2nd International Symposium on Naturalistic Driving Research

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Naturalistic Data Analysis:

What Can We Learn From HSIS?

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HSIS

HIGHWAY SAFETY INFORMATION SYSTEM

Discussion Points

- Brief history of FHWA's Highway Safety Information System (HSIS)
- Similarities with SHRP-2 naturalistic data
- Quality control issues and how HSIS handles them
- Data distribution issues
- Summary of major issues

HSIS

HSIS Database

- FHWA's HSIS developed in 1987 using 1985 data from 5 States
- Files can be linked for a wide spectrum of safety studies
  - Crash
  - Inventory
  - Traffic flow
- Multi-jurisdiction
- Multiple files from each agency each year
- Multiple years of annual files

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Importance of Linked Data

- Analyses of change in risk due to changes in roadway characteristics can NOT be accomplished with crash data alone
- HSIS contains inventory and traffic flow data on ALL road segments, not just the segments that experienced crashes
- Segment-based system allows studies of change in risk due to changes in roadway characteristics

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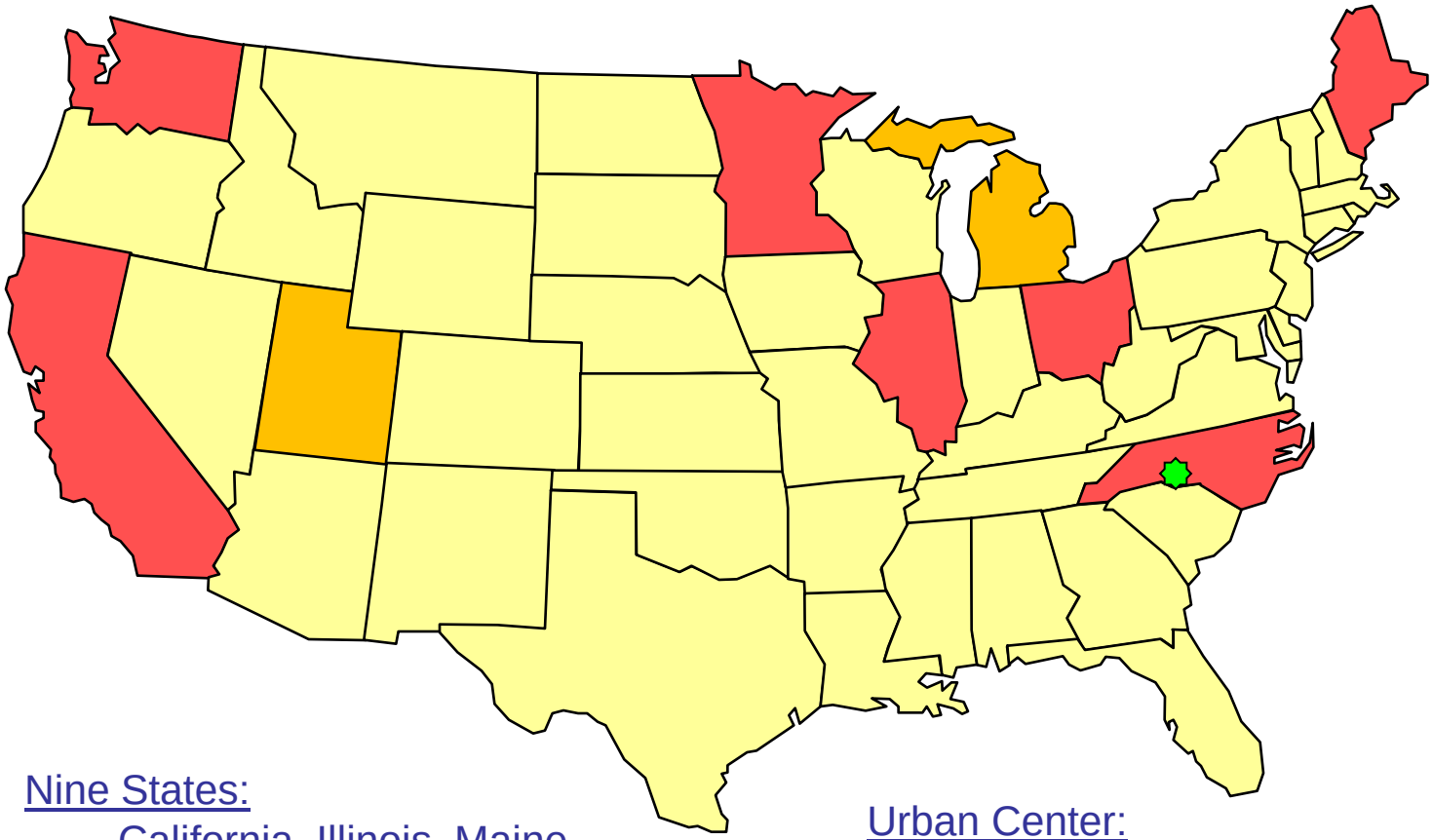
HSIS States and Urban Center



