Changes in Interstate Highway Pavement Conditions between 2015 and 2018

By

Sareh Kouchaki

Wood Environment & Infrastructure Solutions, Inc.

Research Team: Amy Simpson, Pedro Serigos, Gonzalo Rada and Jonathan Groeger

RPUG Road Profile Users' Group

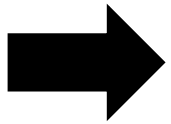
Outline

- Introduction
- Project Objectives
- Project Data
- Project Data Analysis
  - Network – level comparison
  - State – level comparison
  - Route – level comparison
- Concluding Remarks

Introduction

- MAP-21 & FAST ACT legislations required FHWA to adopt pavement performance measures for evaluating condition of Interstate Highway System (IHS)

- IRI
- Cracking
- Rutting
- Faulting



Condition Metric	Performance Level	Threshold
IRI – All Pavements	Good	<95
	Fair	95-170
	Poor	>170
Percent Cracking, AC	Good	<5%
	Fair	5 – 20%
	Poor	>20%
Percent Cracking, CRCP	Good	<5%
	Fair	5 – 10%
	Poor	>10%
Percent Cracking, JCP	Good	<5%
	Fair	5 – 15%
	Poor	>15%
Rutting - AC	Good	<0.20
	Fair	0.20 – 0.40
	Poor	>0.40
Faulting - JCP	Good	<0.10
	Fair	0.10 – 0.15
	Poor	>0.15

Condition Rating of Pavements

- ACP and JCP:
  - Good if all condition metrics good
  - Poor if two or more condition metrics poor
  - Fair for all other combinations of metric conditions

- CRCP:
  - Good if both condition metrics good
  - Poor if both condition metrics poor
  - Fair for all other combinations of metric conditions

Interstate Highway Sampling Projects

- FHWA study in 2015 (IS1)
- FHWA study in 2018 (IS2)

Objectives

- Collect unbiased dataset for statistically significant sample of IHS
- Produce report indicating condition on IHS nationally and each State where data collected
- Assess the quality of Highway Performance Monitoring System data
- Compare 2015 and 2018 IHS pavement conditions at national, State, and route level
  - Four pavement condition metrics
  - Good/fair/poor overall condition ratings

Projects Data Collection

- IS1 – 8,587 miles
- HPMS Field Manual 2014

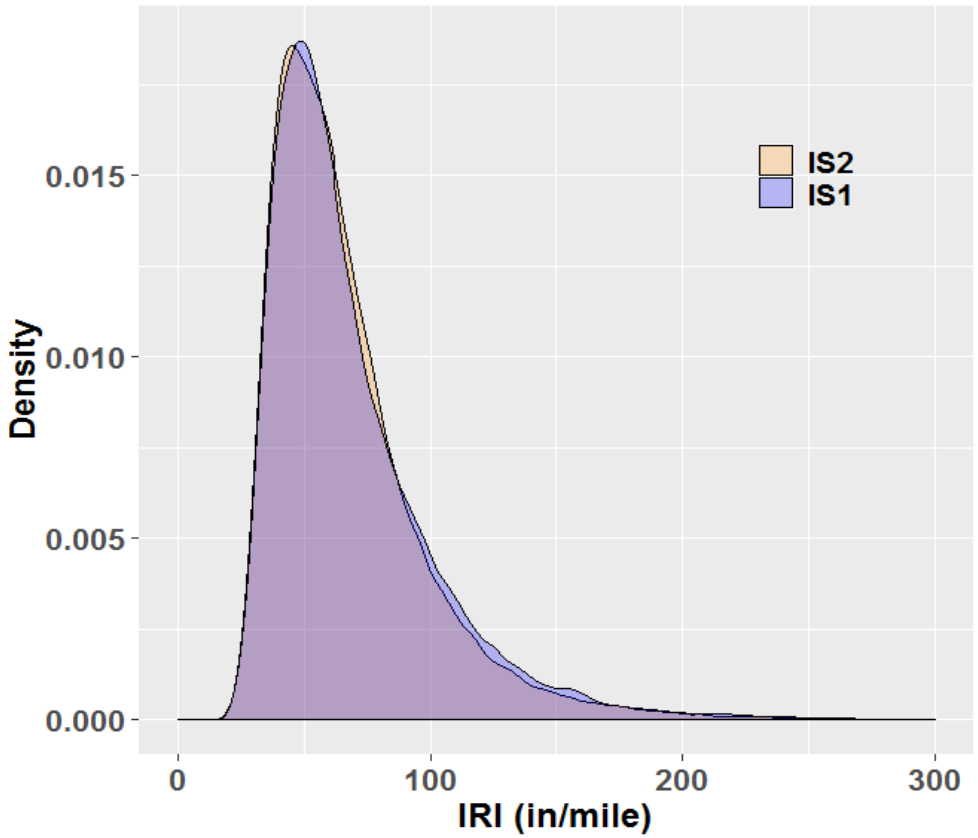
ACP	JCP	CRCP
6,837 mi.	1,316 mi.	434 mi.

