Urban Mobility Study Performance Measures

Presented to Kentucky Traffic Model Users Group

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Texas Transportation Institute

Urban Mobility Study Goal:
Produce mobility information for a broad range of audiences

Our Sponsors

California DOT
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Minnesota DOT
New York State DOT
Ohio DOT
Oregon DOT
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Houston-Galv Area Council
Maricopa Assn of Govts
Federal Hwy Admin

Mobility Studies Website (http://mobility.tamu.edu)

- **Urban Mobility Study – Pooled Fund**
  - Annual congestion estimates
  - 75 cities
- **Mobility Monitoring Program - FHWA**
  - Teamed with Cambridge Systematics
  - Analysis of archived freeway data
  - 21 cities
- **Resources**
  - Performance measures
  - Corridor & Multimodal analysis
  - Data archiving

The Problem

- Congestion growing 5%± per year
- Issues are difficult to understand, communicate & obtain data
- Lack of consensus on "the plan" in an area
- Lack of transportation funding
- Understandable measures of transportation and land use actions

Urban Mobility Measures

Delay/Person – Hours per year

Travel Time Index

$$\frac{\text{Peak Period Travel Time}}{\text{Free Flow Travel Time}}$$

Buffer Time Index

$$\frac{\text{95th \% Travel Time} - \text{Average Travel Time}}{\text{Average Travel Time}}$$

Travel Time Index

- Ratio of Peak Period Travel Time to Free-Flow Travel Time
- 1.3 means 30% more time in peak
- Use daily traffic per lane to estimate speed
- Add incident delay
- Also used in other measures

Measure Improvements

- Measures – Travel Time Index, Delay per Capita or Traveler, Others
- Additional Components
  - Ramp Metering
  - Incident Management
  - Signal Coordination
  - Public Transportation
  - High-Occupancy Vehicle Lanes