Nine States:

California, Illinois, Maine, *Michigan, Minnesota, North Carolina, Ohio, *Utah and Washington

*inactive

Urban Center:

Charlotte, NC

HSIS

Highway Safety Information System

HSIS File Types

	CA	IL	ME	MI	MN	NC	OH	UT	WA
Crash	X	X	X	X	X	X	X	X	X
Roadway Inventory	X	X	X	X	X	X	X	X	X
Traffic Volume	X	X	X	X	X	X	X	X	X
Curve and Grade		X						X	X
VIN		X		X		X	X		
Intersection	X				X				
Interchange Ramp	X		X	X					X
Guardrail/Barrier			X						

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Quantity of Data in HSIS

	1st Year Available	Average Accidents/Year	Roadway Mileage
California	1991	160,000	15,300
Illinois	1985	120,000	15,400
Maine	1985	39,000	19,800
Michigan	1985	145,000	9,500
Minnesota	1985	77,000	51,000
North Carolina	1991	97,000	34,200
Ohio	1993	75,000	16,800
Utah	1985	46,000	9,300
Washington	1997	38,000	7,200

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HSIS Funding and Tasks

- HSIS Funding – Approximately $1.1 million annually
- Major HSIS Tasks
  - Prepare data for DOT use and use by external researchers (~50% of funding)
  - Conduct internal research and policy analyses for FHWA (~50% of funding)

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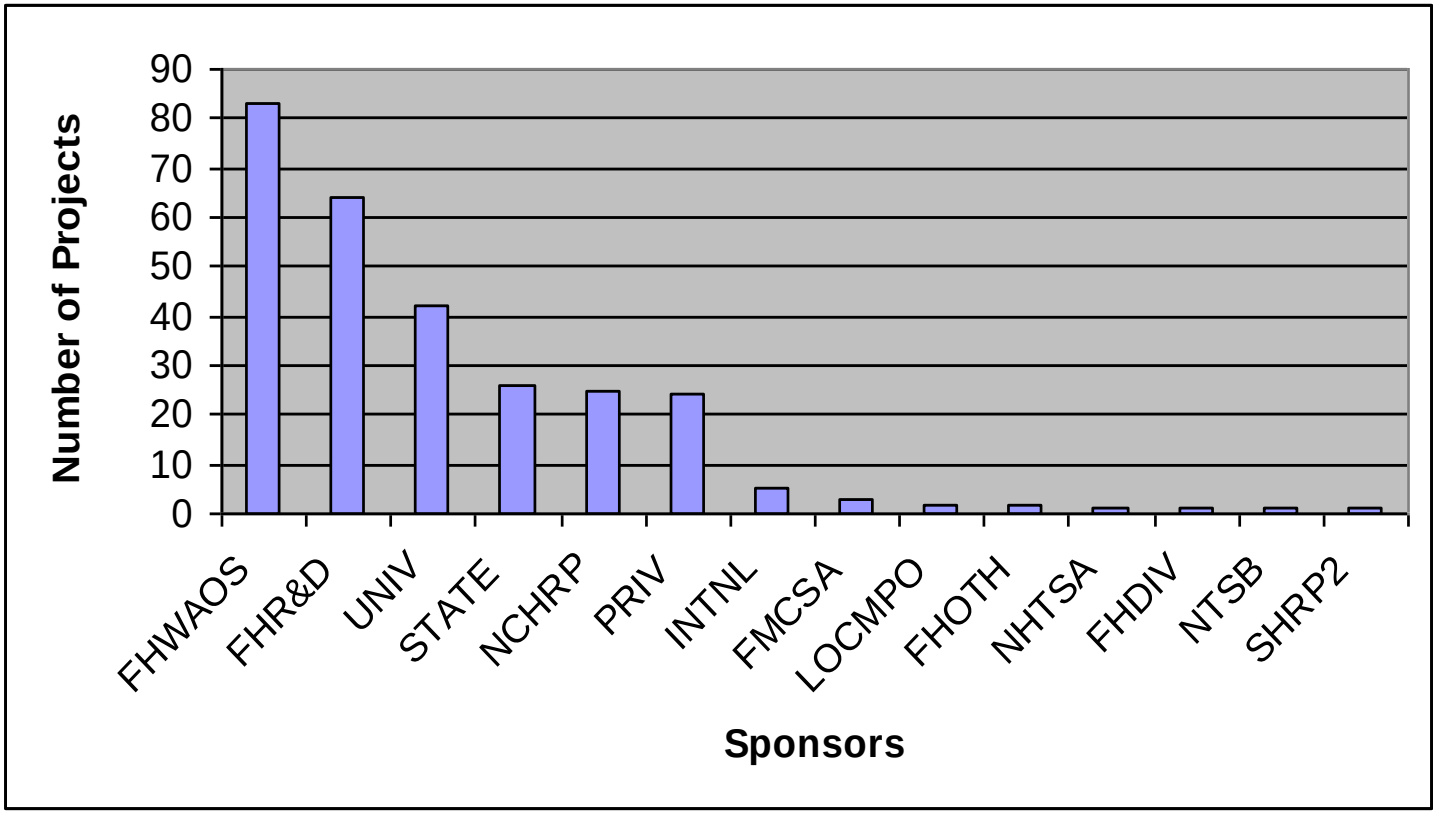
Data and Research "Customers" (2006 – 2010)