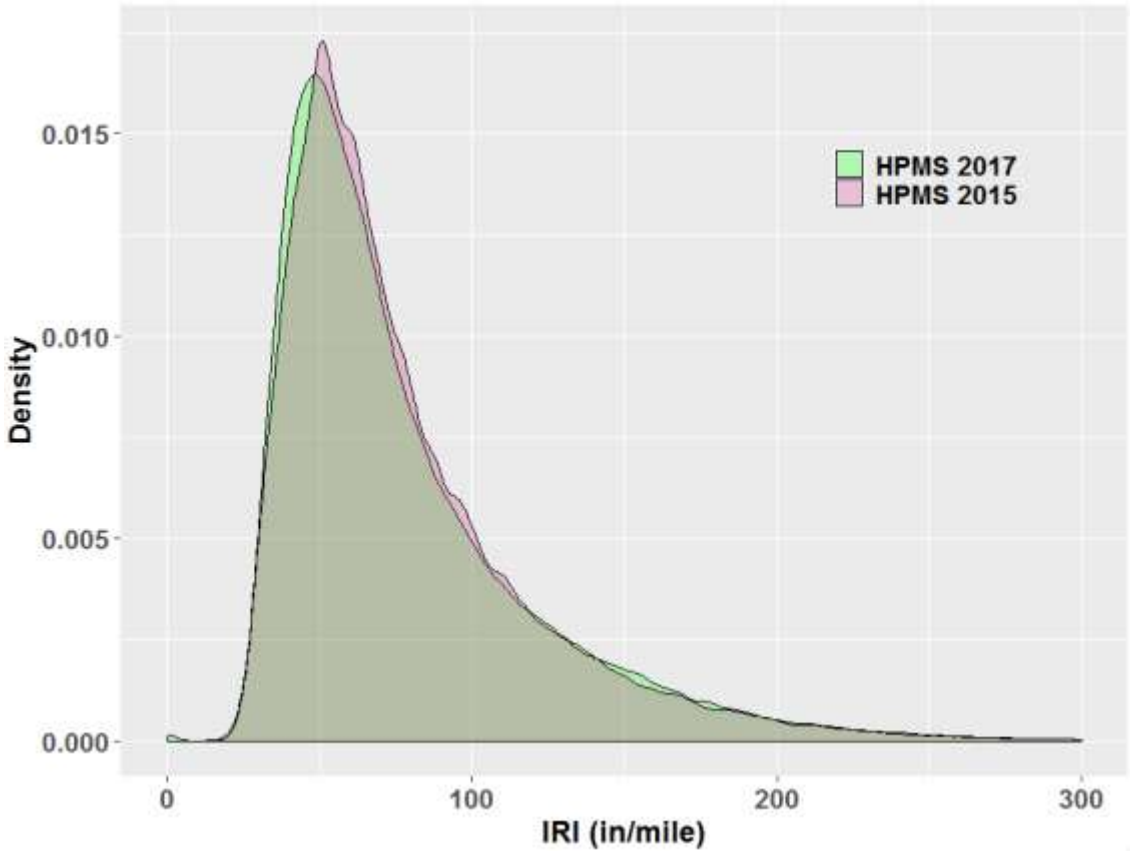
- IS2 – 7,544 miles
- HPMS Field Manual 2016

ACP	JCP	CRCP
5,734 mi.	1,384 mi.	426 mi.

Network-Level Comparison

IRI Condition Data





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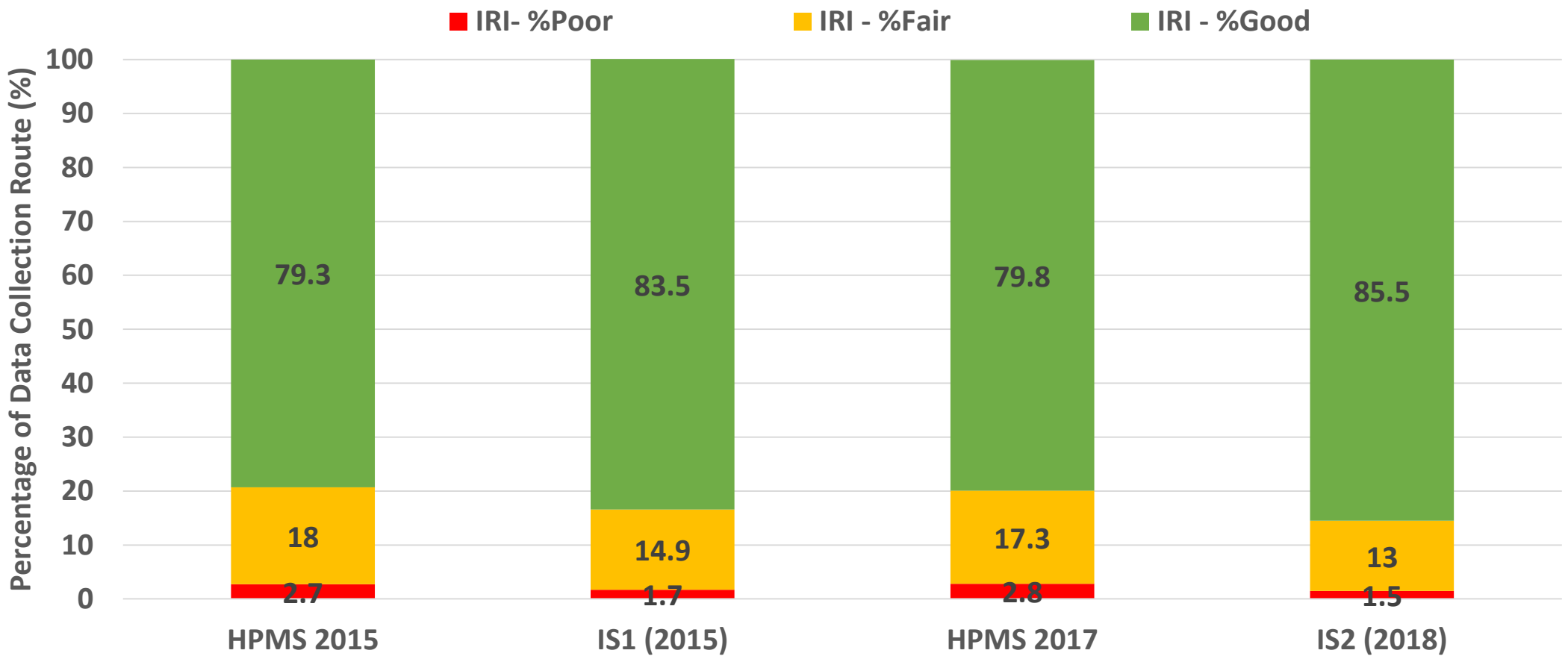
IRI - Good/Fair/Poor Ratings



