



# Review of IRI Data as Collected for HPMS

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# Agenda

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1. Introduction
2. Objectives
3. Change of IRI over Time
4. Factor Analysis
5. Conclusions

# Introduction

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- ▶ IRI is considered one of most reliable and complete measurement
- ▶ IRI has been required by HPMS since 1998
- ▶ IRI is required by MAP-21 and FAST ACT legislation
- ▶ ~47,000 miles of IRI values per year from 2013 to 2015 of HPMS data analysed for FHWA study
  - ▶ Determine if HPMS is unbiased representation of IHS
  - ▶ Evaluate sampling requirements
    - ▶ One vs two directions
    - ▶ Optimum section length
    - ▶ Collection and reporting protocols, etc.

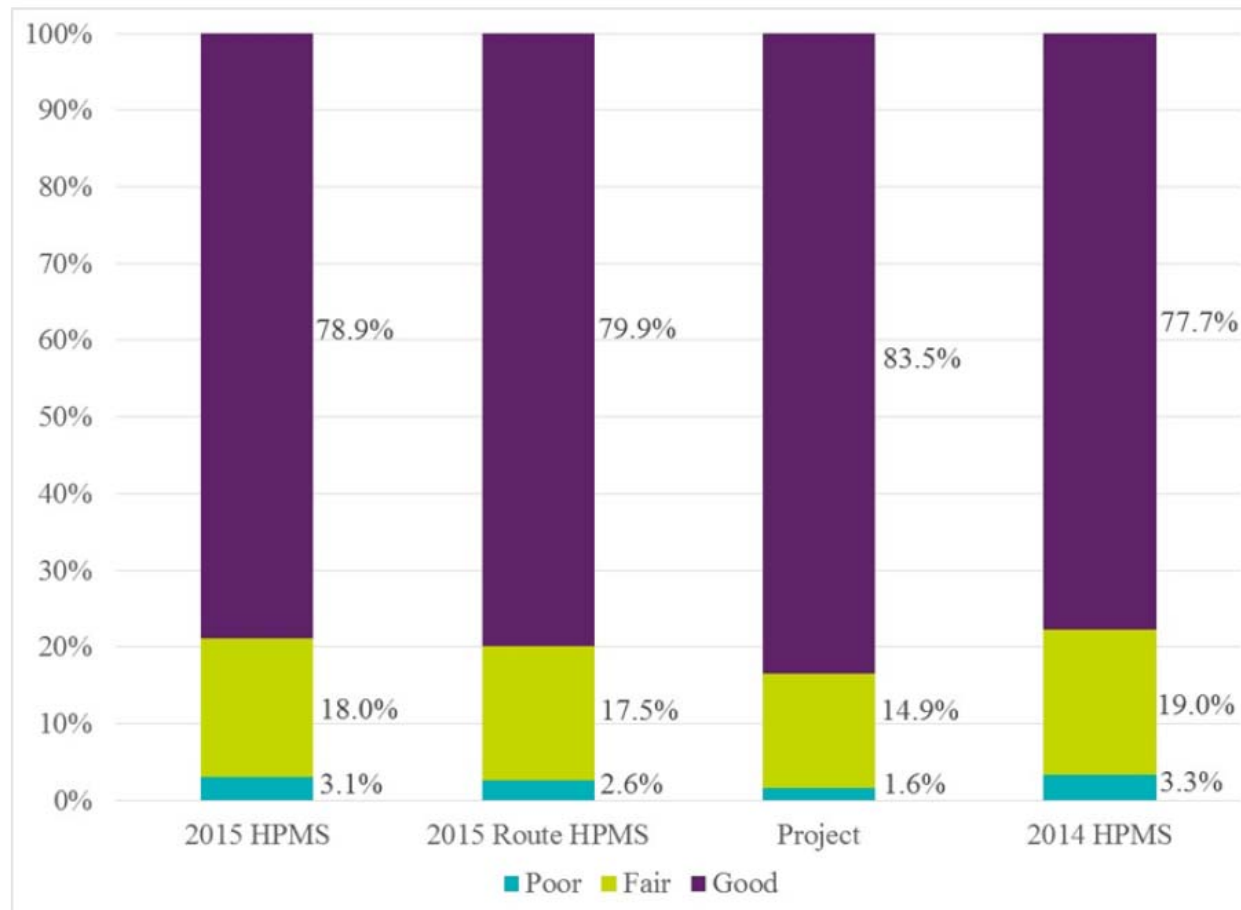
# Objectives

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- ▶ Perform temporal analysis of 2013, 2014, and 2015 HPMS IRI data
  
