Winter Maintenance Best Practices:

How and Why Companies Use Low-Salt Practices

Holden Sparacino and Dr. Kristine Stepenuck

Lake Champlain Deicing Conference | October 10, 2018

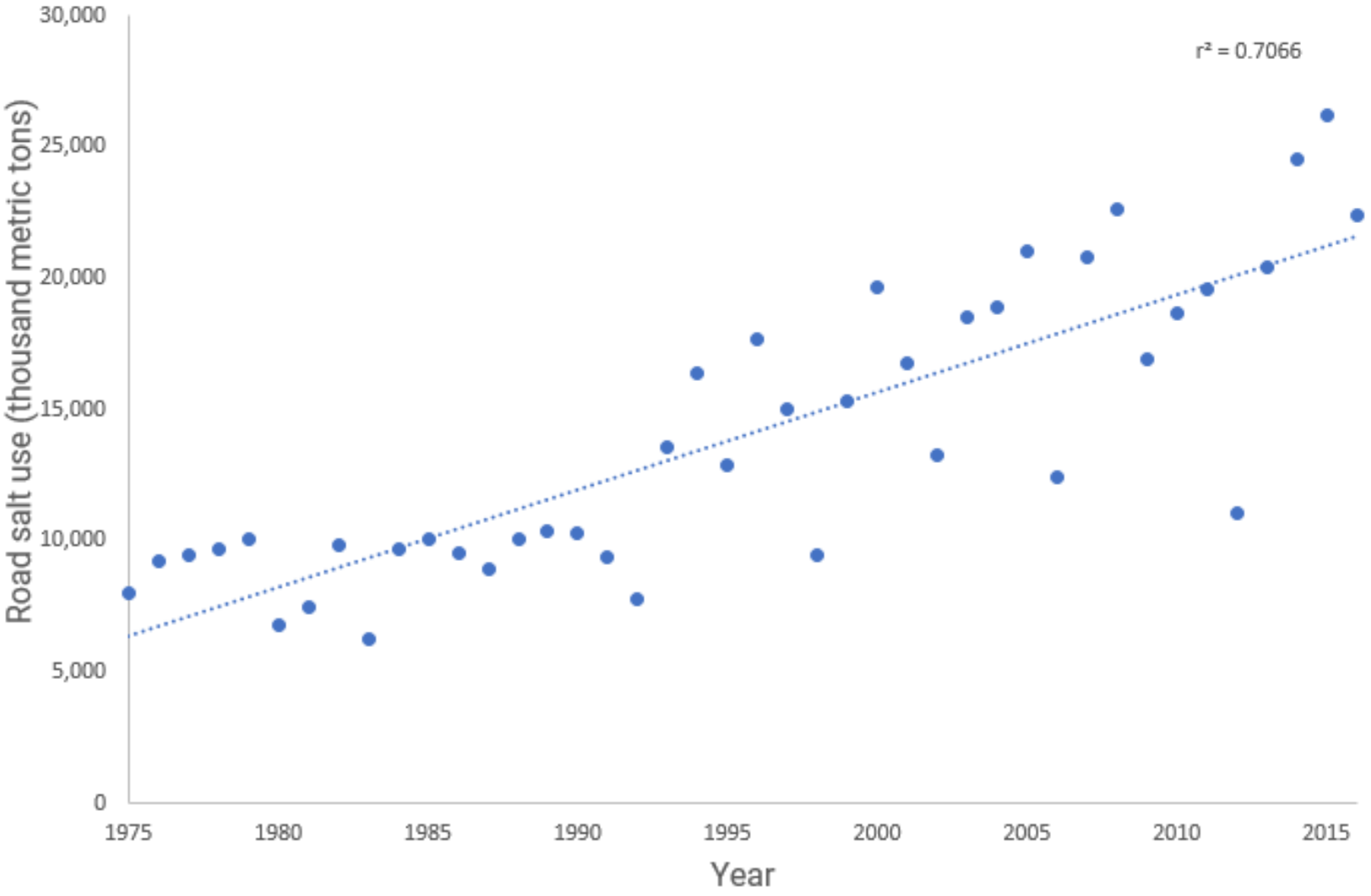
NOAA National Oceanic and Atmospheric Administration · U.S. Department of Commerce

Sea Grant Lake Champlain

The University of Vermont Extension

The University of Vermont Rubenstein School of Environment & Natural Resources

Road Salt (Sodium Chloride) Use is Increasing



Data Source: USGS: https://minerals.usgs.gov/minerals/pubs/commodity/salt/index.html

Environmental Impacts

- Increased salinity
- Aquatic communities
- Drinking water risks
- Stratification
- No viable removal

Trombulak, S. C., & Frissell, C. A. 2000;
Shi, Xie, & Gong, 2012;
United States Dugan et al., 2017;
Environmental Protection Agency
2017

