Systemic Approach Verses Black Spot Approach

2011 SASHTO Conference

Louisville, KY

August 23, 2011

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Agenda

- Background of Highway Safety Improvement Program
- Black Spot Approach
- Systemic Approach
- Advancing Systemic Approach to Safety
  - Systemic Safety Project Selection Tool

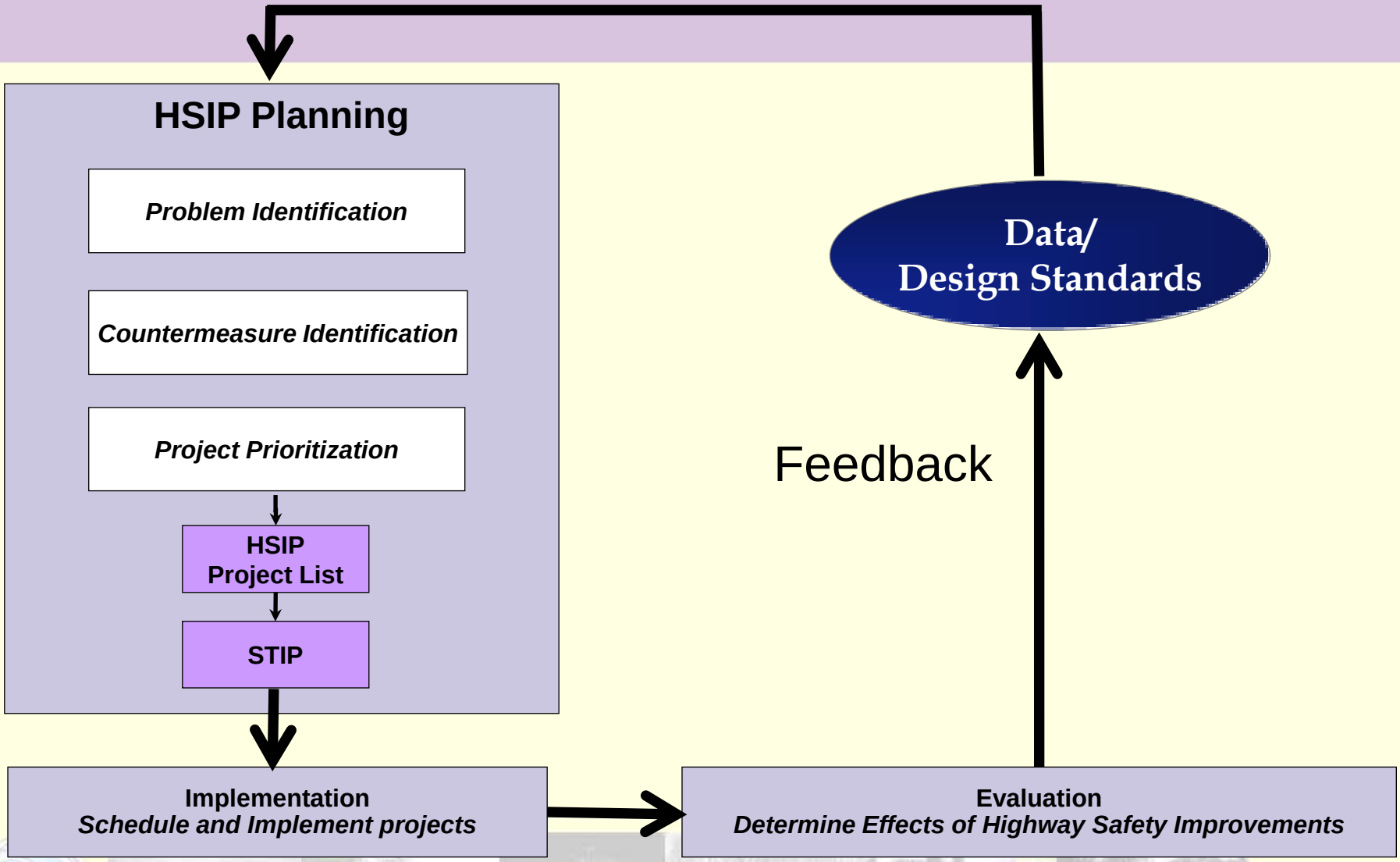
Highway Safety Improvement Program

- Roadway safety management process
- Federally-funded, state administered
- Data-driven
- Infrastructure-related safety improvements
- **All public roads**

Purpose of the HSIP

To achieve a significant reduction in fatalities and serious injuries on all public roads through implementation of infrastructure-related highway safety improvements.