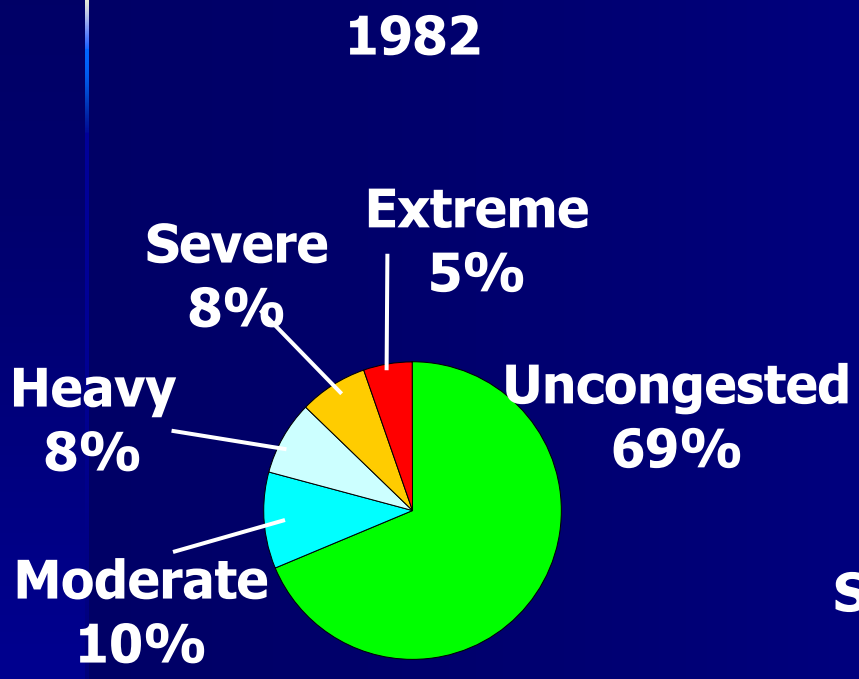
Tools of the Trade

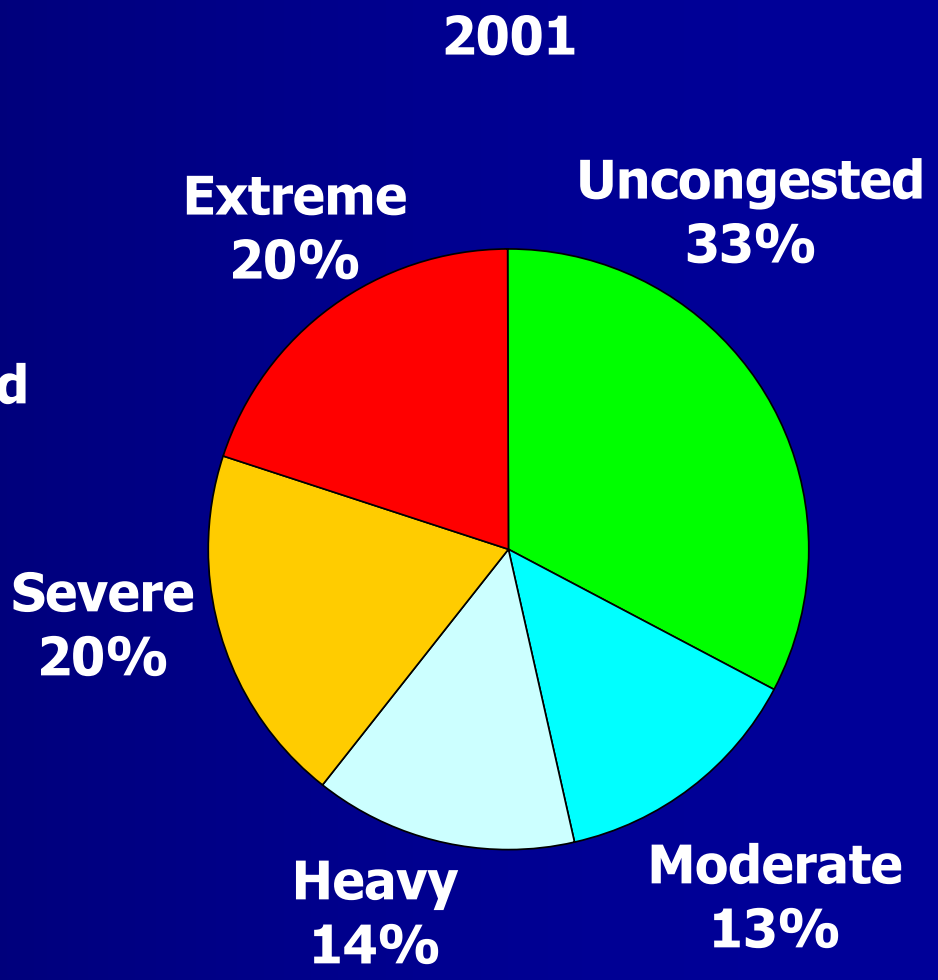
Our Methods

Basic Methodology

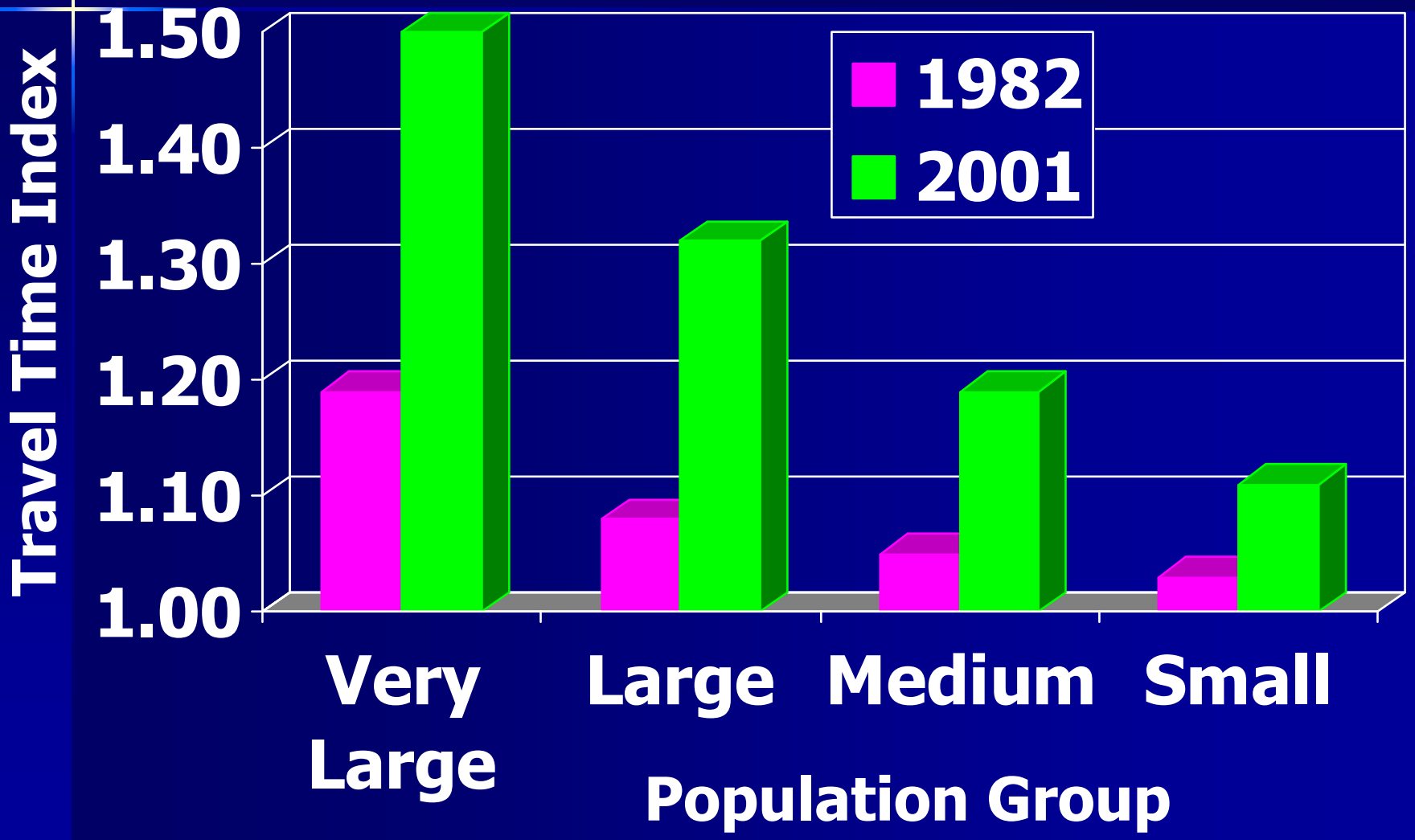
- Basic Goal – Estimate speed, person volume and travel delay
- Daily volume per lane on Freeways and Principal Arterial Streets
- Directional distribution
- Length of time system might be congested
- Estimate speed
- Calculate measures

