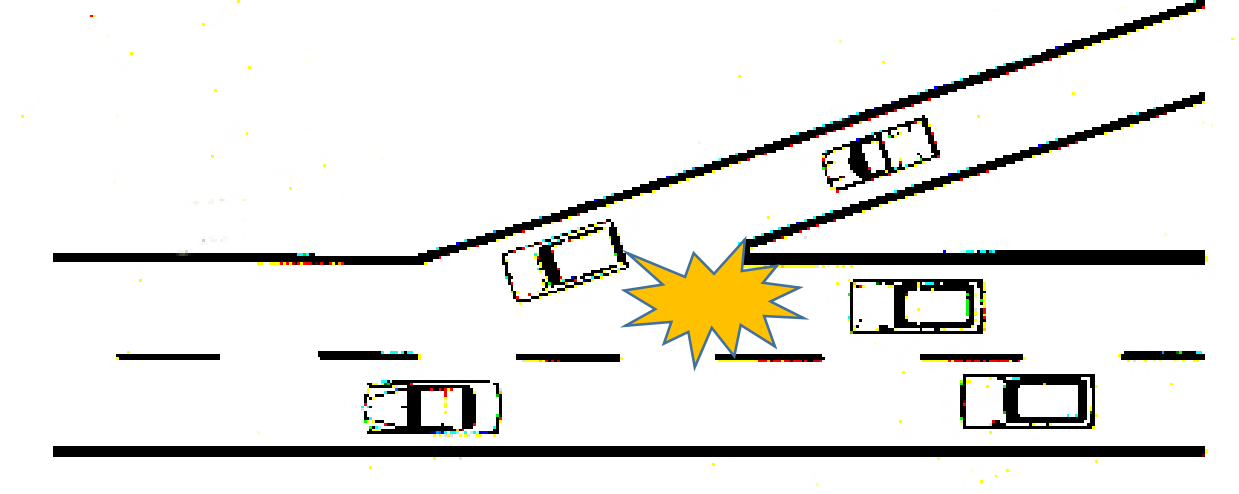


# ACTIVE TRAFFIC MANAGEMENT AT EXPRESSWAY MERGING SECTIONS: A DRIVING SIMULATOR STUDY

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## Expressway merging sections



**Problem statement:**  
Harsh deceleration & abrupt lane changes of right lane drivers due to merging vehicles from short on-ramps (~ 150 m in Qatar)

- contribute to bottlenecks & conflicts with surrounding traffic
- increase the risk of rear-end and sideswipe crashes

**Traffic management strategies:**

- Active (ATM)
- Passive (PTM)

**Apparatus**  
**Driving simulator:**

- Range Rover (fixed base)
- Interfaced with STISIM Drive® 3



**Research question**  
Are ATM or PTM strategies more effective in preparing right lane drivers to safely respond to merging on-ramp vehicles?

## BACKGROUND

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## Conclusion

- Active TM strategies motivated drivers to **change lanes earlier**, while **eliminating abrupt lane changes**.
- Gradual and smooth mean speed reduction** was achieved through Variable Speed Limits (VSL)
- Road marking treatment not suitable for rural expressway (100 km/h)** as abrupt lane changes & harsh speed reduction increased