State Highway Safety Improvement Program



Black Spot Approach

- States for the last many years have moved more to a comprehensive approach to safety and moving to focus on severe crashes
- Many traditional network screening techniques that identify sites with promise base investment decisions on high crash frequencies (likely an urban/suburban location with an intersection bias)

Black Spot Approach

- All but the most sophisticated analysis tends to produce projects that can't address the multiple risk factors at the location that were the source of the crashes that qualified the location for selection originally

Black Spot Approach

- Rural road crashes account for a high % of all severe crashes but a low density of crashes
- Vulnerable Road Users (pedestrians, bicyclists, motorcyclist) can be an urban condition with low density of crashes
- Such conditions are not easily adaptable to comprehensive systemwide approach

Systemic Approach to Highway Safety

- What is a Systemic Safety Improvement (SSI)
  - A countermeasure that addresses risk factors identified through systemwide analysis of severe crash types
  - The countermeasure will likely be a low cost roadway improvement linked with a particular roadway or traffic element that addresses risk factors in human performance or behavior.
  - The SSI is widely implemented based on the identified condition associated with the risk condition.

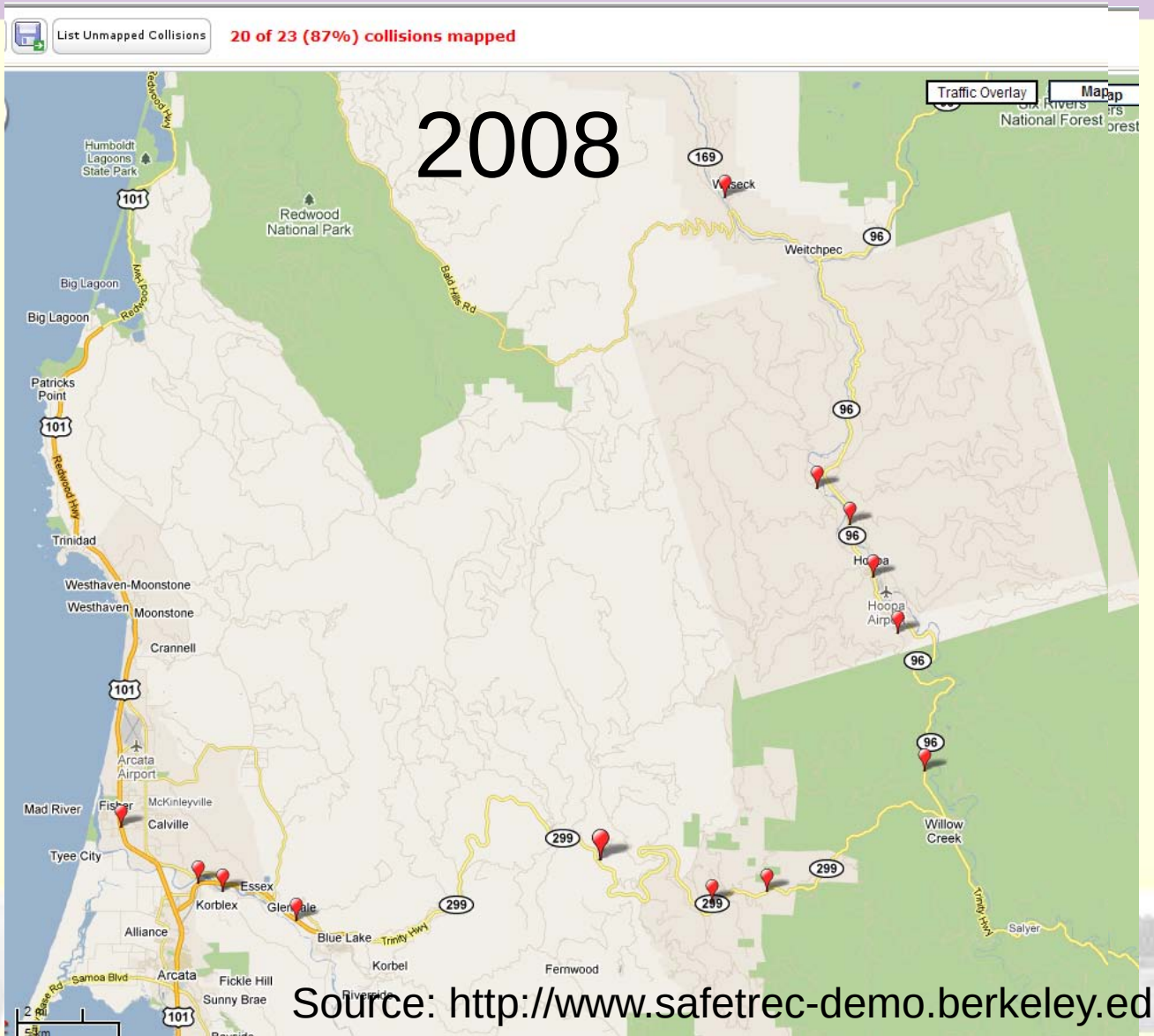
Systemic Approach Advantages

- Less data requirements once process established
- Countermeasures usually have low unit cost