Growth of Congested Travel 1982 to 2001

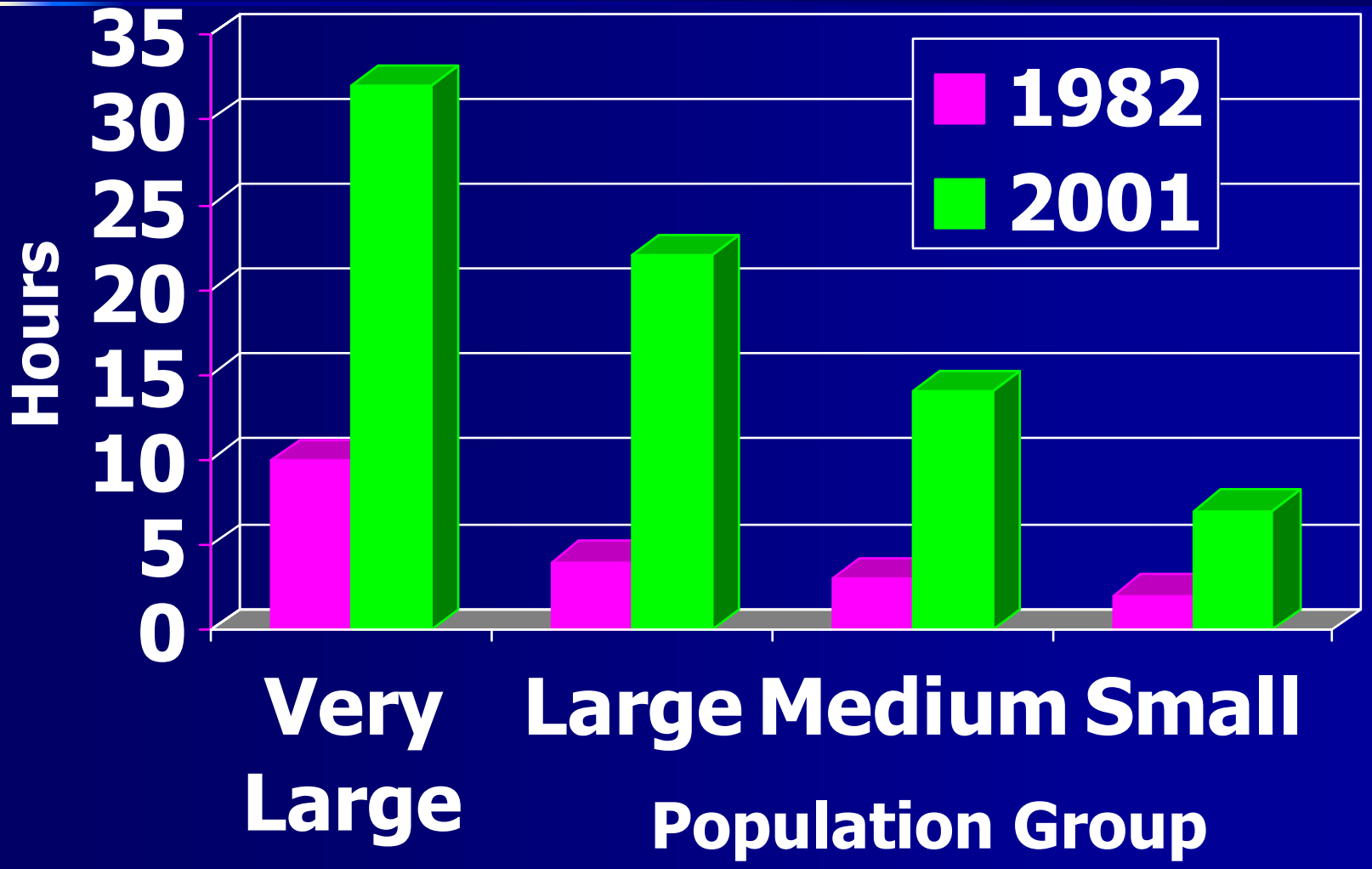




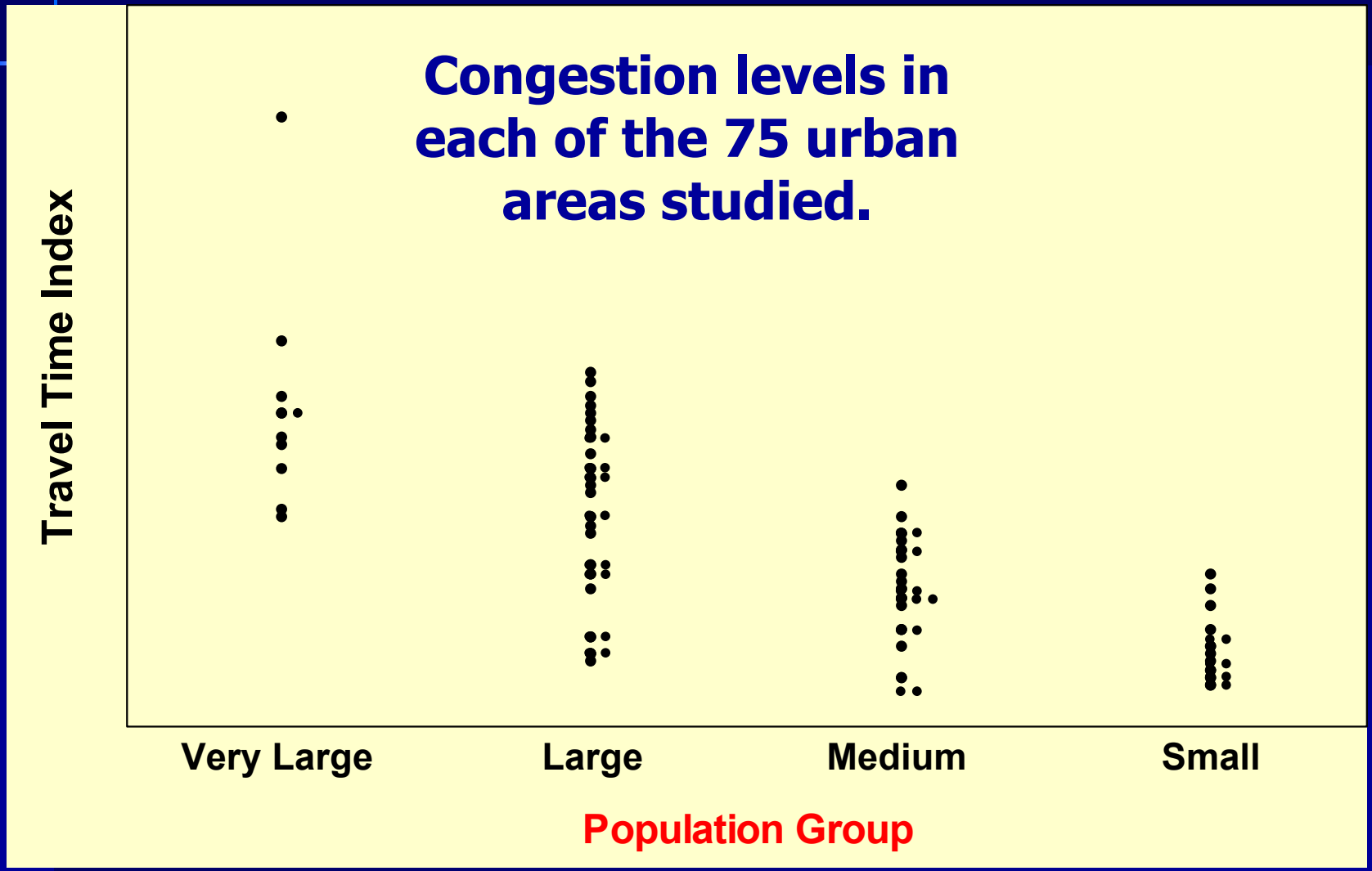