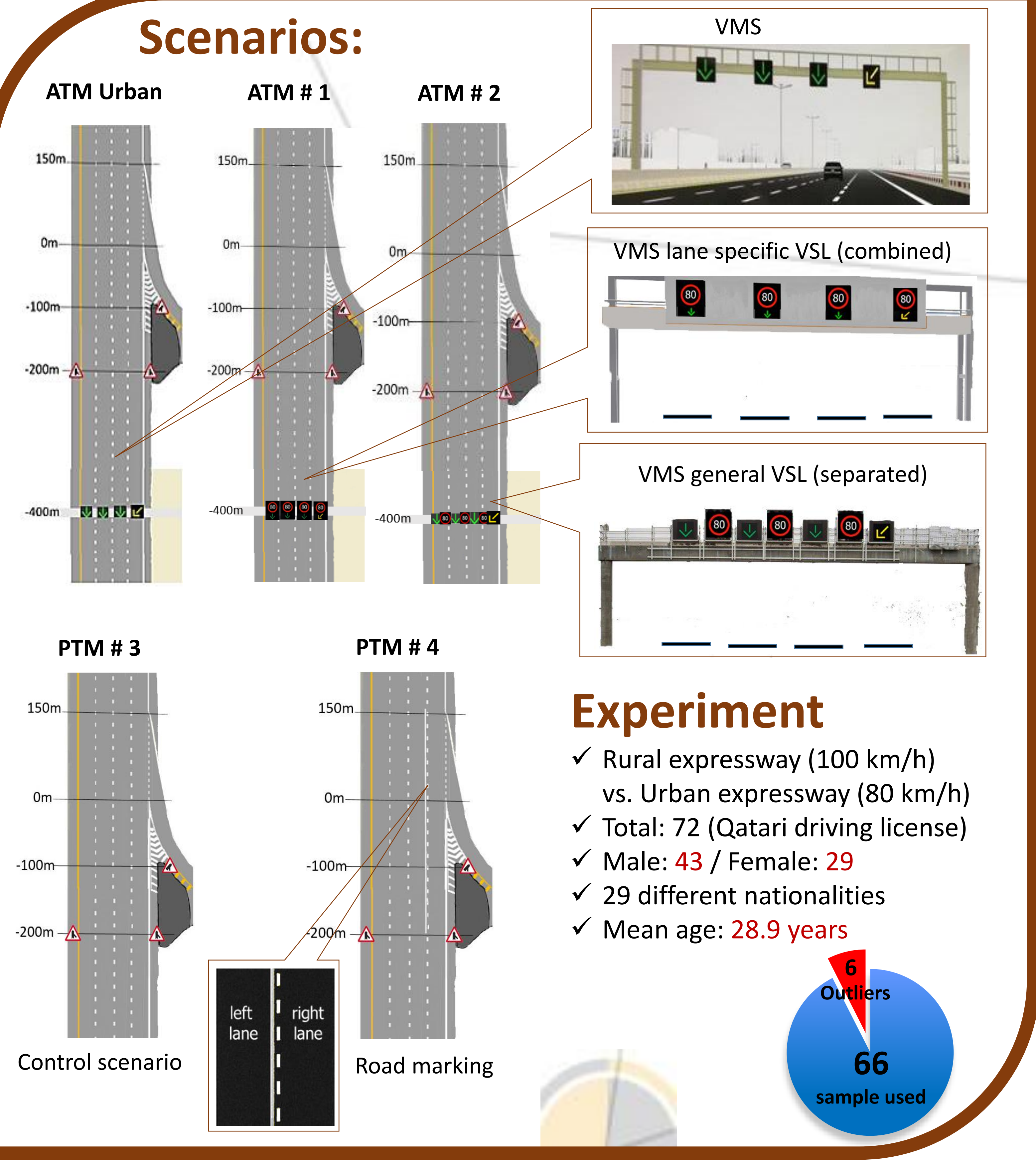
## Recommendations

- Active Traffic Management strategies** are most effective on rural expressways:
- Easy understandable pictograms can be activated on demand
  - Lane use advice improves safe driving on the right lane