- ▶ Evaluate whether regional conditions impact Interstate pavement IRI:
  - ▶ Urban vs rural
  - ▶ Climatic zones
  - ▶ Mountainous terrain vs plains or rolling terrain

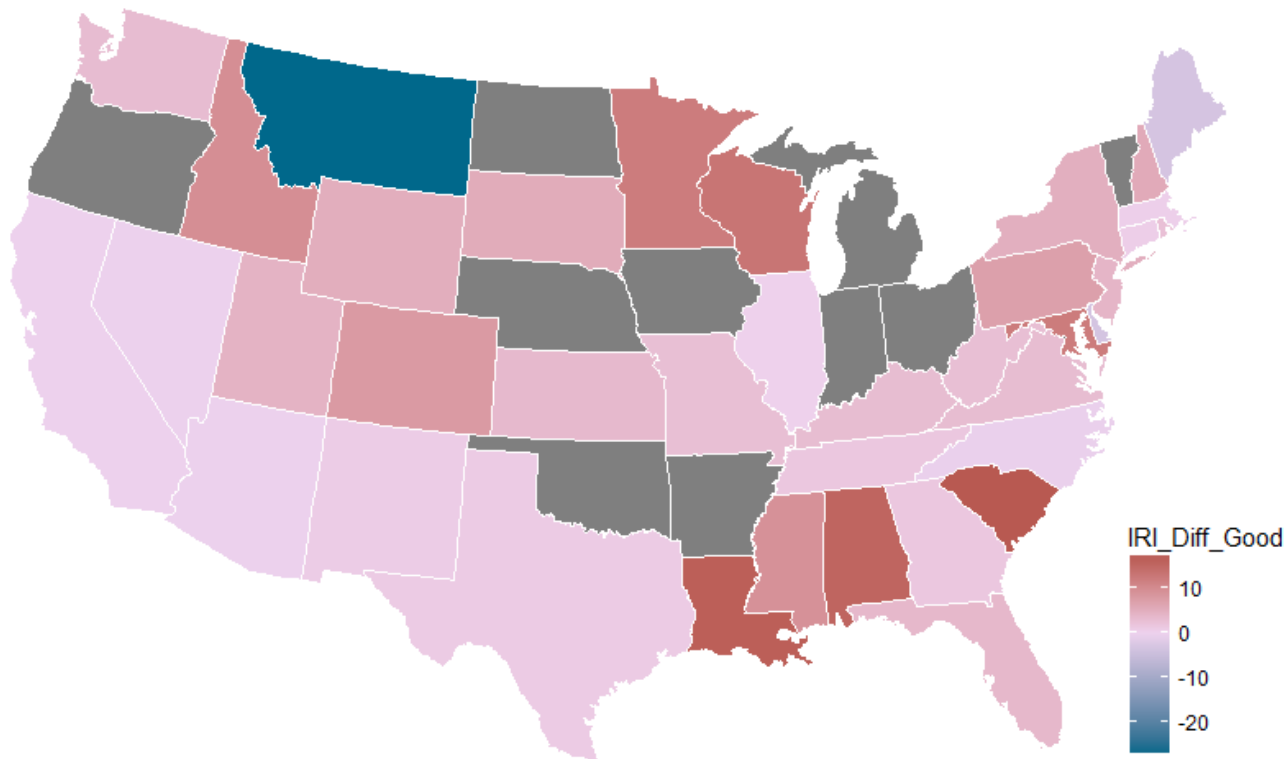
# Change in IRI over time

## ► Comparison of IRI condition



# Consistency across States

## ► 2015 HPMS vs Baseline

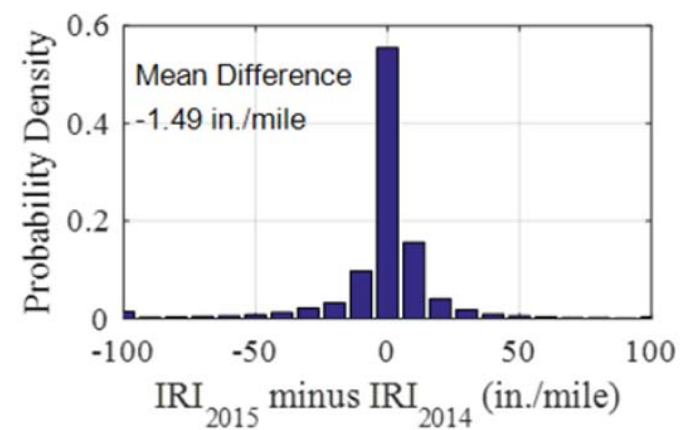
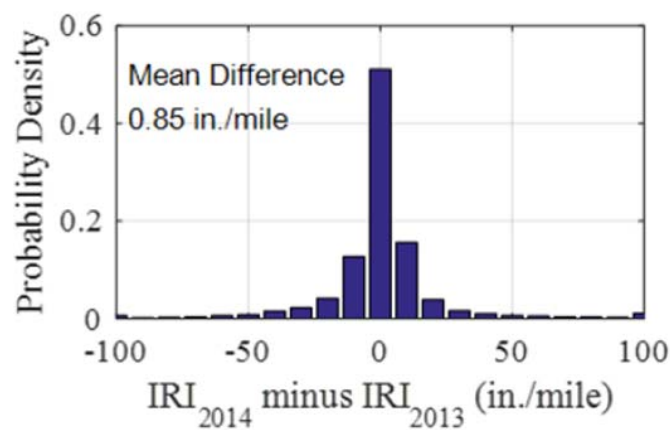


STATE	% Good IRI		
	15HPMS	IS	Diff
Montana	89.4	62.7	-26.7
Minnesota	68.4	80.4	12.0