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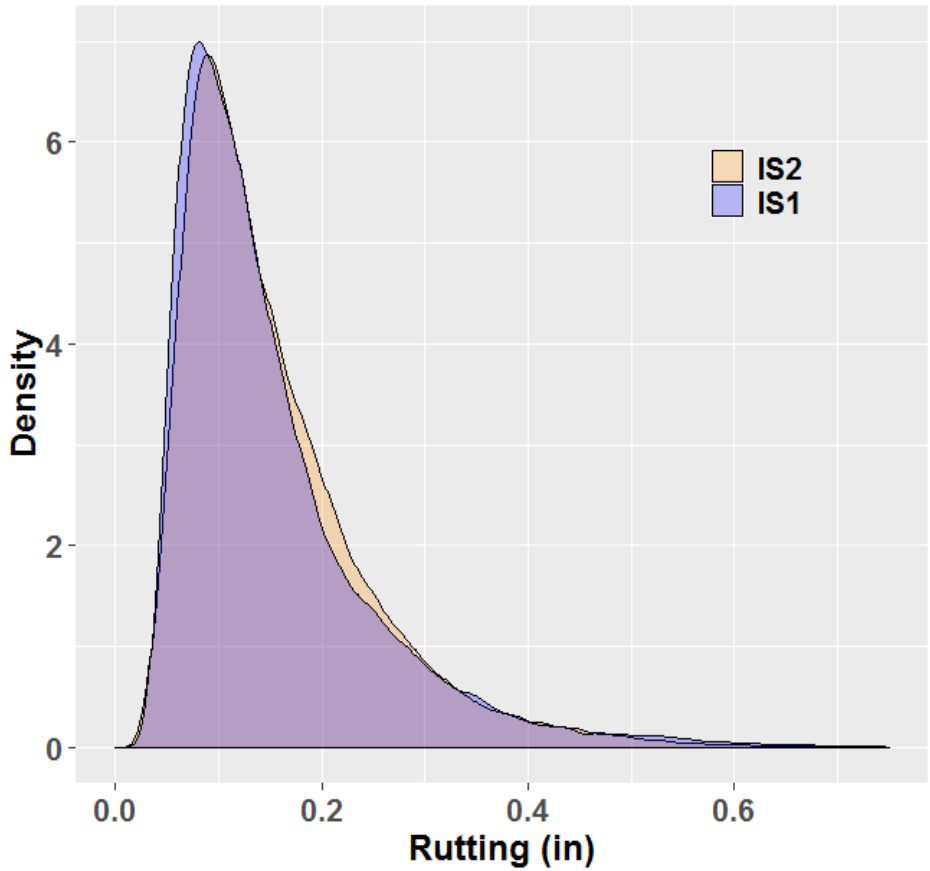
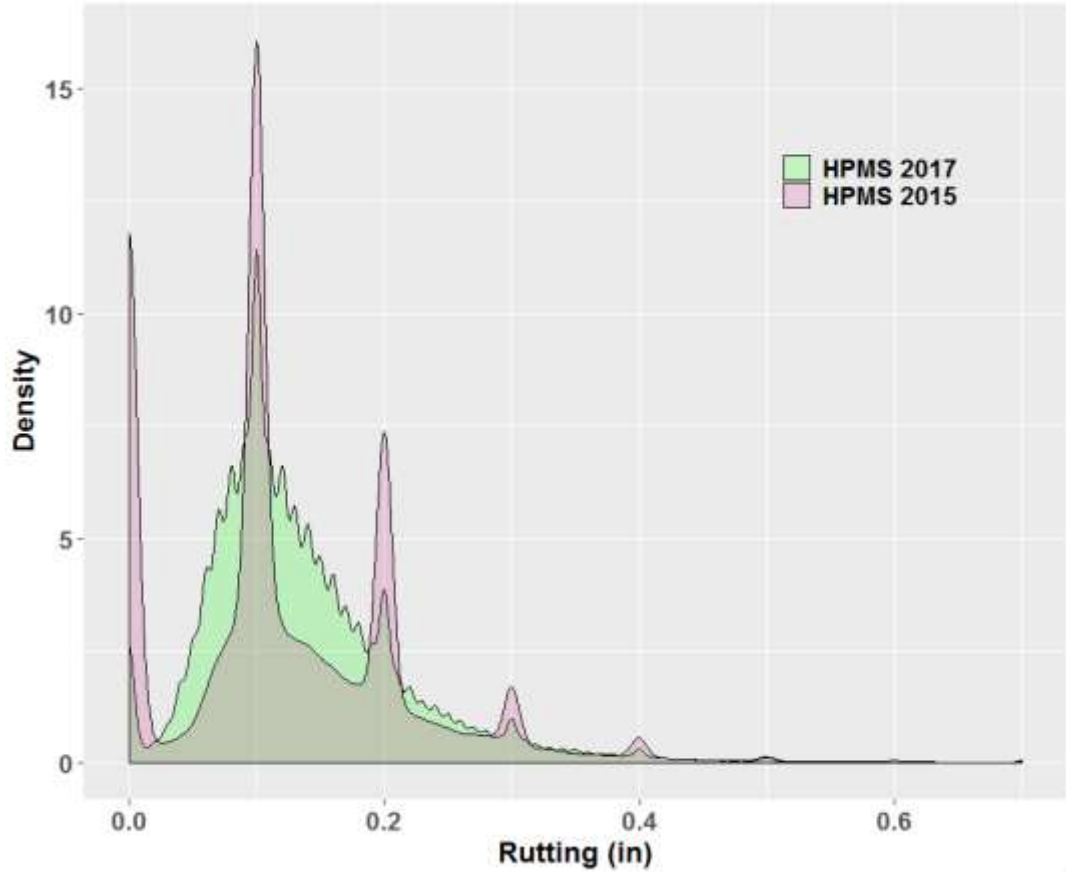
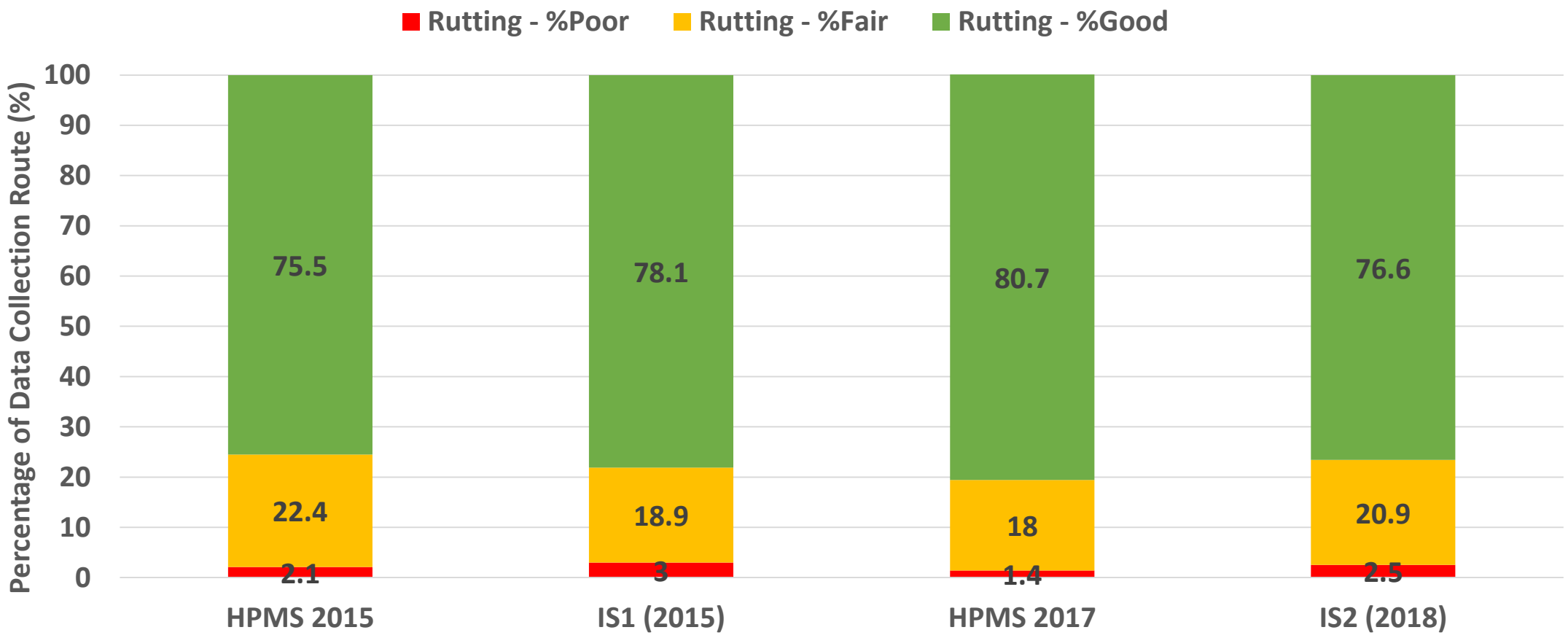
Rutting Condition Data