- 280 tasks



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Example Internal Research Projects

- Development and operation of Crash Modification Factor Clearinghouse
- Low cost project for improving friction on curves and ramps
- Fatalities by state and percentage change from 2006 to 2008
- Identifying potential vehicle-infrastructure safety treatments through crash analysis
- Enhance motorcycle crash causes and outcomes database
- Recalibration of Highway Safety Manual predictive tools
- Update Accident Modification Factors for SafetyAnalyst and Highway Safety Manual
- Development of a speeding-related crash typology

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Example External Projects Using HSIS Data

- Revising Geometric Design Criteria for Sharp Curves On Steep Grades (NCHRP 15-39)
- Characteristics of Motorcycle-to-Barrier Crashes. (NCHRP 22-26)
- Safety Prediction Models for Interchange Components. (NCHRP 17-45)
- Wrong Way Driving Crashes on Freeways in IL. (IL DOT)
- Comparing Effectiveness of Different Methods to Identify High Accident Locations. (CA DOT)
- Weather Related Crashes on Public Lands (University graduate student PhD thesis)

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Similarities with SHRP 2

- Multiple files for same location that must be linked (HSIS by route mp; SHRP 2 by spatial coordinates)
- Multiple files for same location across time
- Multiple requests for research extract files each year – different formats, different levels of researcher knowledge
  - HSIS receives 40-60 requests each year for data to be used in research funded by FHWA, NCHRP, State DOTs, universities, safety groups
- Large database, but no comparison
  - HSIS is 31 gigs
  - SHRP 2 will be 33,000 times larger!

HSIS

Quality Control Issues

- Codes can change across years, but users need consistency **within the same agency** database
  - HSIS annually recodes all past year data in each variable to current year codes.
    - SHRP2 will need to be sure that coding is same between locations
  - HSIS has internal QC programs to identify possible issues
    - Contacts agencies for corrections or explanations.
    - If correction is not possible, HSIS documents the problem in the data documentation
  - HSIS uses feedback from users
    - Detect problems
    - Revise documentation

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Quality Control Issues (cont)

- Consistency in data “gaps”
  - HSIS retains crashes where there is a roadway section in the roadway inventory file
  - HSIS retains roadway sections to which crash mileposting is possible
- HSIS only has to work with inventory data from one agency, per State
- SHRP2 will have a more difficult task - incorporating inventory data from multiple agencies

HSIS

Data Distribution

- Website (http://www.hsisinfo.org)
  - Well-designed
  - Continually maintained w
- Detailed Guidebooks for users
  - One per agency
  - Overview of agency data system
  - Detailed description of each variable in each file
  - Linking instructions
  - Online

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Data Distribution (cont'd)

- Data request "rules" and system dr
  - On-line request for data thru website
  - Two-phase request system

- **Big Issue** – researcher will ask for "all data"
  - HSIS cannot provide due to agreements with HSIS states. Thus requires email discussion and results in delay

- HSIS has no personal identifiers!

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Data Distribution (cont)

- Quick turnaround
  - Goal: deliver customized research data files in 1-2 weeks
  - Data file development code to meet similar requests
- Staff expertise
  - Review request, screen, work with requestor and develop output files
  - Knowledgeable (engineer) computer analyst and a senior researcher

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HSIS Analysis Issues

- HSIS has Route/Milepost linkages
  - Difficult to trace the same location across multiple years in HSIS
  - “Address” of the same location may shift due to upstream change that lengthens or shortens the route
- SHRP2 linkages based on spatial coordinates
  - Tracing locations across years not an issue
  - Possible unforeseen problems
- Moral – Try to find inventory systems based on spatial data if possible

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Major Issues –HSIS Lessons

- Linkage of files is a continuing, critical issue
- Need for consistency of data across locations and time in all input files
- Need for internal QC processes and process to capture feedback from users
- Need for detailed documentation that is continually updated based on what is learned
- Need for custom computer programs that will quickly develop often-requested output file formats.
- Need for data request *system* that will weed out requests that can't be met, insure that output file developed is what is needed by the user, and do so in a reasonable time period.
- Data distribution will take resources, detailed knowledge of the data and knowledge of possible research methods, and good public relations

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Questions?