Maryland	76.5	88.6	12.1
Wisconsin	48.8	61.8	13.0
Alabama	79.2	94.5	15.3
Louisiana	60.2	76.4	16.2
South Carolina	67.1	84.1	17.0
% States with	> 10	18%	
an absolute	> 20	3%	
difference of	> 30	0%	

# Change in IRI over time

- Summary Statistics of IRI data for 2013 to 2015 data.

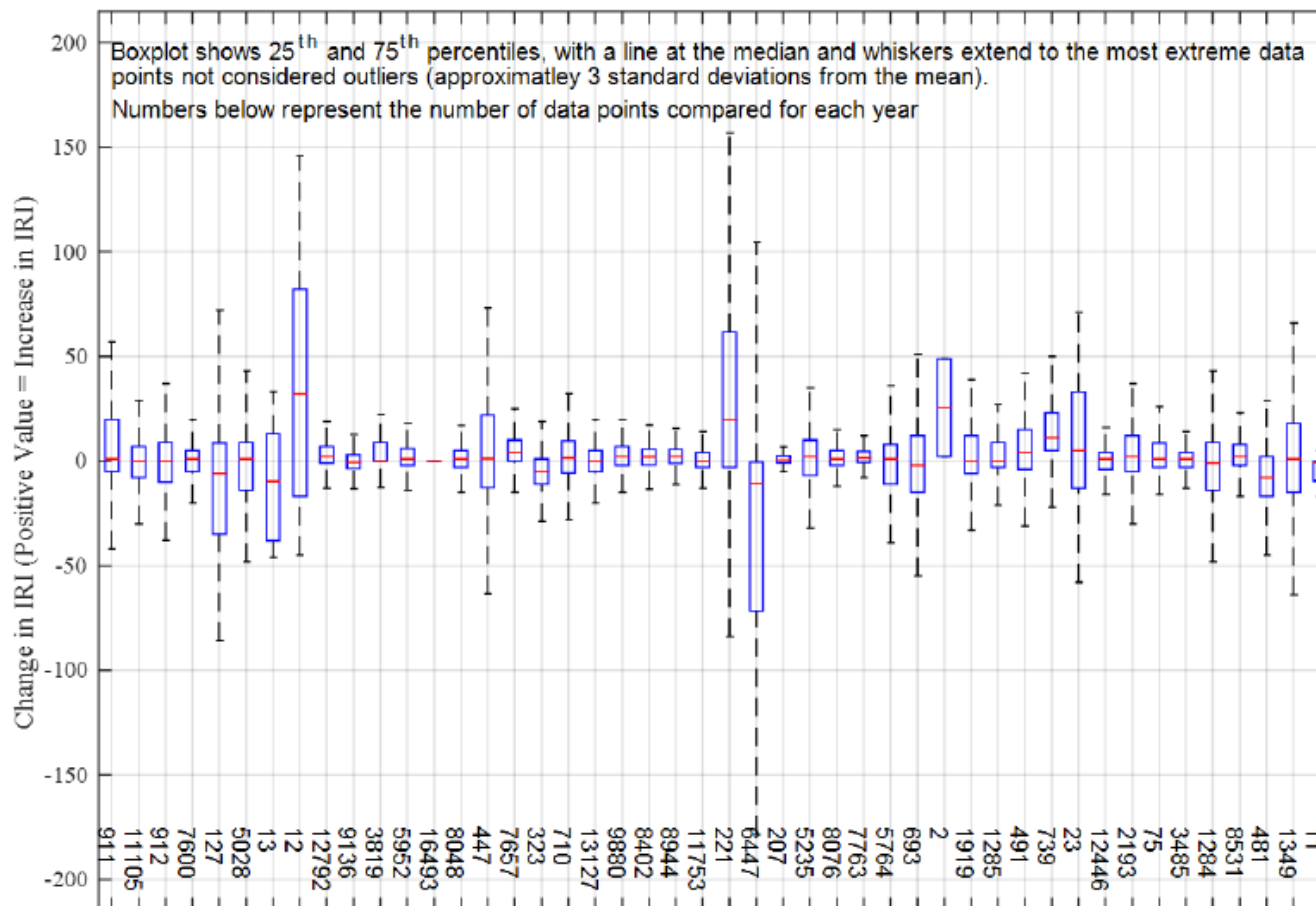
IRI statistic	2013 HPMS data	2014 HPMS data	2015 HPMS data
IRI (in./mile)	80.1	79.6	79.0
Cracking (%)	4.7	4.7	3.4
Rutting (in.)	0.24	0.13	0.14
Faulting (in.)	0.11	0.08	0.05