Best Practices are Being Adopted by Municipalities

https://c1.staticflickr.com/2/1405/5170709274_cd76d086a2_b.jpg

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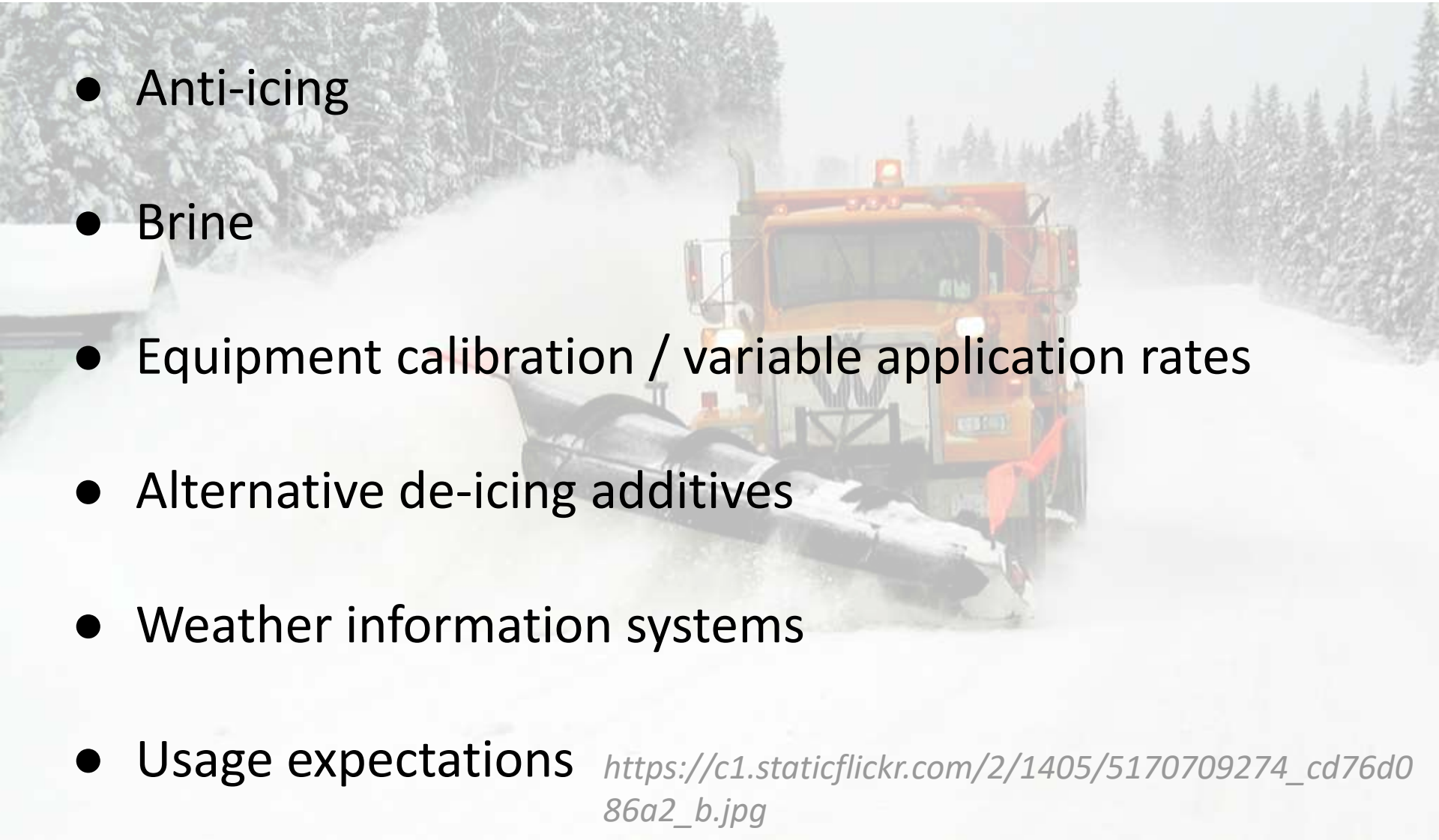


- Anti-icing
- Brine
- Equipment calibration / variable application rates
- Alternative de-icing additives
- Weather information systems
- Usage expectations

https://c1.staticflickr.com/2/1405/5170709274_cd76d086a2_b.jpg

Best Practices are Being Adopted by Municipalities

Environment Canada

- Up to 73% sodium chloride reductions from best management practice implementations

Environment and Climate Change Canada, 2013

https://c1.staticflickr.com/2/1405/5170709274_cd76d086a2_b.jpg

What About Private Contractors?

http://www.forconstructionpros.com

What About Private Contractors?

- Service areas
- Application materials and equipment used
- Practices used
- Barriers and motivations to reduced-salt practices

http://www.forconstructionpros.com

Impacts from Private Contractors May be Substantial

New Hampshire Total Mass Daily Load study

- Estimated 52.7% of all chloride inputs from private roads and parking lots

Trowbridge, 2007, 2010

http://www.forconstructionpros.com

The Study Has Three Objectives:

1. Characterize contractor practices
2. Identify barriers and motivations
3. Inform outreach to break down barriers to promote behavior changes

http://www.forconstructionpros.com

Census Design and Questions

- How much/what type of areas to contractors cover?
- What practices, application materials, and equipment do contractors currently use?
- What are the barriers and motivations for contractors to use best management practices?
- How can social marketing techniques be used?