Rutting - Good/Fair/Poor Ratings



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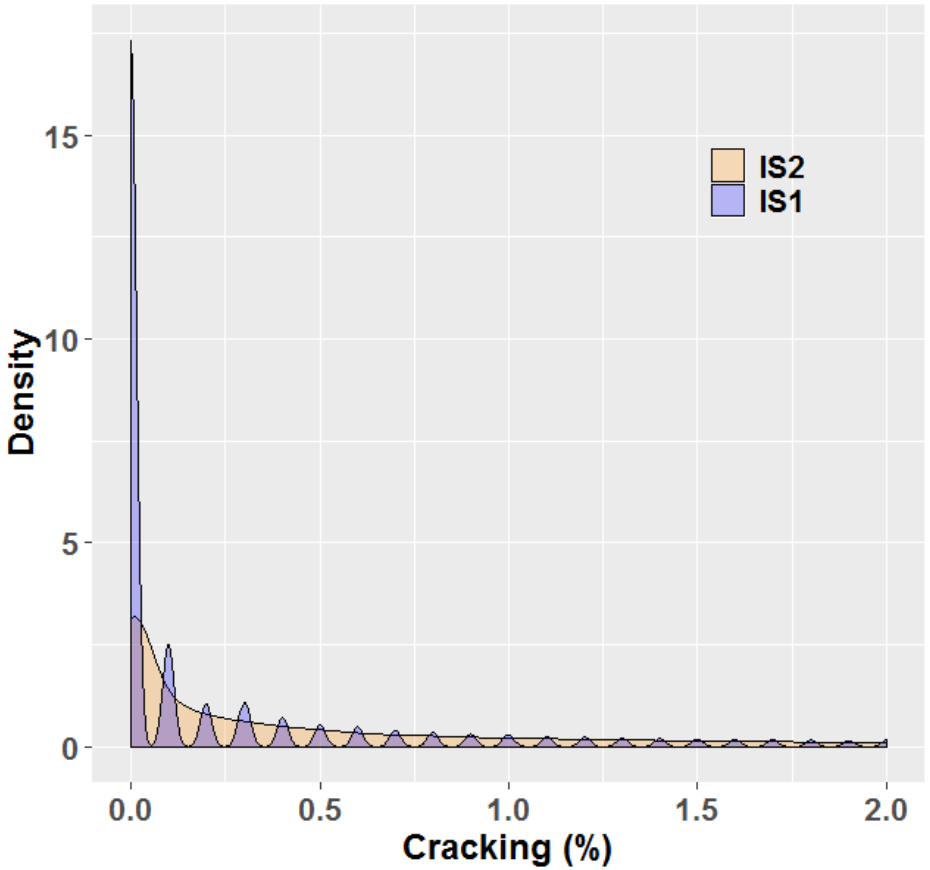
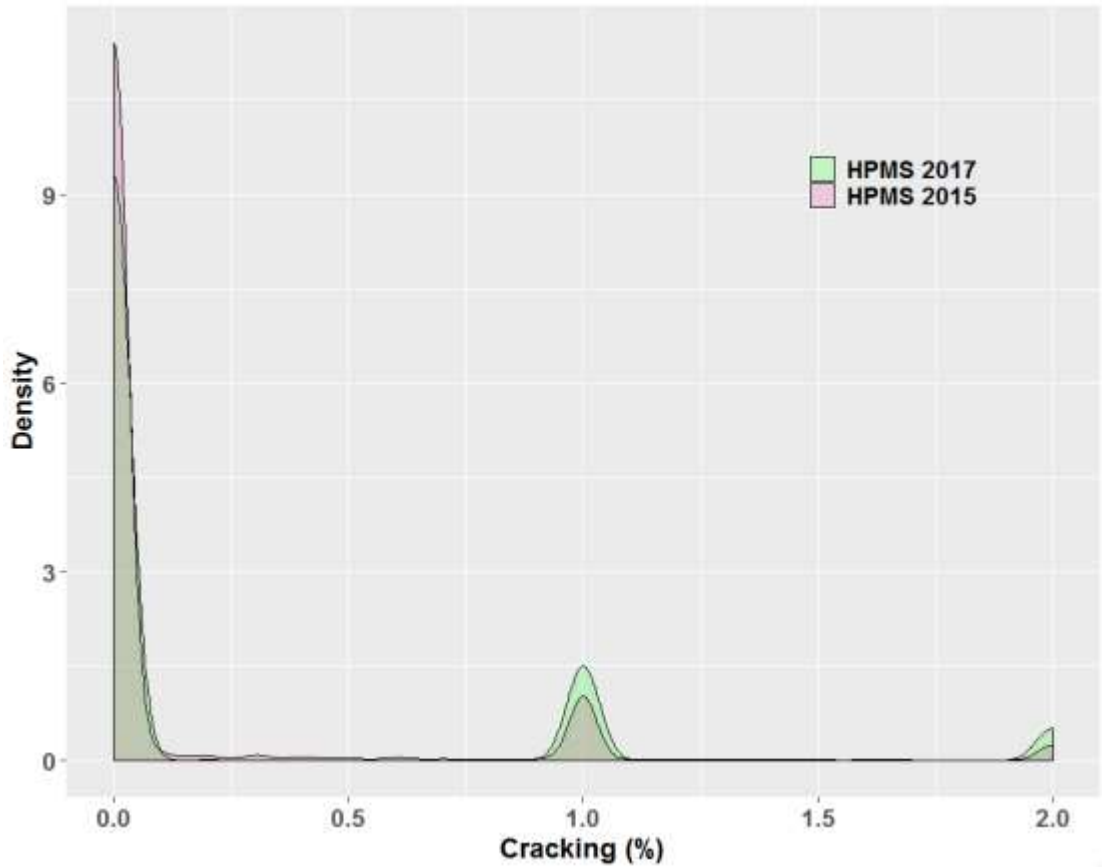
Cracking Condition Data