- Generally can be implemented quicker by grouping applications into large projects since the tasks are usually repeatable
- Usually countermeasures require minor construction which has less environmental issues

Example

- Look at Fatal Crashes plotted in rural Humboldt County California over four years (2005 through 2008)
- Can you see a place that needs to be treated?

Humboldt County Fatal Crashes



Source: http://www.safetrec-demo.berkeley.edu/index.php

Fatal Crash Types

2005

2. Type of Collision		
Factor	Number	Percent
A: Head-On	424	11%
B: Sideswipe	173	5%
C: Rear End	305	8%
D: Broadswide	720	19%
E: Hit Object	1017	27%
F: Overturned	441	12%
G: Vehicle/Pedestrian	656	17%
H: Other	75	2%
NS: Not Stated	0	0%
UN: Unknown	11	0%
Others	0	0%
TOTAL	3822	100%

2006

2. Type of Collision		
Factor	Number	Percent
A: Head-On	447	12%
B: Sideswipe	173	5%
C: Rear End	325	9%
D: Broadswide	695	18%
E: Hit Object	1007	27%
F: Overturned	408	11%
G: Vehicle/Pedestrian	651	17%
H: Other	80	2%
NS: Not Stated	0	0%
UN: Unknown	7	0%
Others	0	0%
TOTAL	3793	100%

2007

2. Type of Collision		
Factor	Number	Percent
A: Head-On	390	11%
B: Sideswipe	133	4%
C: Rear End	315	9%
D: Broadswide	608	17%
E: Hit Object	1024	29%
F: Overturned	414	12%
G: Vehicle/Pedestrian	585	16%
H: Other	79	2%
NS: Not Stated	0	0%
UN: Unknown	9	0%
Others	0	0%
TOTAL	3557	100%

2008

2. Type of Collision		
Factor	Number	Percent
A: Head-On	306	10%
B: Sideswipe	148	5%
C: Rear End	257	8%
D: Broadswide	507	16%
E: Hit Object	883	28%
F: Overturned	305	10%
G: Vehicle/Pedestrian	589	19%
H: Other	104	3%
NS: Not Stated	0	0%
UN: Unknown	14	0%
Others	0	0%
TOTAL	3113	100%