Travel Time Index



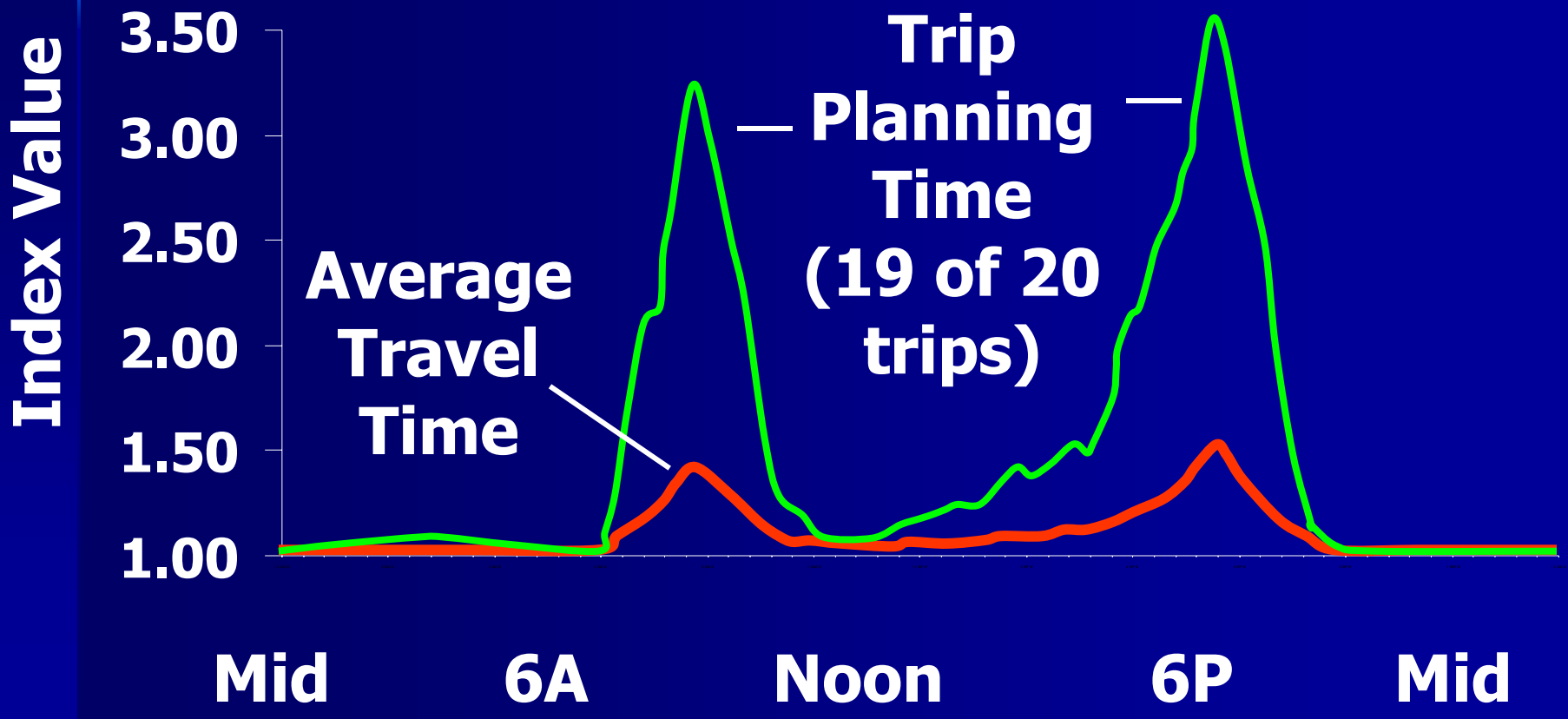
Annual Delay per Person



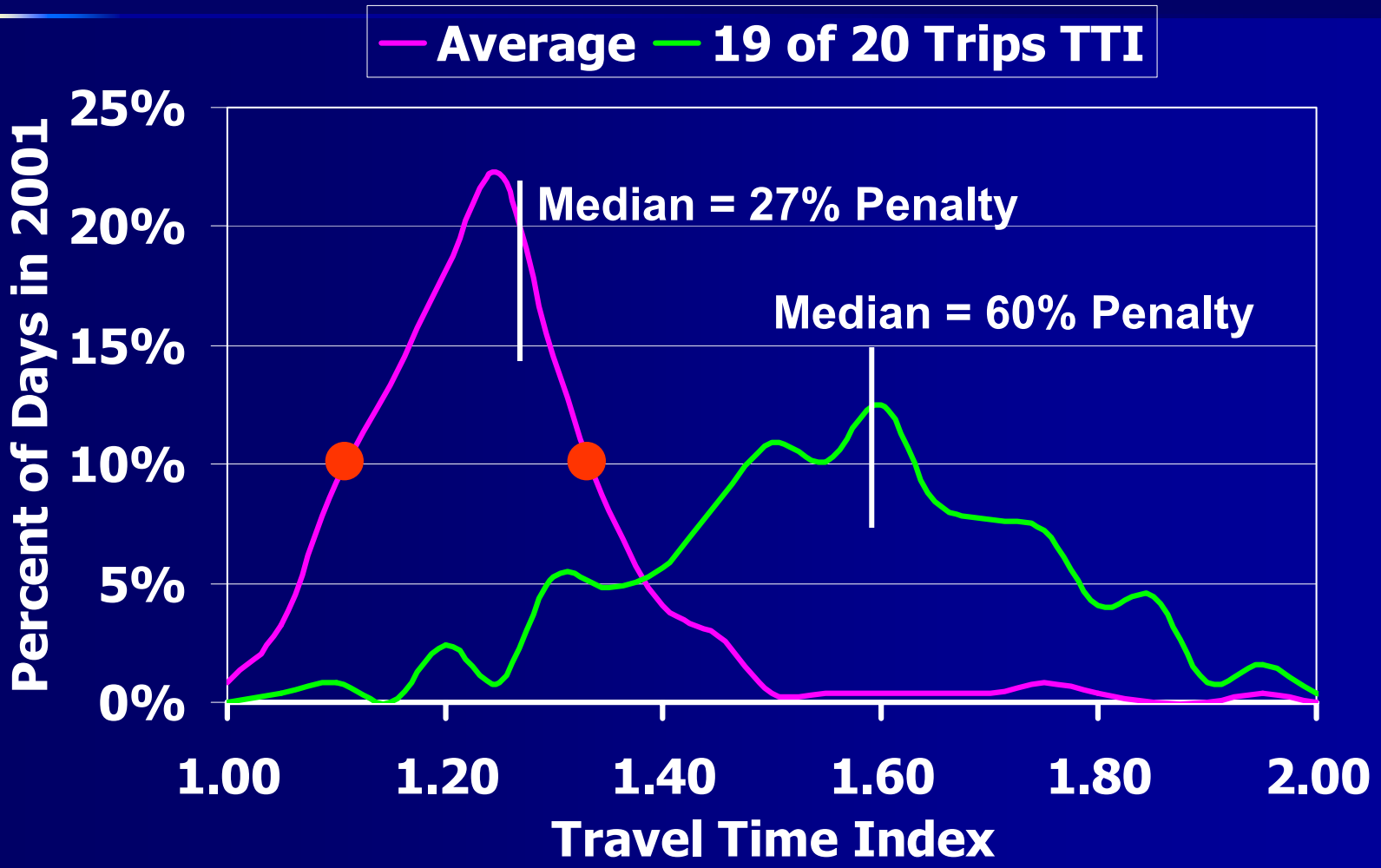