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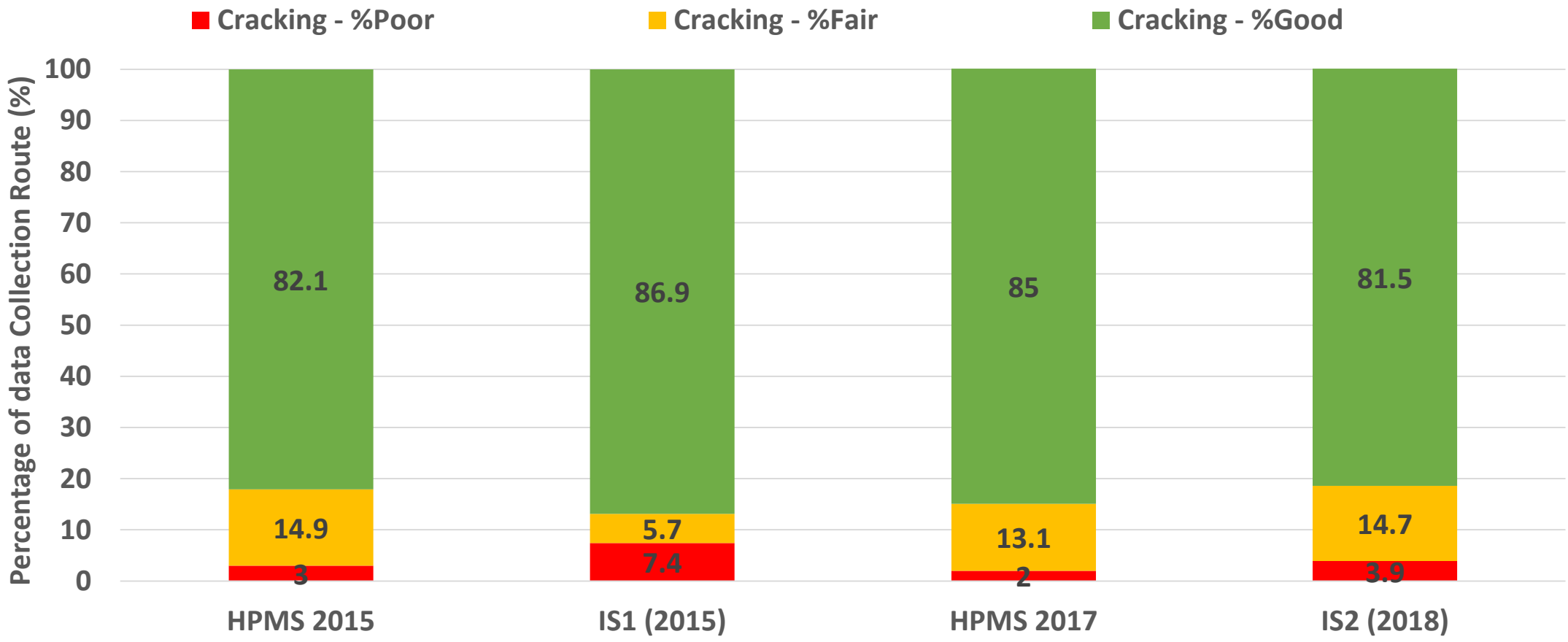
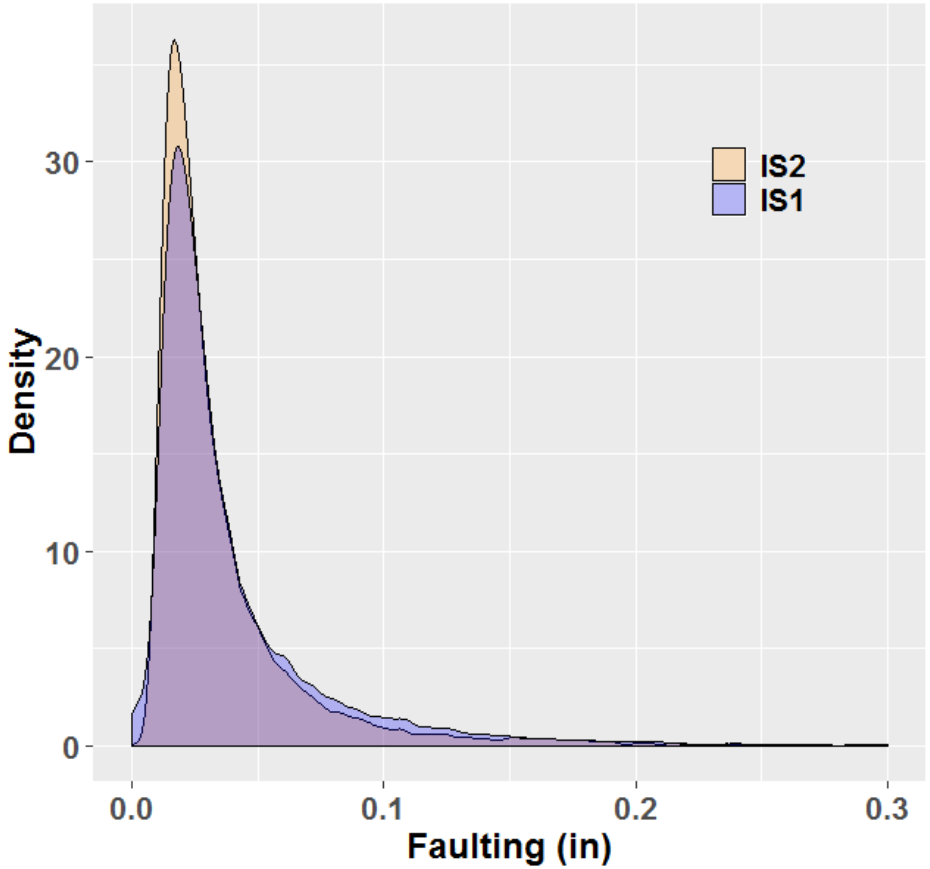
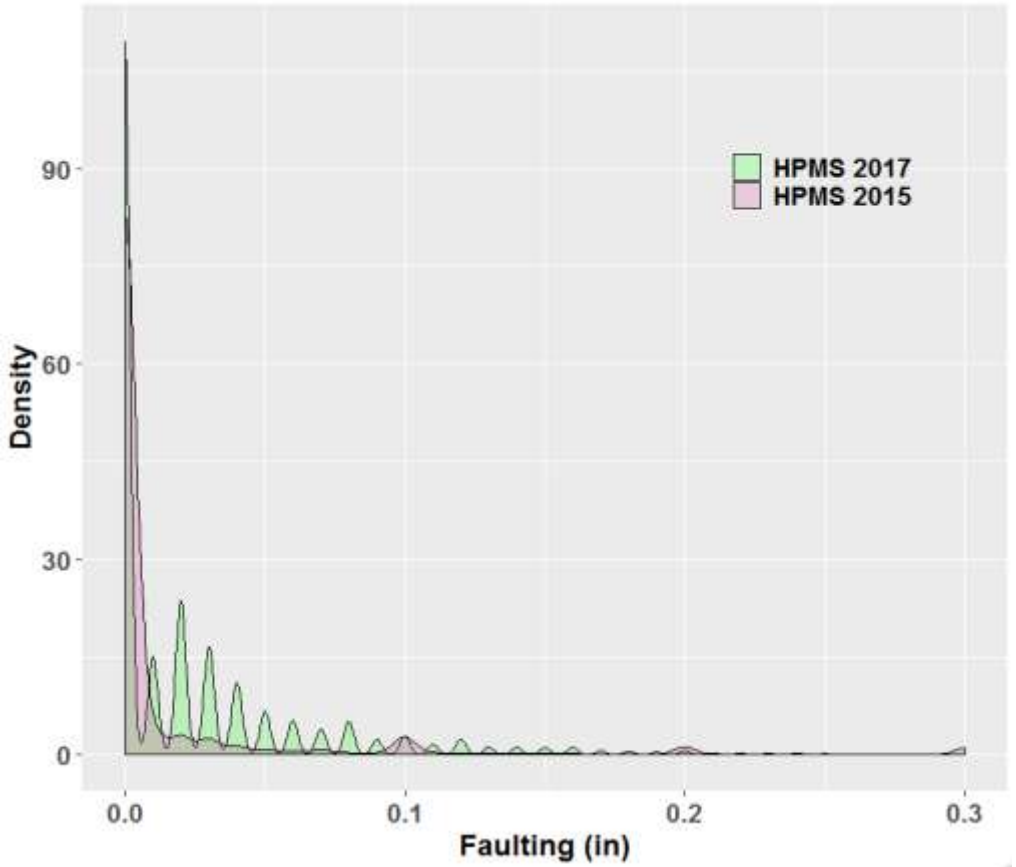
Cracking - Good/Fair/Poor Ratings