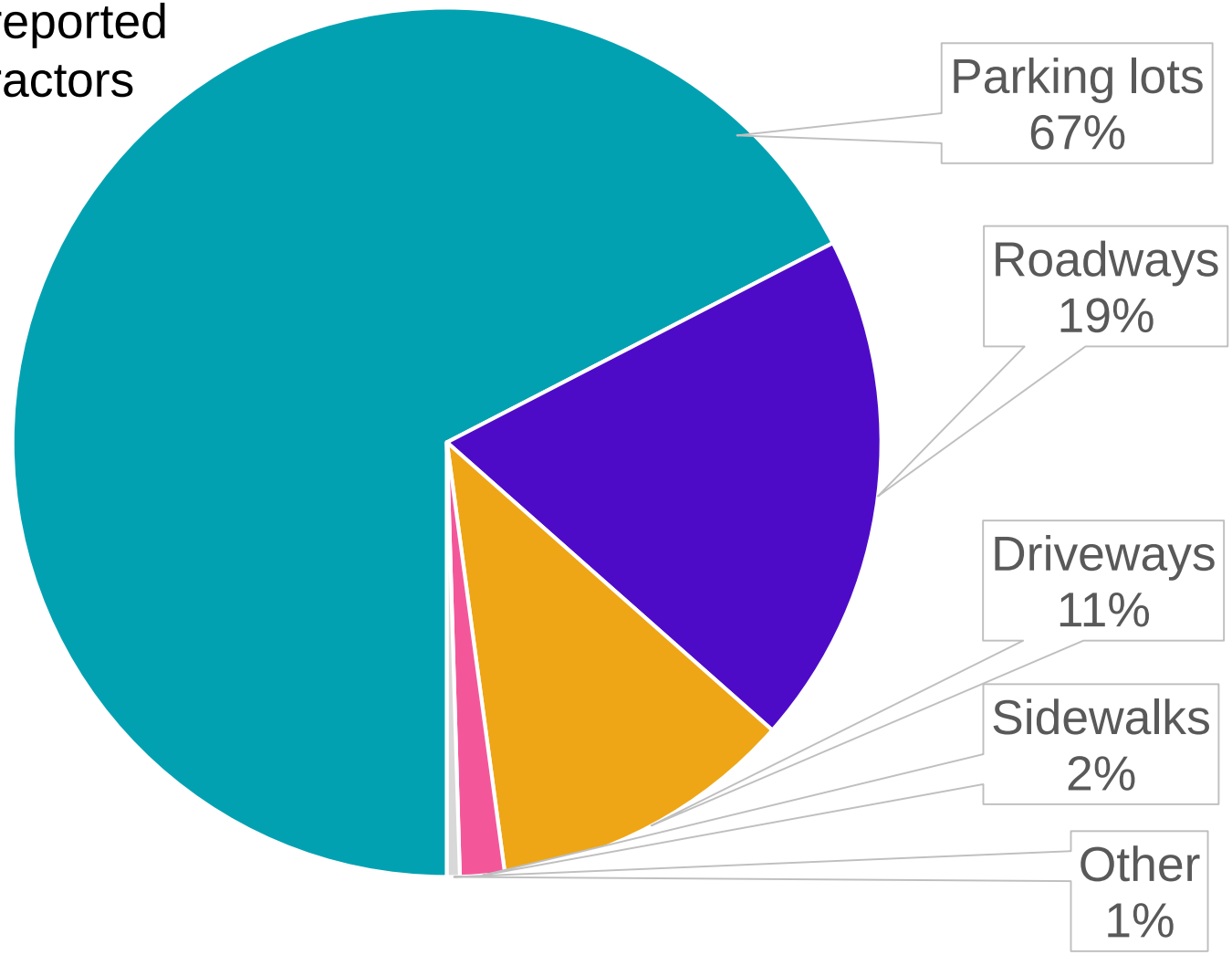
Contractors in the Lake Champlain Basin

- 232 businesses across VT and NY
- Identified through publicly available information
- Advertising or listed as provided snow removal services in the Lake Champlain Basin
- 70 participants (30.2% response rate)

Average of 24 lane miles per contractor

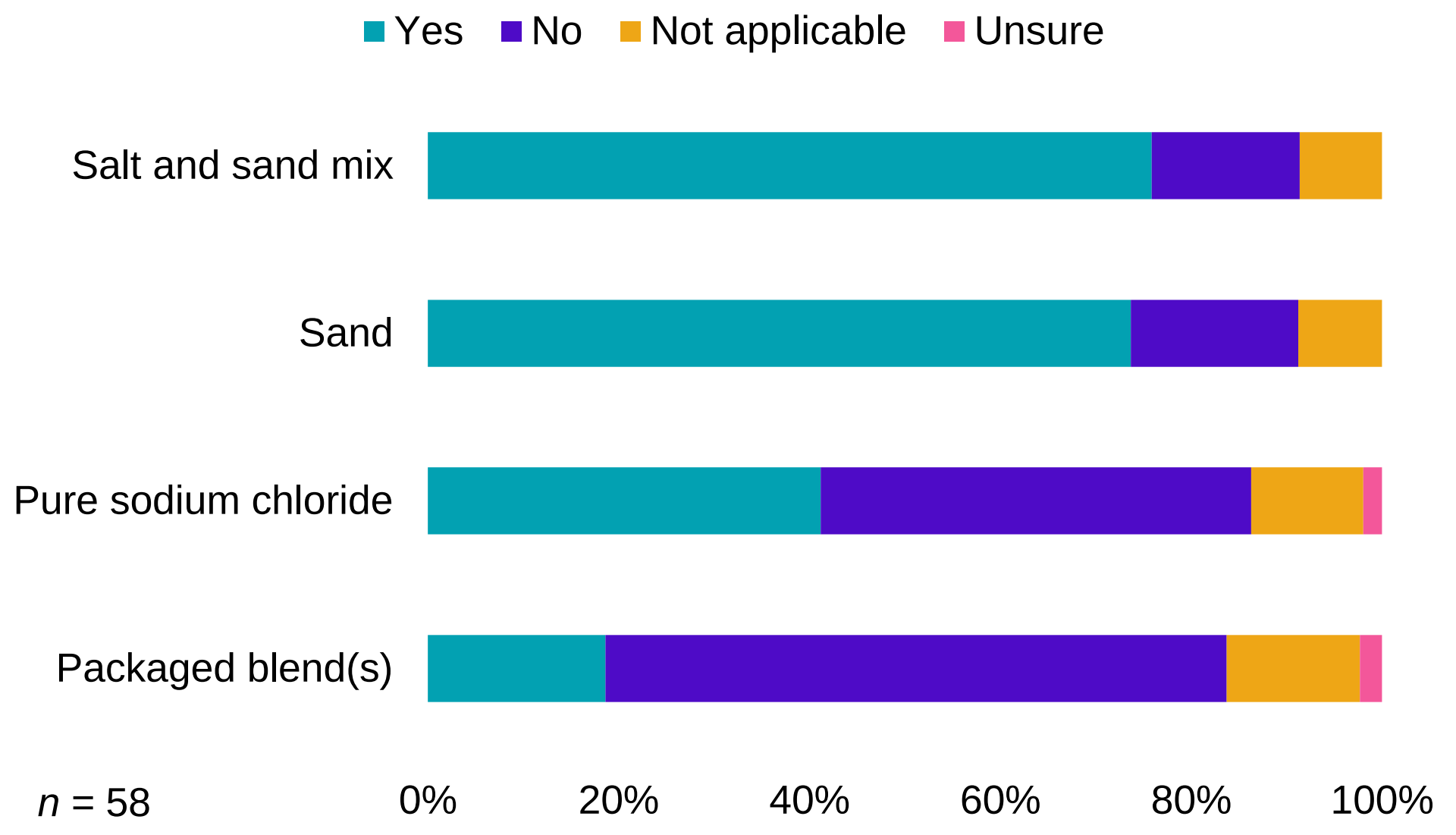
1,042 lane miles reported
from 19% of contractors