Congestion and Population



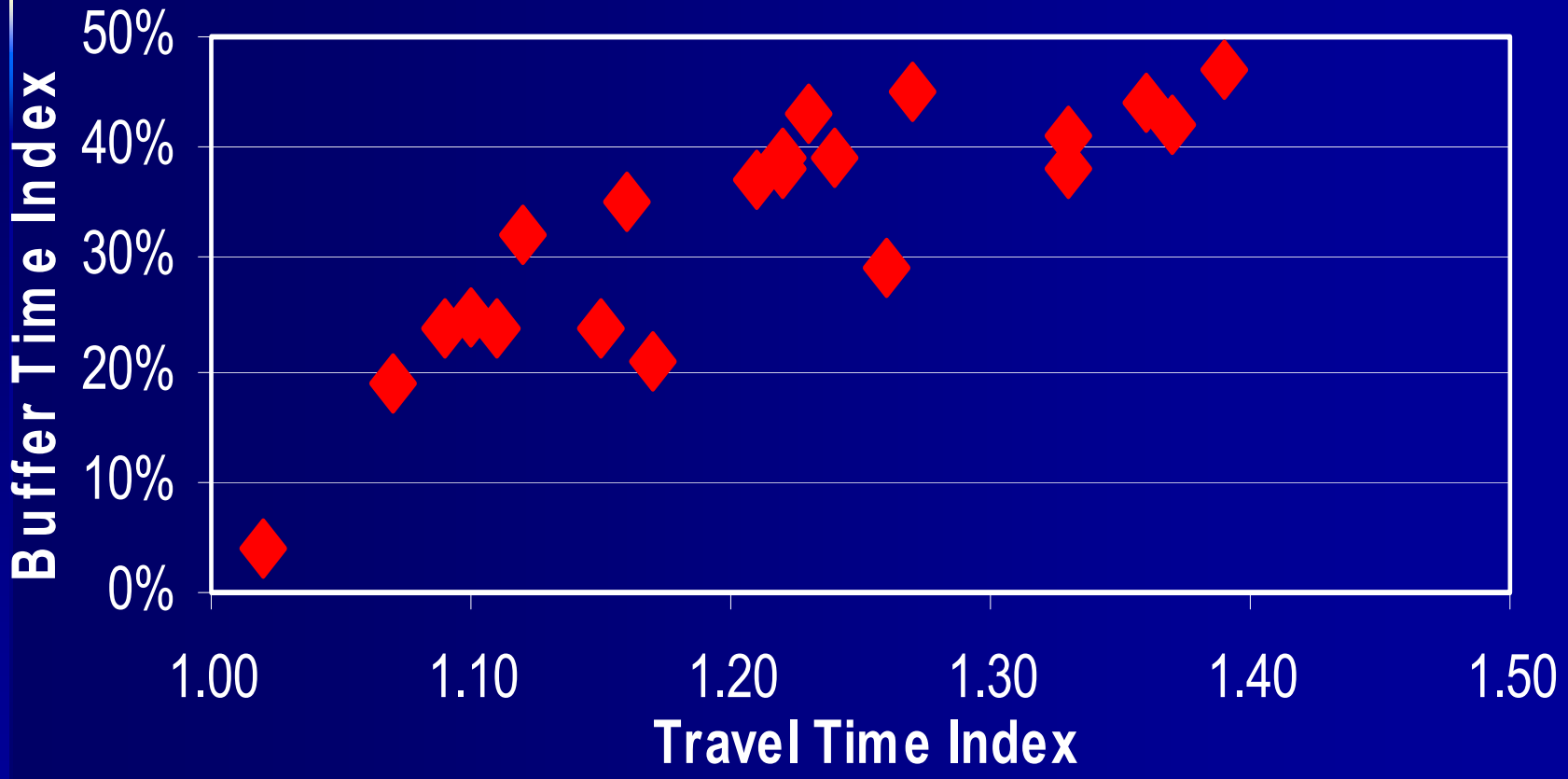
Planning a Trip
What do you consider?