Faulting Condition Data





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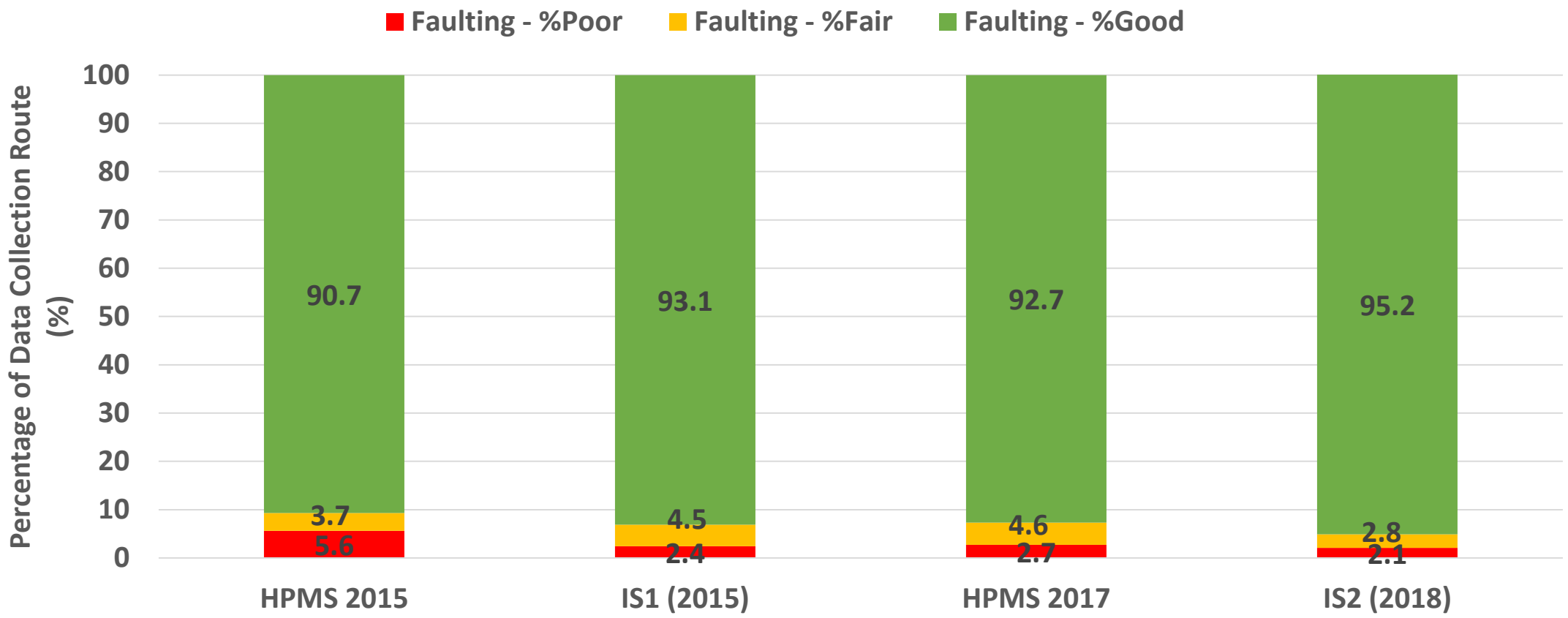
Faulting - Good/Fair/Poor Ratings



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Percent Cracking

Surface Type	IS1 - Mean	IS2 - Mean
CRCP	0.1	0.4
JCP	10.7	4.3
ACP	1.9	3.5

Percent Cracking on JCP:

IS1: Percentage of slabs exhibits both transverse and longitudinal cracking

IS2: Percentage of slabs exhibits transverse cracking

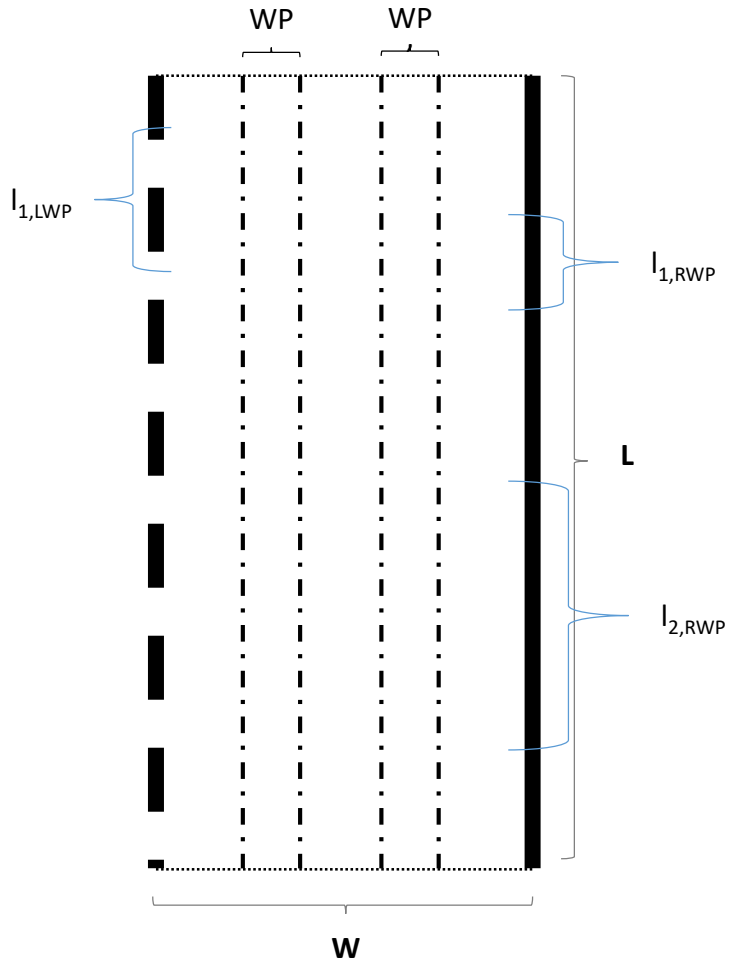
Percent Cracking on ACP

- **Definition (HPMS Field Manual)**

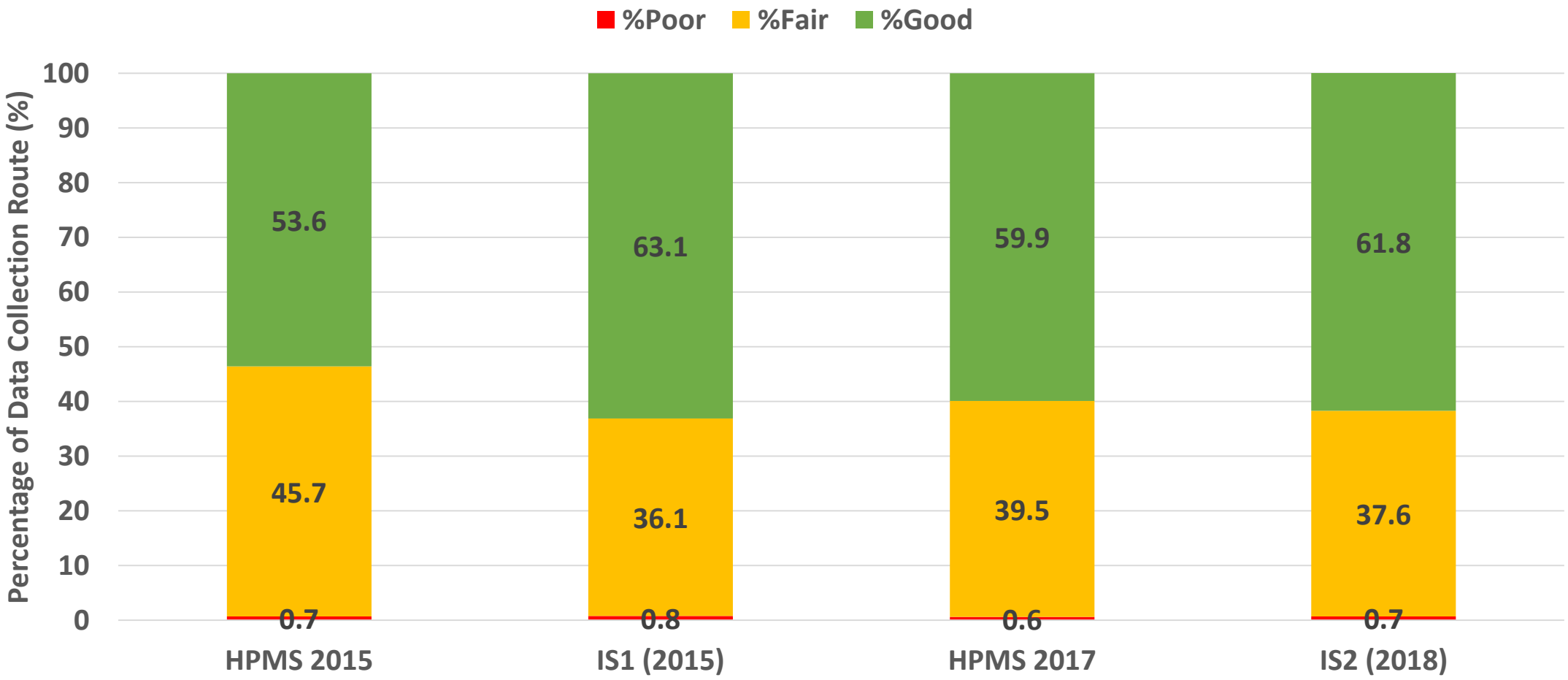
  Total cracked area located within wheel-path divided by total lane area