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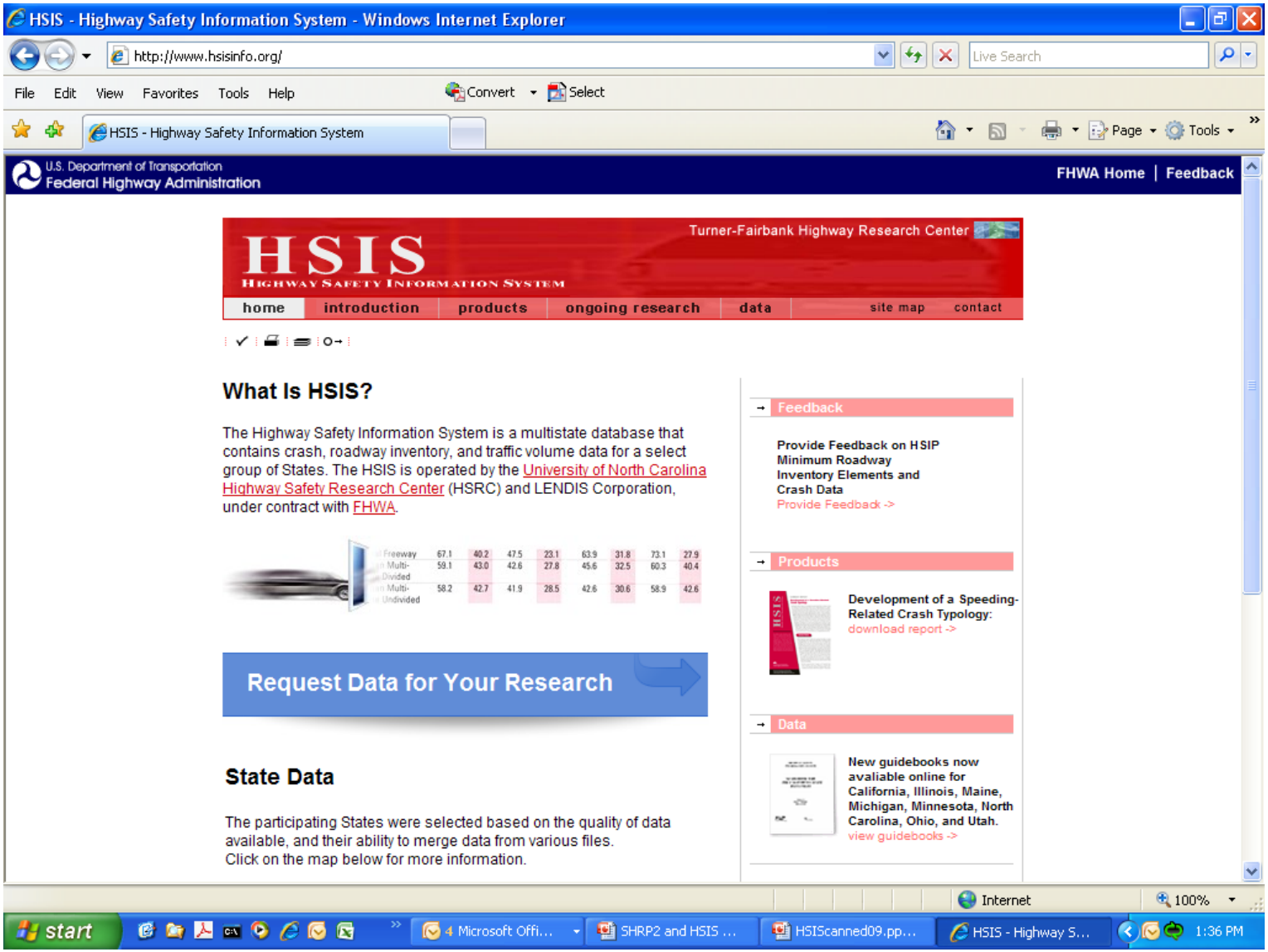
www.hsisinfo.org



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Requesting HSIS Data

- REVIEW the Generic Variable Tables
- Complete & submit the data request form