Daily Variation in Peak Period Frustration Levels



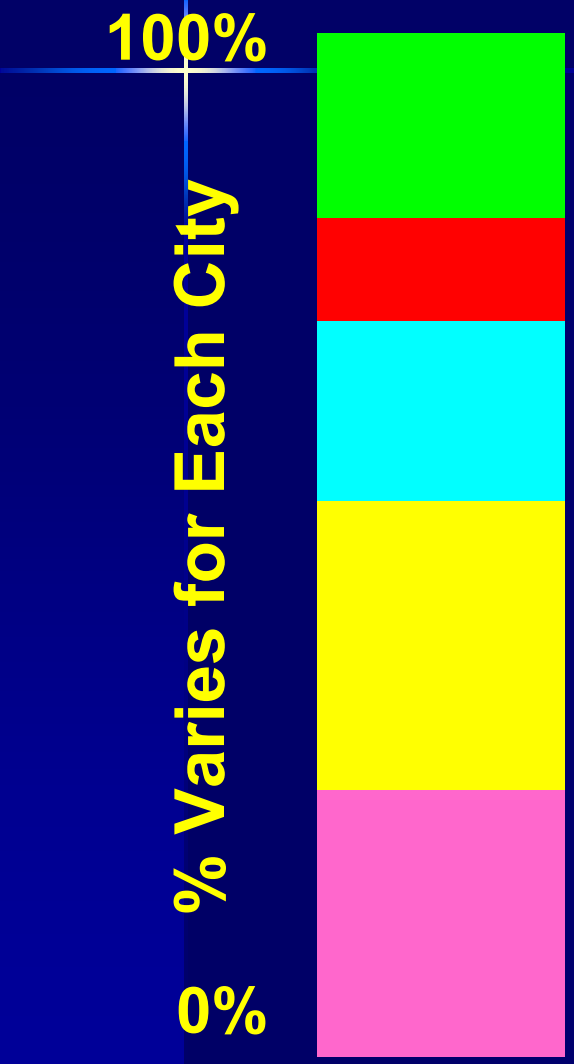
Congestion and Reliability Are Related



What We Think We've Learned

- Roads are part of, but not all of the solution
- Operations & demand management can improve efficiency
- Transit important in some markets
- Pricing and land use have a role
- Need to do more of every "solution"

Variety of Solution Types



Diversify Development Patterns

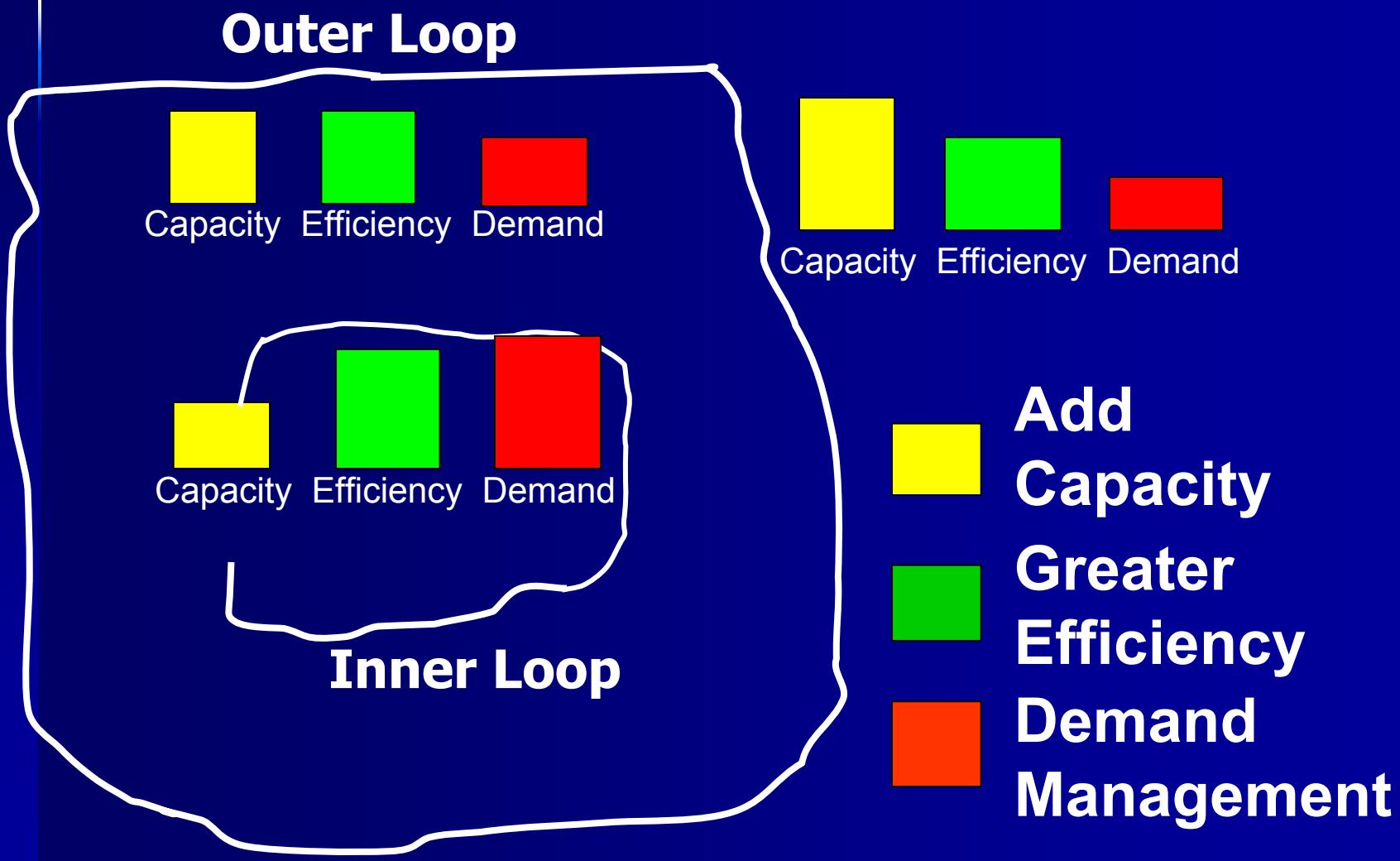
Manage the Construction Process

Manage the Demand

Increase System Efficiency

Build More Capacity

Strategy Mix Will Be Different



More . . .

- Roadway
- Transit
- Special use lanes
- Bicycle and walk paths
- Ridesharing
- Demand management

Better . . .

- Traffic signal coordination
- Transit operations
- Construction processes
- Traveler information
- Parking programs
- Special event traffic management
- Freeway ramp control
- Manage crashes and vehicle breakdowns

Different . . .

- Institutional arrangements
- Land use pattern options
- Urban design treatments
- Goals for transportation service

Solutions? Need for Expanded Management

- In the past we managed:
  - Construction Projects
  - Supply & Capacity
  - Operations
  - Demand
- Should we add?
  - Pricing?
  - Expectations?