VTrans:
14,171 lane miles

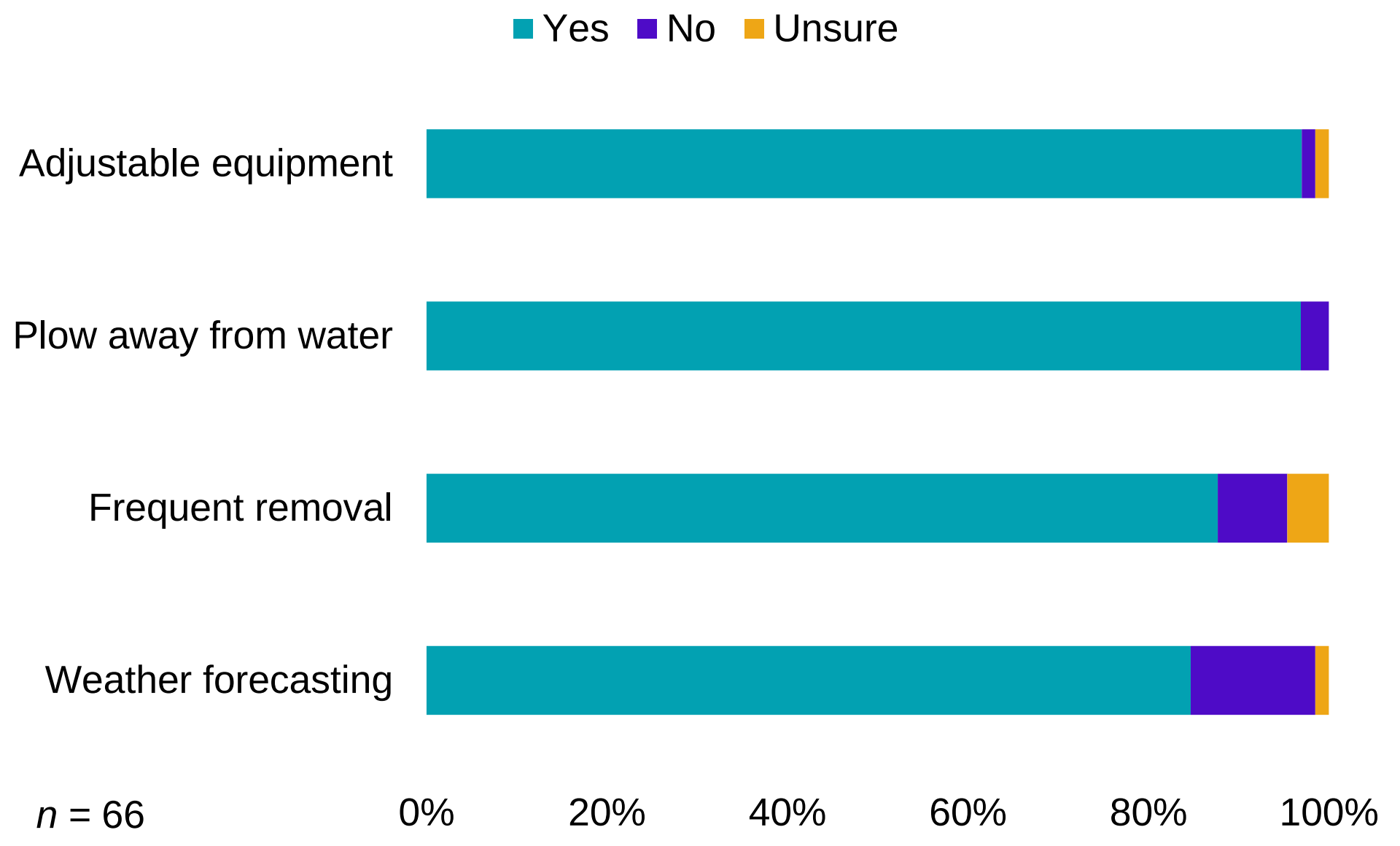


n = 43

Types of Application Materials Used Vary



Contractors Are Using Several Management Practices