Source: http://www.safetrec-demo.berkeley.edu/index.php

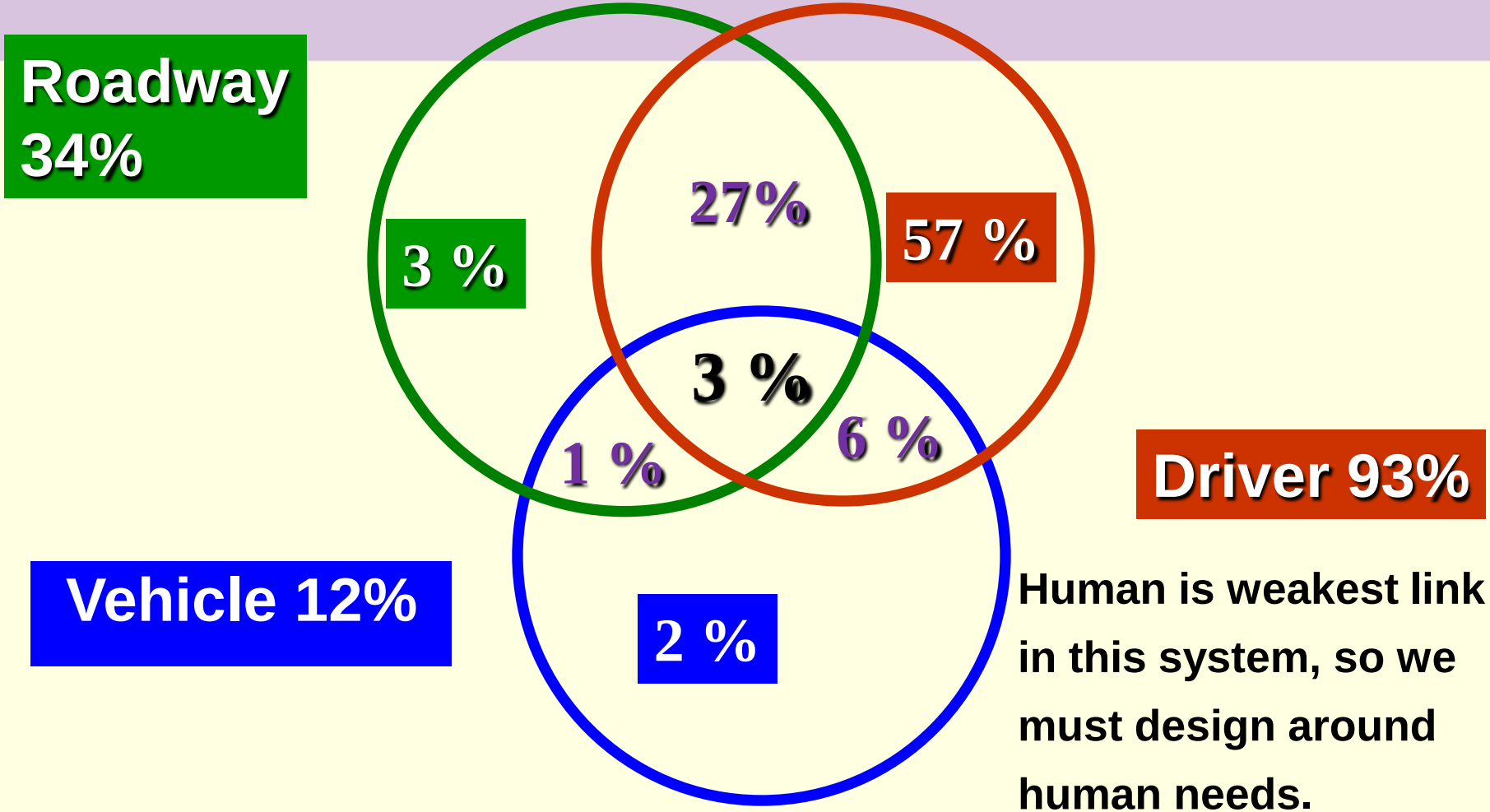
fatal crash locations

are

random

fatal crash
types are
predictable

Systems Approach: Crashes Caused by Various Factors



Human is weakest link in this system, so we must design around human needs.

FROM: Lum & Reagan, Public Roads Magazine, Winter 1995, "Interactive Highway Safety Design Module"

Literature Review

- No established definition for system-based approach
- No inclusive guidance on how to develop a program
  - Analysis techniques
  - Project prioritization implementation
  - Evaluation
- No comprehensive guidance on suitable types of projects for a system-based program
- No information available to guide funding allocation decisions

Recent Research

NCHRP RRD 345: Alternative Strategies for Safety Improvement Investments

- Survey of practice
- Current Methods for Allocating Safety Resources
  - » Black Spot vs. Systemic
  - » State vs. Local
  - Case studies : IA, MN, MO, NC

NCHRP RRD 345 Challenges

- Existing analytical tools and techniques focus on Black Spot analysis
- Lack of safety-related experience of local government agency staff

Advancing Systemic Roadway Safety Improvements

- FHWA Focused Approach
  - Intersection Safety
  - Roadway Departure Safety
- Systemic Safety Project Selection Tool

Systemic Safety Project Selection Tool

- Step-by-step process to conduct systemic safety analysis and planning
- Mechanism to quantify benefits of systemic safety improvements
- Method for balancing systemic safety improvements and spot safety improvements
- Method for Program Evaluation (not location evaluations) and guidance for Interpreting results

Systemic Safety Project Selection Tool Framework

Understand & Document Target Crash Types and Location Characteristics

- Systemwide crash analysis
- Fatal and serious injury crashes

Crash type → Roadway Characteristics → Surrogates

Balancing System-Based vs. Black Spot Investments

- Currently none use a formula to determine distribution
- Program managers use professional judgment to establish general targets/goals for safety investment
- States interested in decision tree/flow chart

Recommended Improvement Implementation Approaches

- Black Spots
  - Seek sites with promise focused on severe crashes
- Systematic Deployment
  - A complementary analytical technique intended to supplement the high crash technique to be more comprehensive and proactive
- Standards based
  - Incorporate improvements on all projects

All 3 approaches are needed

Questions?