Need for Expanded Measurement, Also

- Use real-time data
- Incorporate benefits of operational improvements
- Incorporate public transportation
- Modify measures for improved communication

Enhancements Goal

- Allow estimates of more delay saving treatments
- Improve congestion estimates
- Incorporate archived data
- Use IDAS and ITS Deployment data
- Evolve the data and savings estimates


Previous methods only included some types of delay SAVE-ings
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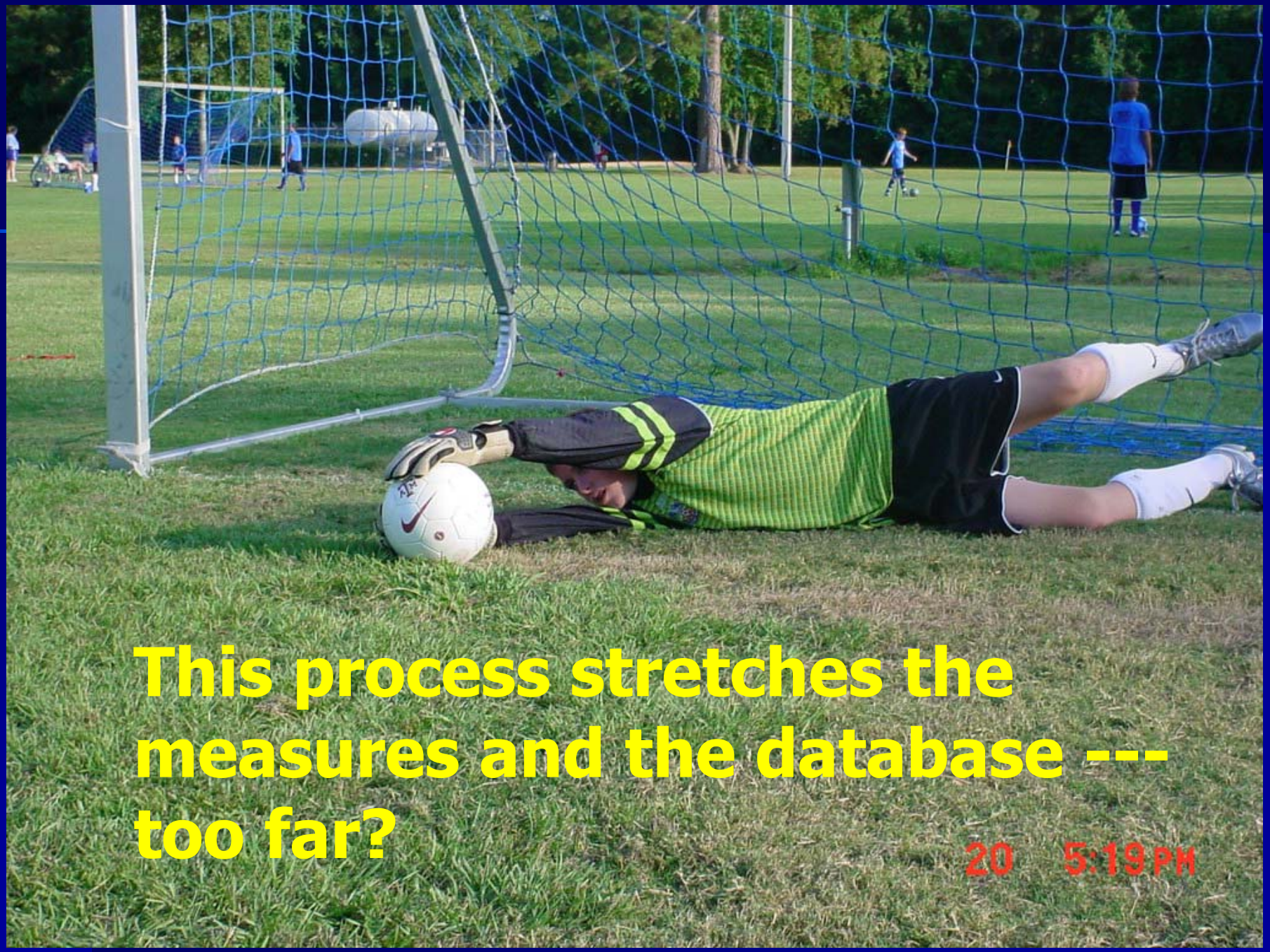
… but many other savings have not been estimated.

Operational Treatment Delay Savings

- Key elements of transportation spending
- Basic Mobility Study methods did not include operations
- Subtract delay reduction estimates from basic estimates
- Key Factors
  - Area Covered – How much is treated?
  - Density – How well is it treated?
  - Congestion – What is treated?
  - Effect – What is the delay reduction effect?