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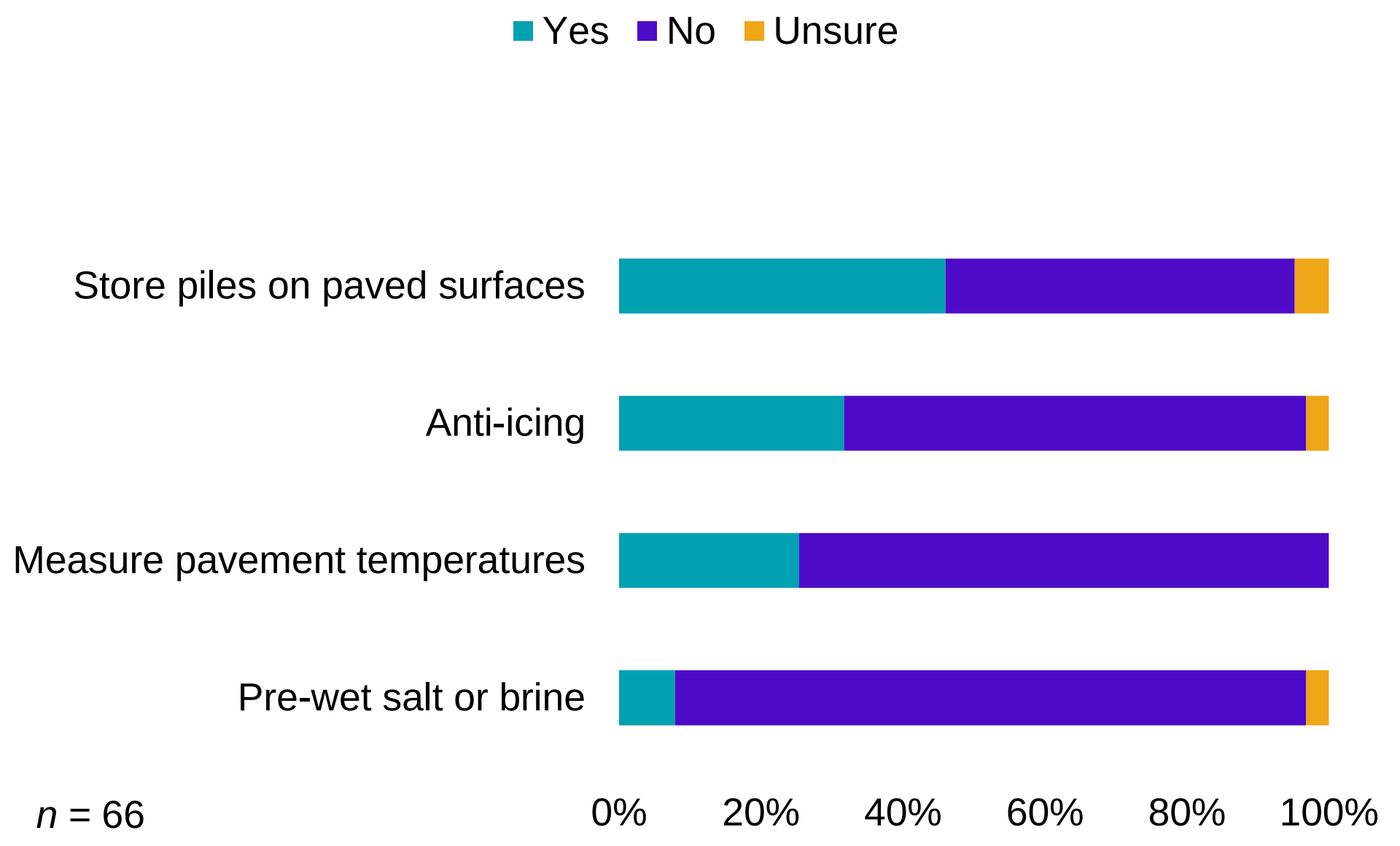
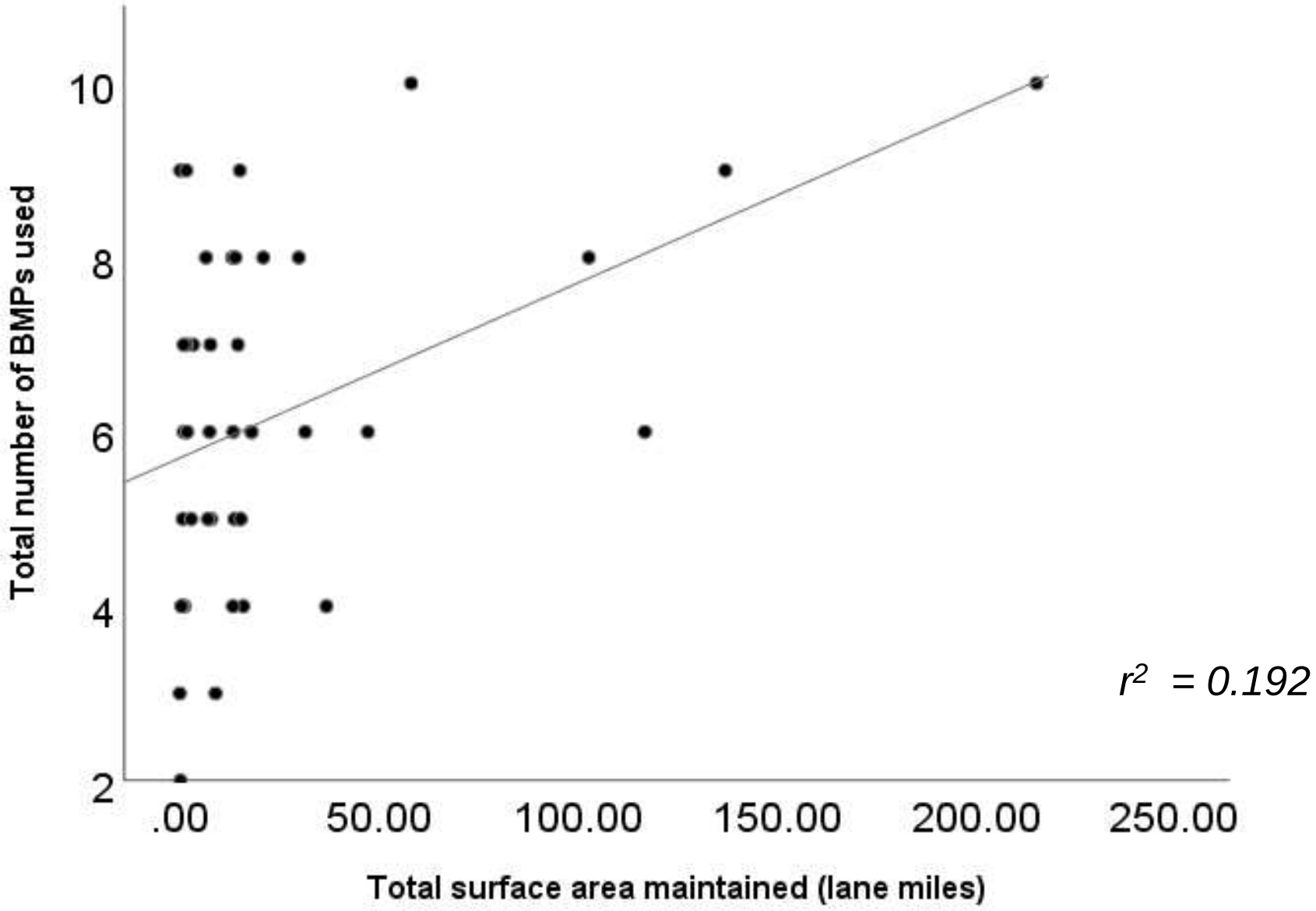