## CONCLUSION

## METHODOLOGY

**Scenarios:**

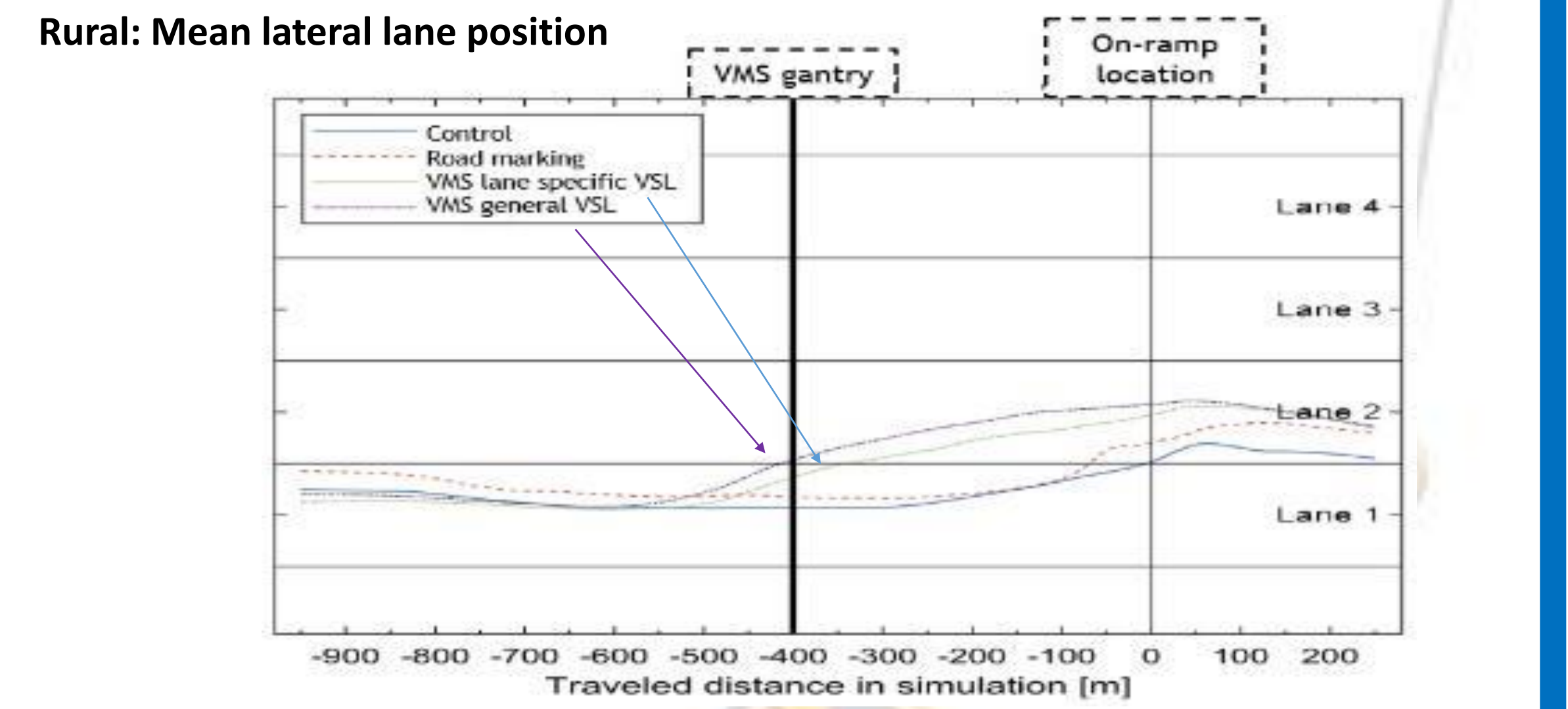
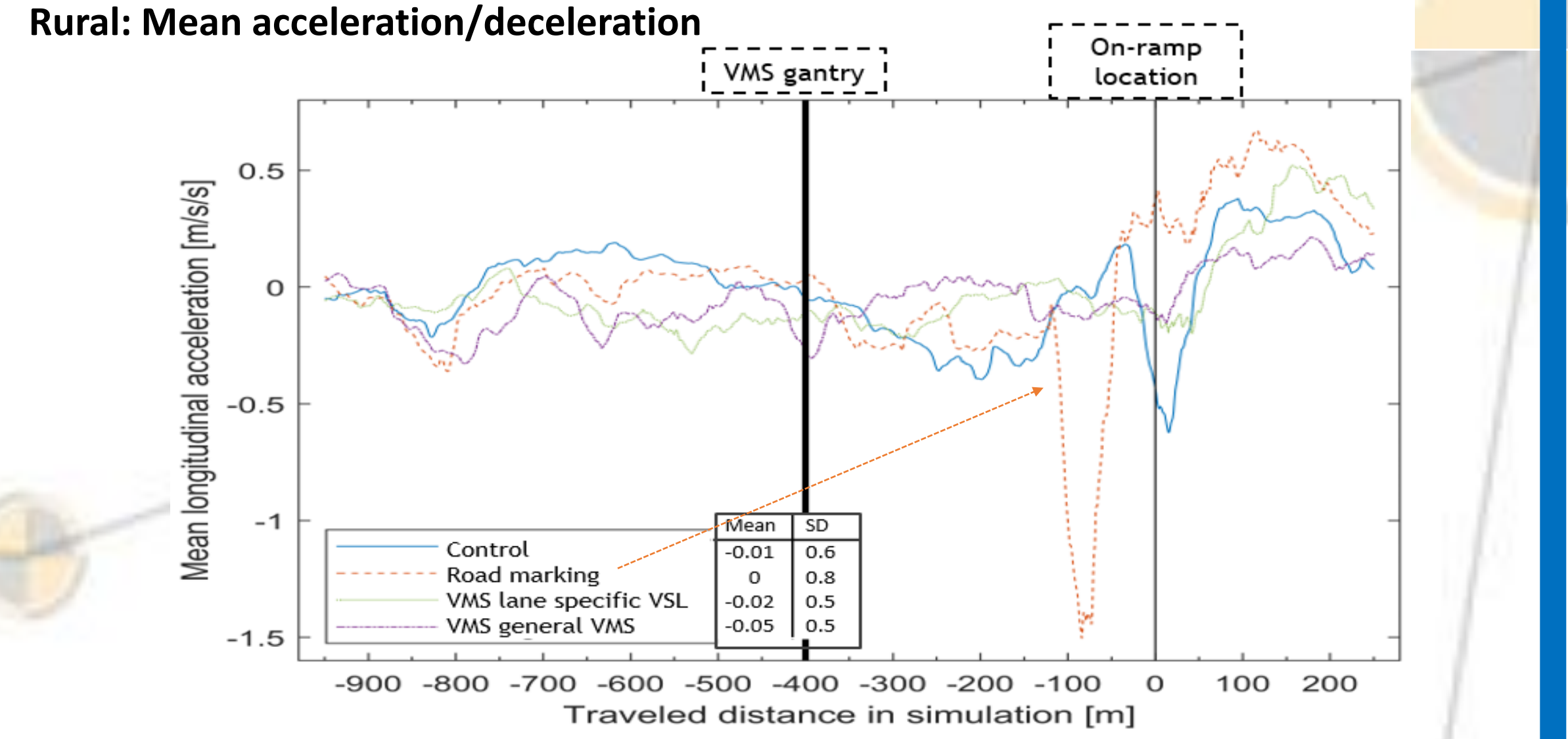
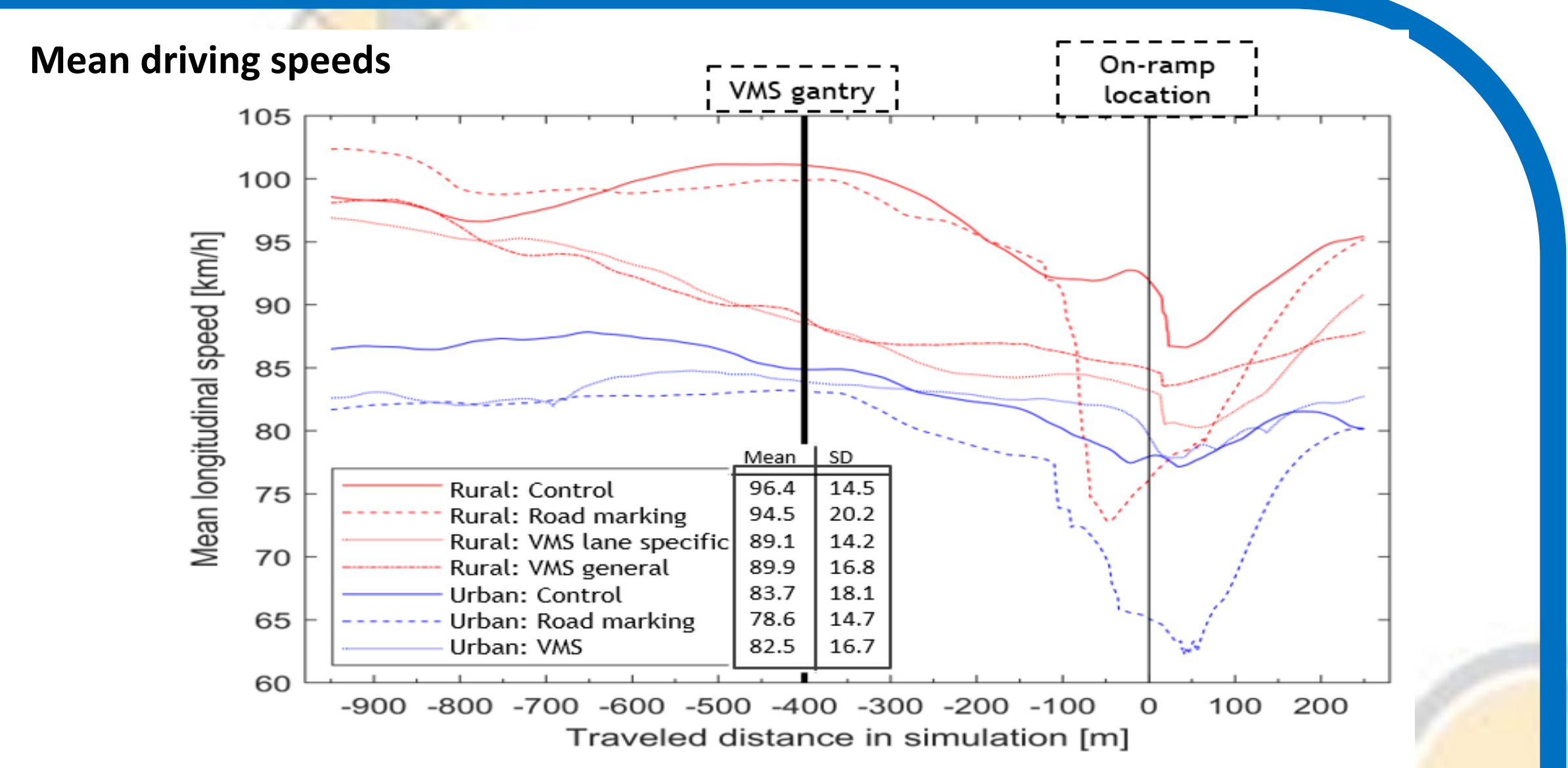


**Experiment**

- ✓ Rural expressway (100 km/h) vs. Urban expressway (80 km/h)
- ✓ Total: 72 (Qatari driving license)
- ✓ Male: 43 / Female: 29
- ✓ 29 different nationalities
- ✓ Mean age: 28.9 years

6 Outliers  
66 sample used

## RESULTS



**Active Traffic Management (Rural)** vs. **Passive Traffic Management (Rural)**

Scenario	Lane change (%)	Speed reduction (%)
ATM 1 (Combined VSL)	97	14
ATM 2 (Separated VSL)	95	13
PTM 3 (Control scenario)	62	7
PTM 4 (Road marking)	68	26