Study	Wheelpath width (WP)
IS1	2 ft
IS2	3.3 ft

Narrower wheelpath ➡ **Lower percent cracking**



Overall Condition Ratings



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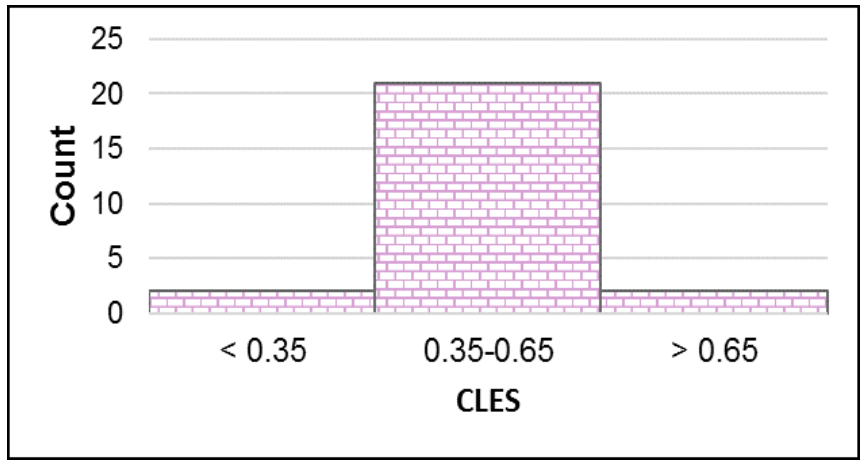
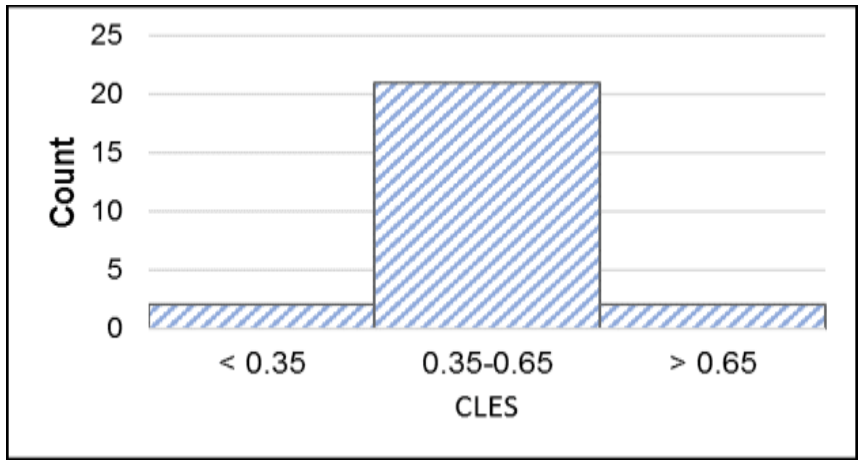
State-Level Comparison

- **25 common States between IS1 and IS2**
- **Method: Common Language Effect Size (CLES)**
  - Measure magnitude of differences in mean of condition metrics between two datasets at each State

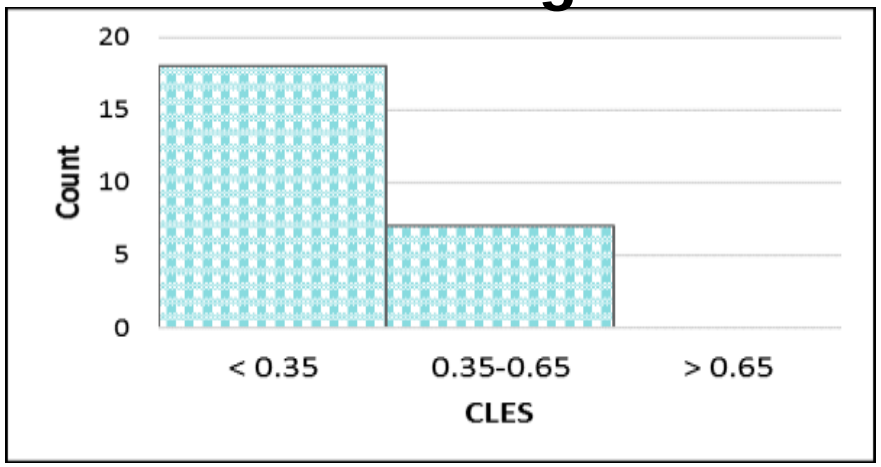
IRI



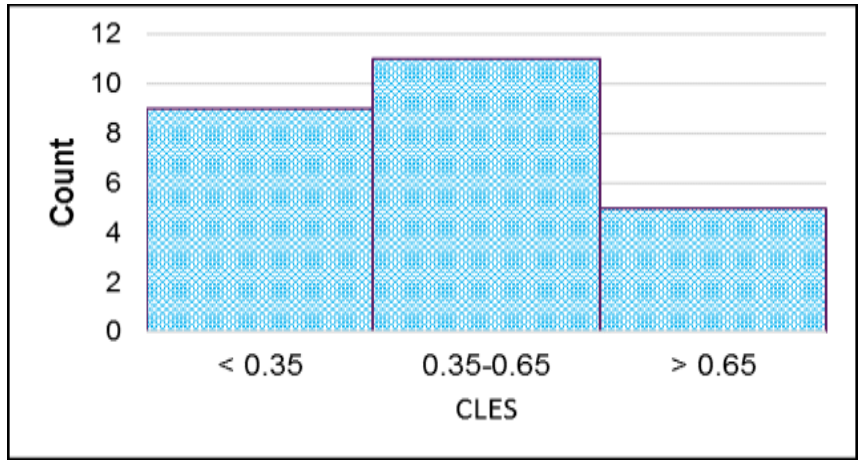
Rutting



Cracking



Faulting



Route-Level Comparison

2,558 mi. duplicated mileage

Condition Metrics	IS1	IS2
IRI, in/mile	72	70
Rutting, in	0.16	0.17
Cracking, %	3.6	3.8
Faulting, in	0.05	0.06

Concluding Remarks

- Network
  - ~ 8,500 miles data were collected on IHS in IS1 and ~ 7,500 miles data were collected in IS2
  - IRI, rutting, and faulting distributions for IS1 and IS2 datasets are nearly identical, but for cracking they have distinct distributions
  - Largest differences observed in cracking – changes in HPMS Field Manual
  - Pavement performance measures at network-level are consistent between HPMS and FHWA IHS data sources.

Concluding Remarks

- State
  - CLES statistic was used to evaluate level of consistency of condition metrics across States.
    - IRI and rutting: most States fall into medium group.
    - Cracking: no States fall into “large” group and most States are in “small” group.
    - Faulting: States are uniformly distributed amongst three groups

Concluding Remarks

- Route
  - When limiting comparisons to route mileage that was common to IS1 and IS2, some differences between two datasets were observed.
  - Reductions in percentage of pavements in overall good condition were observed.
  - Paired route comparison of IS1 and IS2 validates the results observed at the network-level evaluation

Thank you