# Change in IRI over time

## ► Comparison by State – change between 2014 and 2015

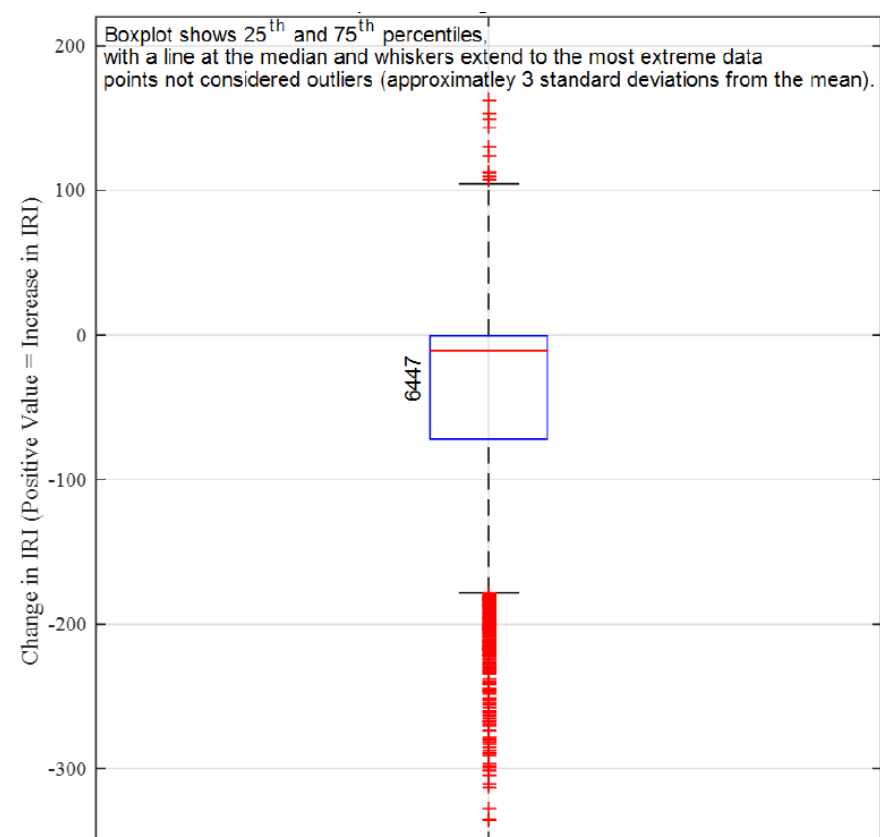
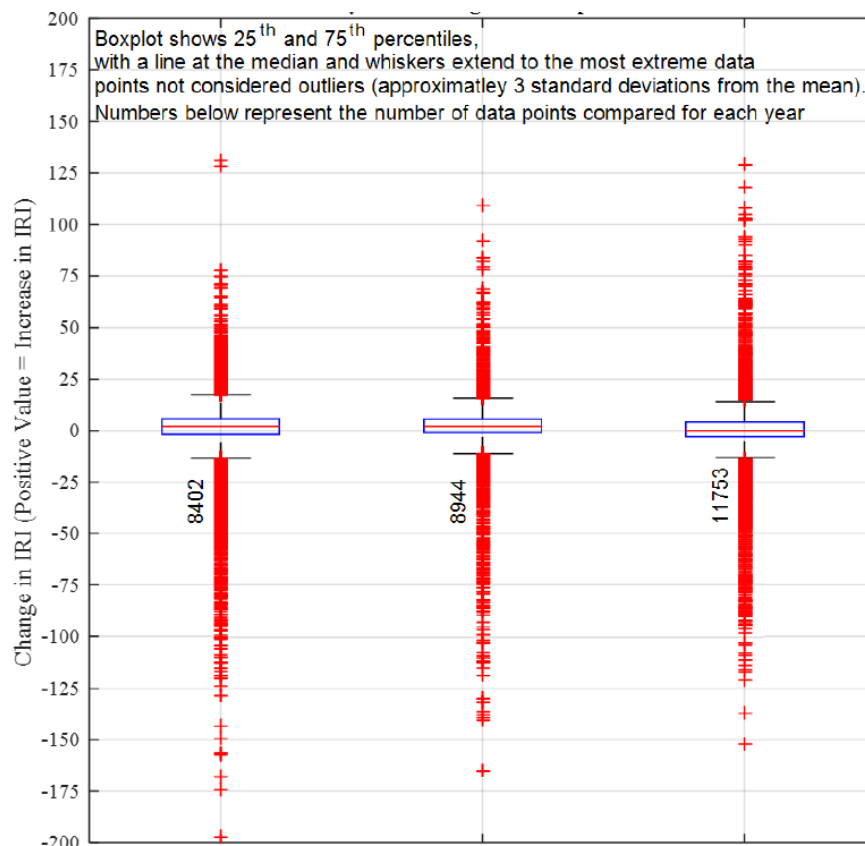






