Accident rate versus months from drivers license allows us to compare simulator trained population against traditionally trained drivers.**
- **Hawthorne accident rate one third of Mayhew/Janke rate**
- **Culver City about three quarters of Mayhew/Janke rate**

DL Regression Analysis Summary

Experimental Group	R^2	Slope	95% Lower Conf. Int.	95% Upper Conf. Int.
Hawthorne	.9583	.00237	.0211	.00264
Culver City	.9858	.00535	.00512	.00558
Palos Verdes	.9841	.00674	.00638	.00710
San Diego	.6152	.00330	.00225	.00435
Mayhew	.9932	.00692	.00672	.00722

•Confidence intervals show that Hawthorne and Culver City accident rates significantly lower than Mayhew/Janke rate.

Confounding Variables

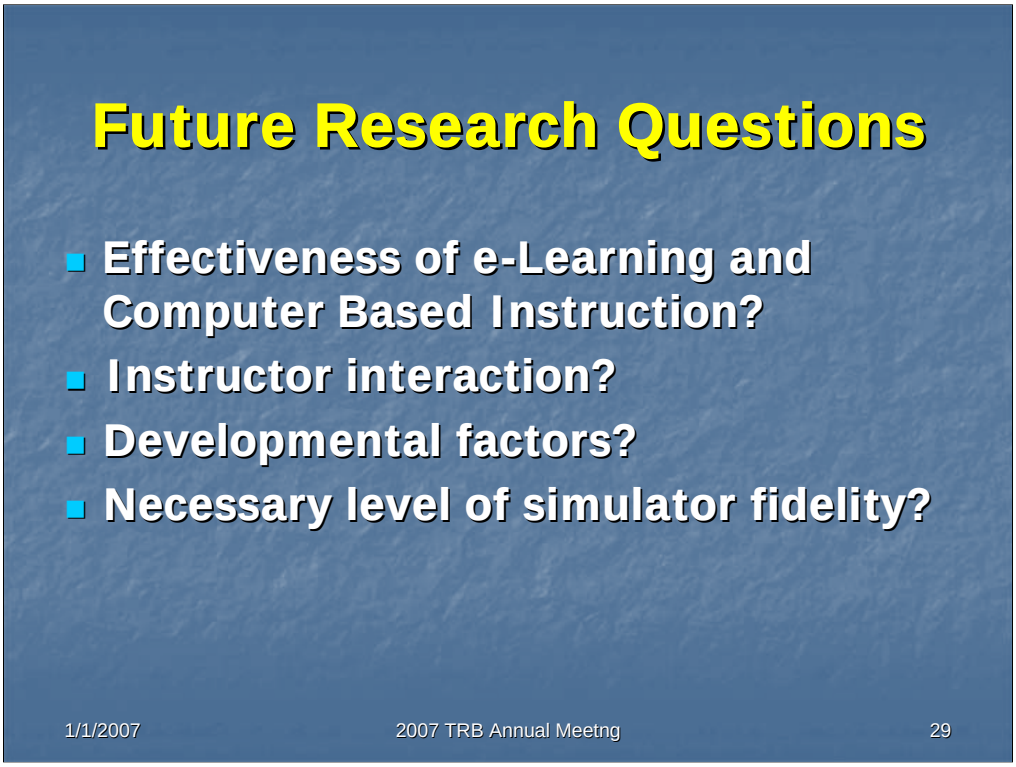
Experimental Group	Setting	Socio-Economic	Driving Environment
Hawthorne	Research Lab Researchers	Low to middle	Urban
Culver City	Research Lab Researchers	Low to middle	Urban
Palos Verdes	Computer Lab Teaching Aide	High	Hilly, winding roads
San Diego	Classroom Teacher	Middle	Hilly, winding roads

•Various considerations have confounded the accident comparisons of the various groups

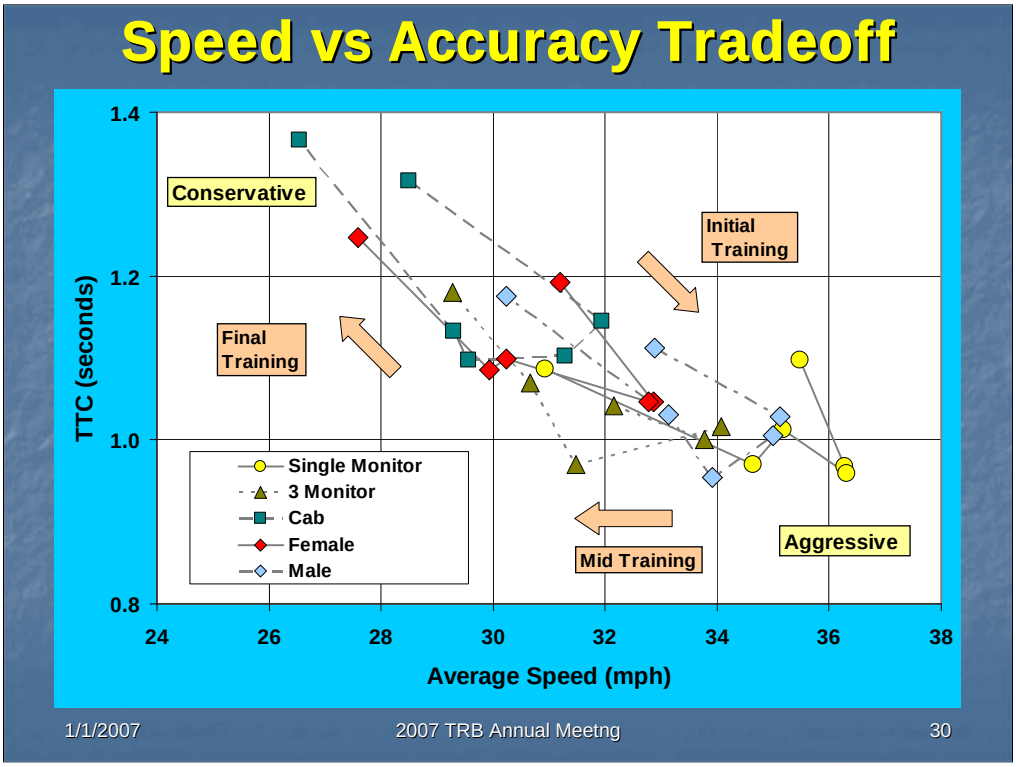
Concluding Remarks

- Simulator training can reduce novice driver accident rate
- Efficacy improves with simulator fidelity
- Adequate level of fidelity not clear
- Role of driver education and instructors not clear

•**Preliminary conclusions**



•Thoughts for future research



- **Novice drivers initially get more aggressive with training, but in final trials when approaching graduation become more conservative.**
- **Females more conservative.**
- **Conservatism increases with FOV and fidelity.**