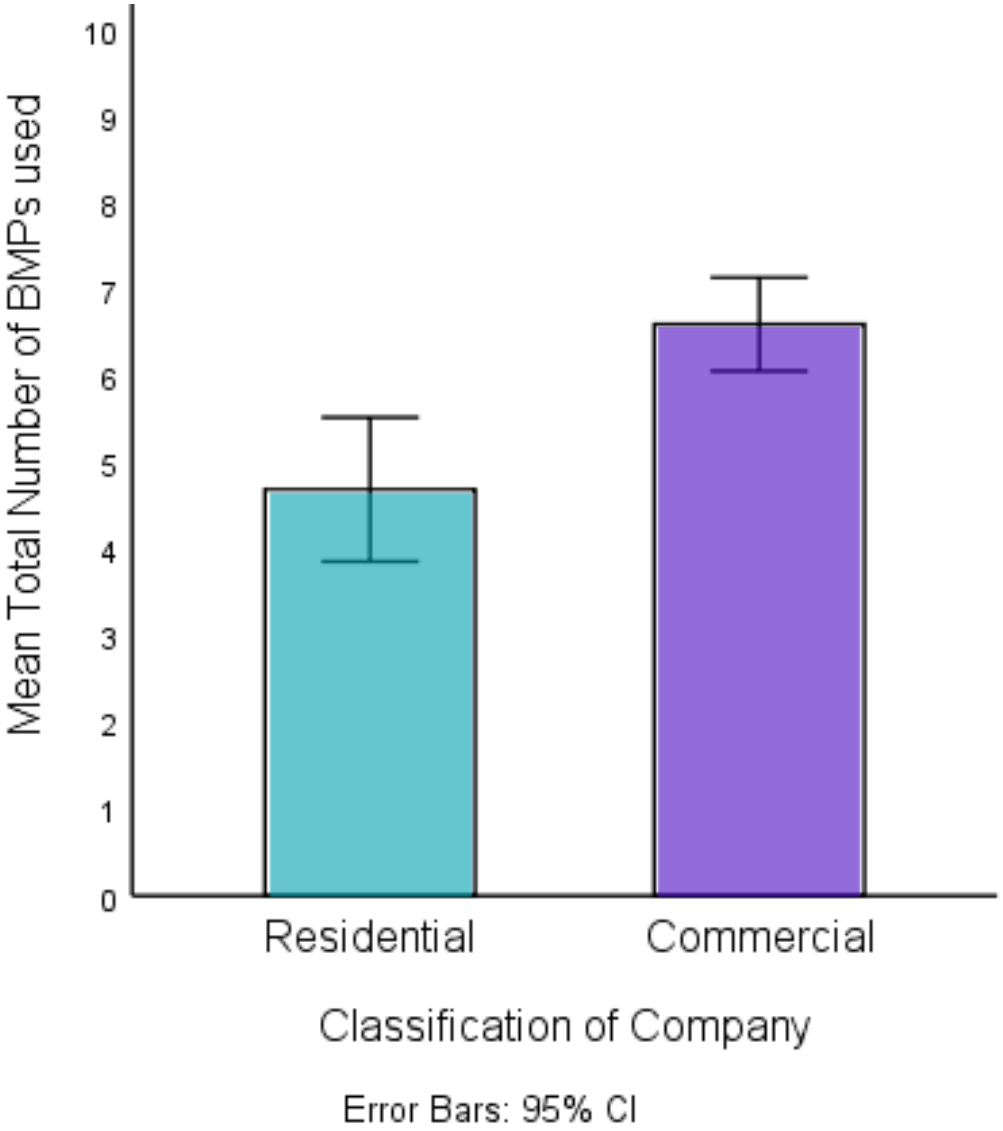
Interviews

- 10 companies
- Selected based on number of clients, BMP usage, surface types
- Data verification
- Exploring behavior changes
- Exploring decision-making factors

Surface area vs. number of BMPs adopted



Statistically significant difference between the number of BMPs residential and commercial contractors adopt



- Mean residential:

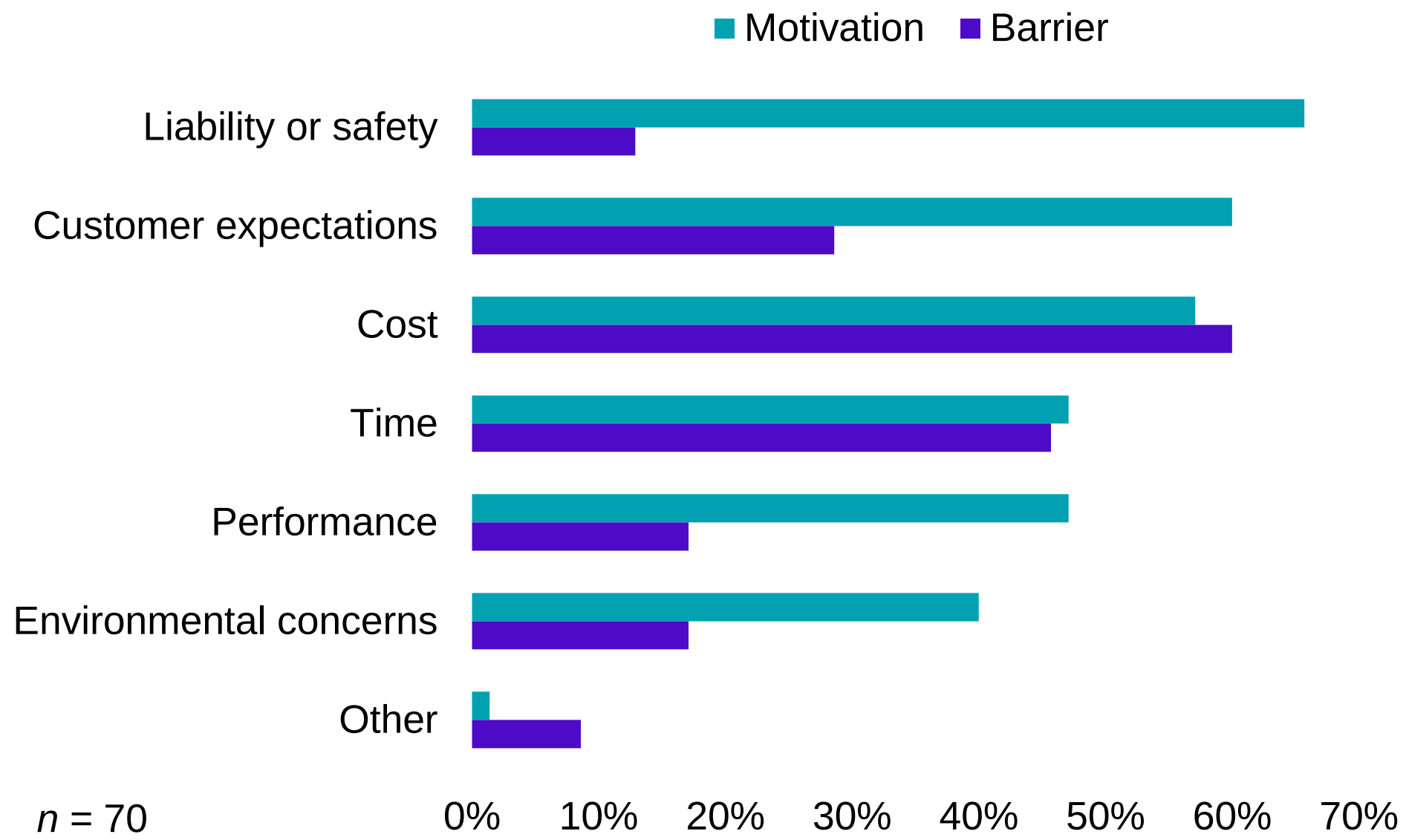
  4.7 ± 1.4

- Mean commercial:

  6.6 ± 1.8

$t(56) = -3.524$, $p = 0.001$

Factors for best management practices vary



No motivations or barriers are significantly related to measuring surface temperature