# Change in IRI over time

## ► Comparison by State – change between 2014 and 2015



# Factor Analysis

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- ▶ Effect of weather and local factors on IRI using 2015 HPMS data

Category	Mean IRI (in./mile)
Rural	69.1
Urban	78.6
Level	70.6
Rolling	72.3
Mountainous	78.8
Wet Freeze	72.4
Wet No Freeze	72.1
Dry Freeze	73.4
Dry No Freeze	68.7
Wet	72.3
Dry	71.6
Freeze	72.7
No Freeze	70.8

# Factor Analysis

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- ▶ IRI data from 2015 HPMS
- ▶ Common language effect size

	Rural	Urban
Rural	n/a	0.427
Urban	0.573	n/a

	Wet	Dry
Wet	n/a	0.505
Dry	0.495	n/a

	Level	Rolling	Mountainous
Level	n/a	0.487	0.437
Rolling	0.513	n/a	0.451
Mountainous	0.563	0.549	n/a

	Freeze	No Freeze
Freeze	n/a	0.515
No Freeze	0.485	n/a

	Wet Freeze	Wet No Freeze	Dry Freeze	Dry No Freeze
Wet Freeze	n/a	0.502	0.492	0.530
Wet No Freeze	0.498	n/a	0.491	0.527
Dry Freeze	0.508	0.509	n/a	0.538
Dry No Freeze	0.470	0.473	0.462	n/a

## Conclusions (1/2)

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- ▶ Change in mean IRI between 2013 and 2015 was not significant (80.14, 79.59 and 79.04 inches/mile)
- ▶ Pairwise comparison showed average change in IRI of 0.85 inch/mile and -1.49 inch/mile between 2013-2014 and 2014-2015.
- ▶ Nearly 20% of segments reported an absolute value of average IRI growth  $\geq 10$  inches/mile/year

## Conclusions (2/2)

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- ▶ Change of IRI per year varied significantly across States
- ▶ Level of population (urban vs rural) and type of terrain (level, rolling, mountainous) were most significant factors to explain difference in IRI
- ▶ Category with largest IRI value (weighted by pavement length) is mountainous terrain, followed by those in an urban setting.
- ▶ The lowest average IRI is in dry no freeze climate category

Thanks for your attention!

Questions?



# Extra slides



# Change in IRI over time

- Cumulated distribution of IRI per year.