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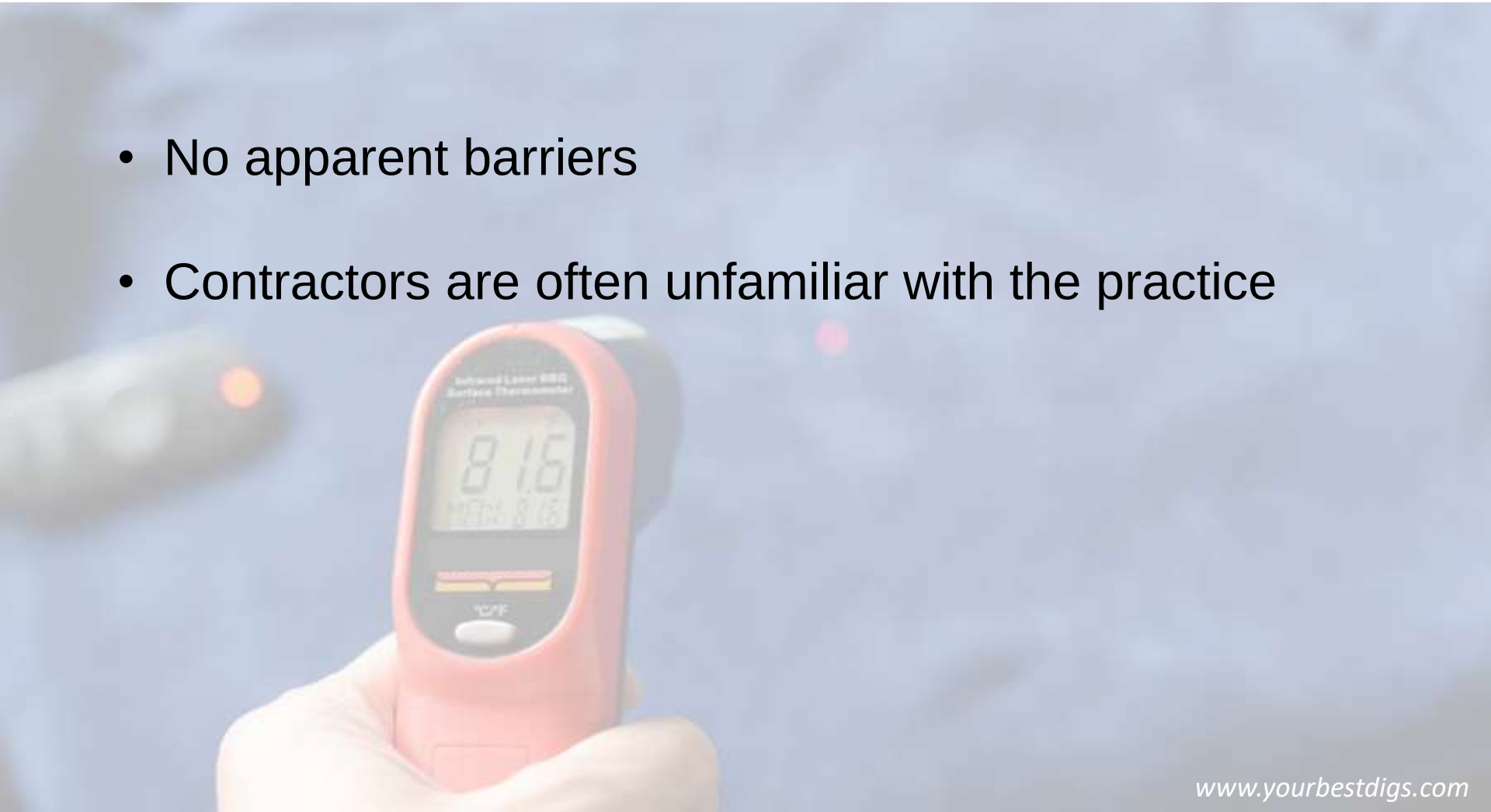

- No apparent barriers
- Contractors are often unfamiliar with the practice

Time and customer requests as motivations are related to higher use of anti-icing

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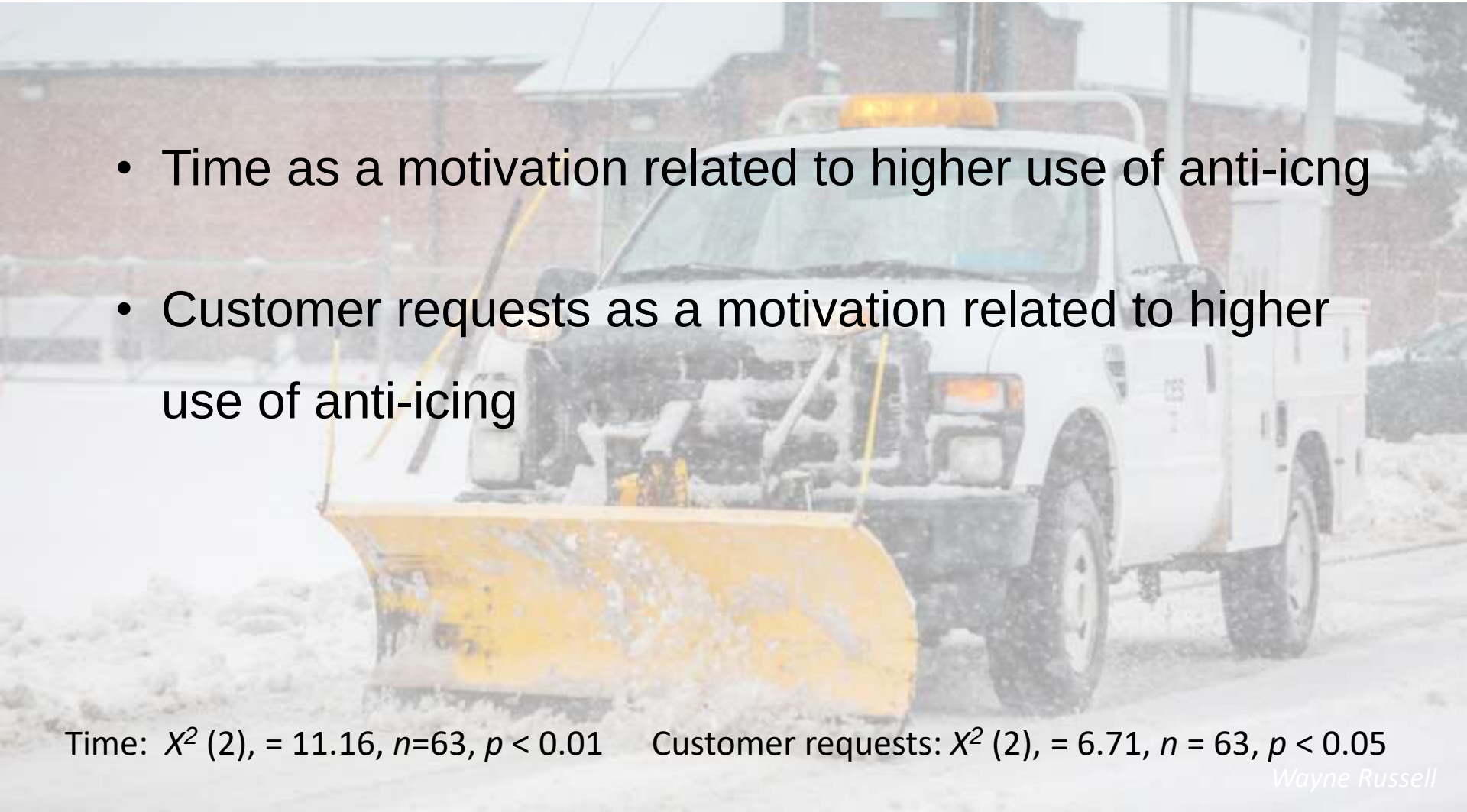

- Time as a motivation related to higher use of anti-icng
- Customer requests as a motivation related to higher use of anti-icing

Time: X^2 (2), = 11.16, n=63, $p < 0.01$ Customer requests: X^2 (2), = 6.71, n = 63, $p < 0.05$

Wayne Russell

Environmental concerns are related to use of pre-wet salt/brine

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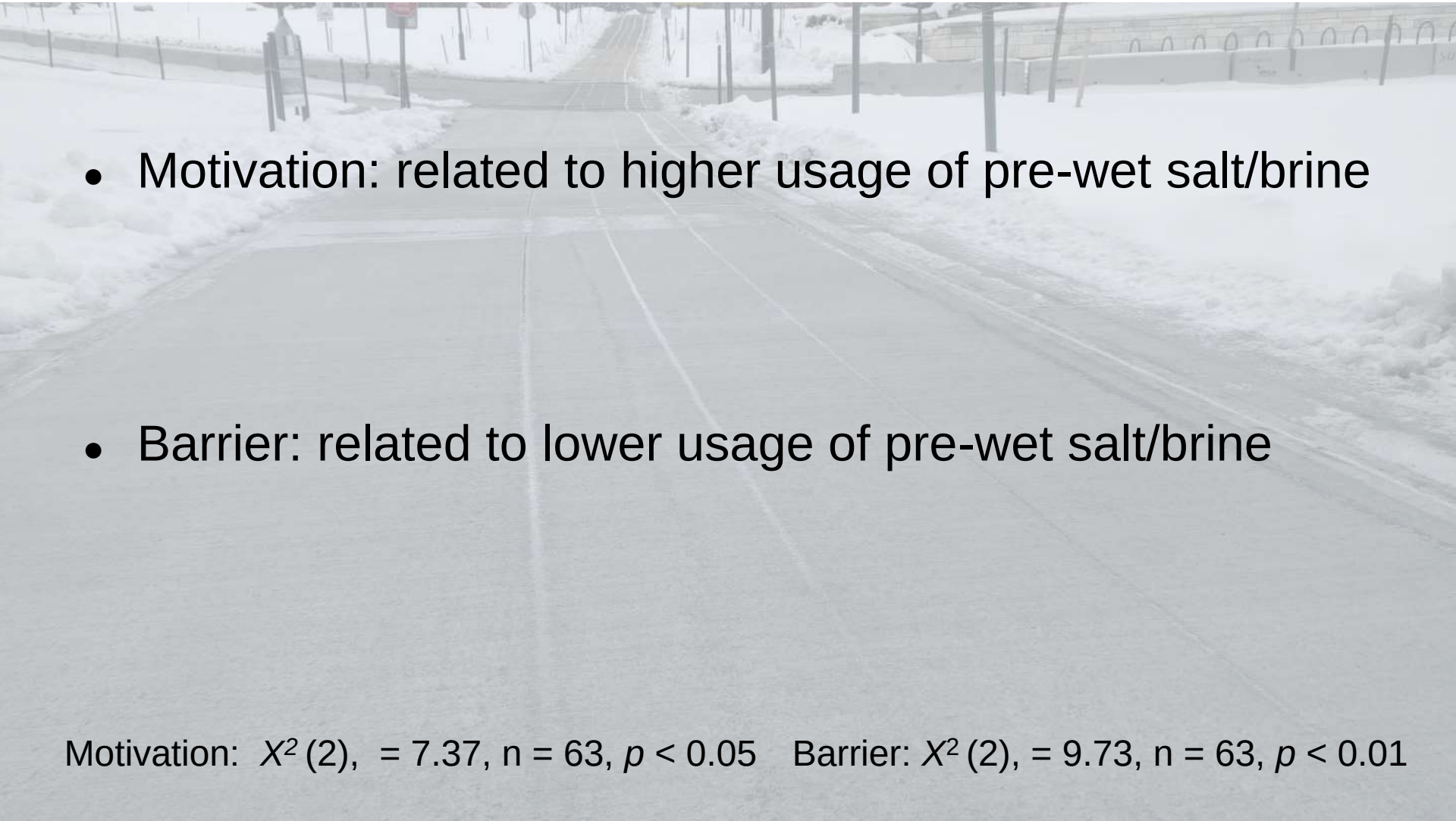

- Motivation: related to higher usage of pre-wet salt/brine

- Barrier: related to lower usage of pre-wet salt/brine

Motivation: X^2 (2), = 7.37, n = 63, $p < 0.05$ Barrier: X^2 (2), = 9.73, n = 63, $p < 0.01$

Calibration may be used infrequently or misunderstood

Calibration may be used infrequently or misunderstood

- Range of definitions for calibration

- Represents time commitment to implement, materials savings and more predictable applications

Wikipedia / Heidas

In-person trainings and online resources related to higher BMP adoption

- In-person workshops and trainings
- Websites and online resources

In-person trainings currently: *M* = 7.06, *SD* = 1.92
Other: *M* = 5.36, *SD* = 2.28, t(62) = -2.72, *p* < 0.01.

Websites currently: *M* = 6.85, *SD* = 1.70)
Other: *M* = 5.05, *SD* = 2.42, t(6 2) = -3.31, *p* < 0.01.

Contractors learn from peers and real-world examples

- Peer mentoring
- Technique trials
- Case studies
- Demonstrations

Contractors learn from peers and real-world examples

- Many resources here today!
- Online resources and trainings
- Sea Grant developing resources

Thank you! Questions?

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