This process stretches the measures and the database --- too far?
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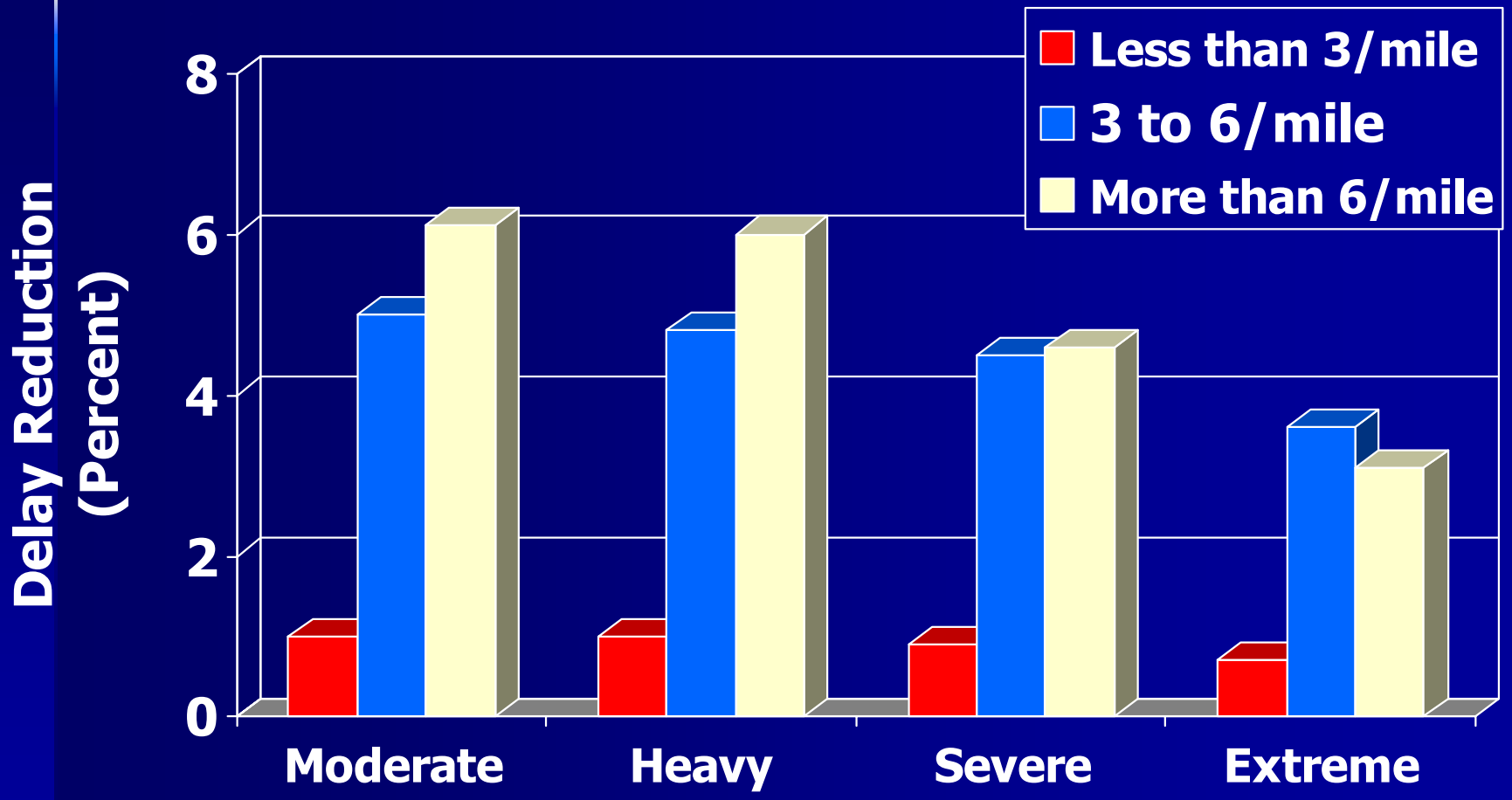
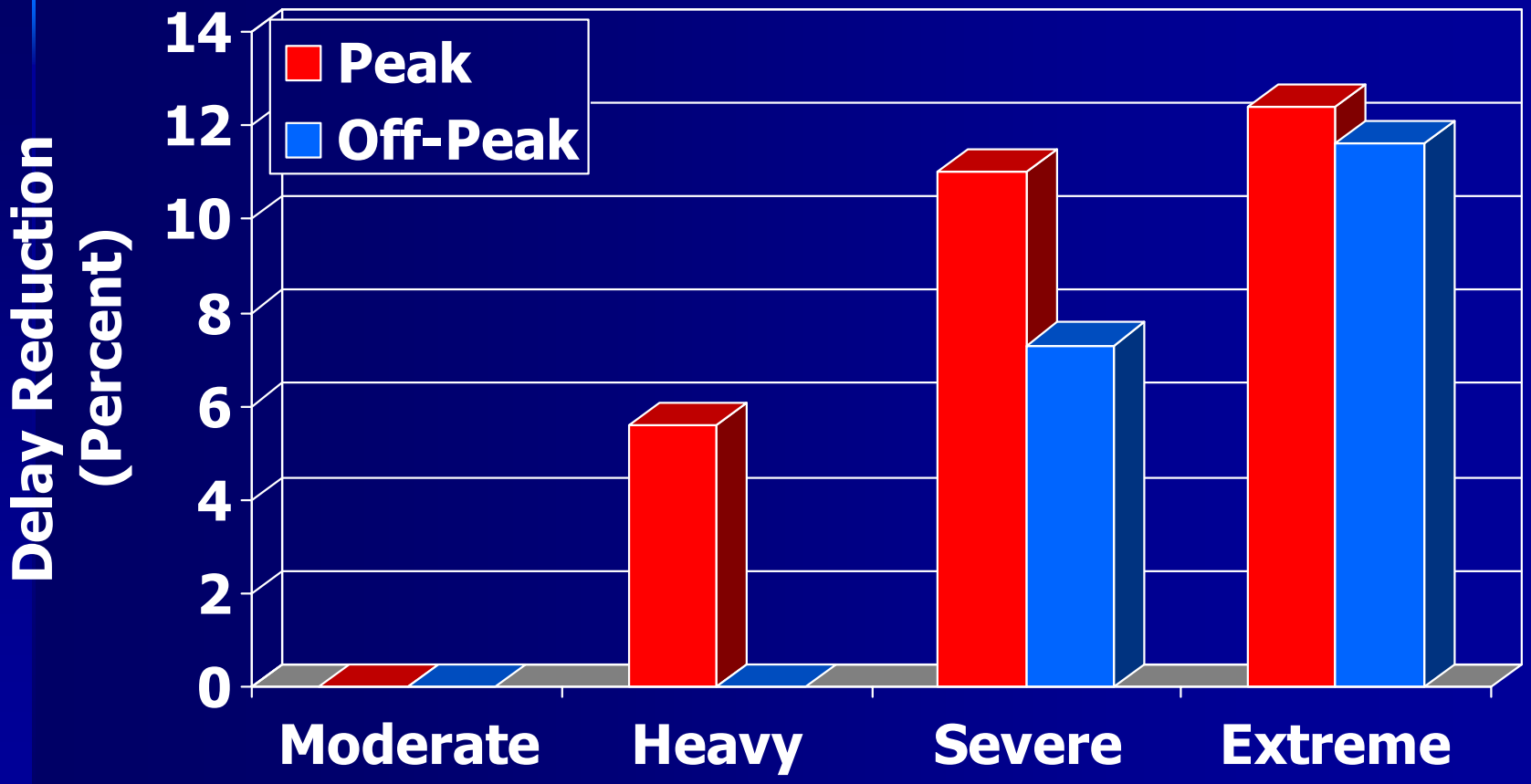
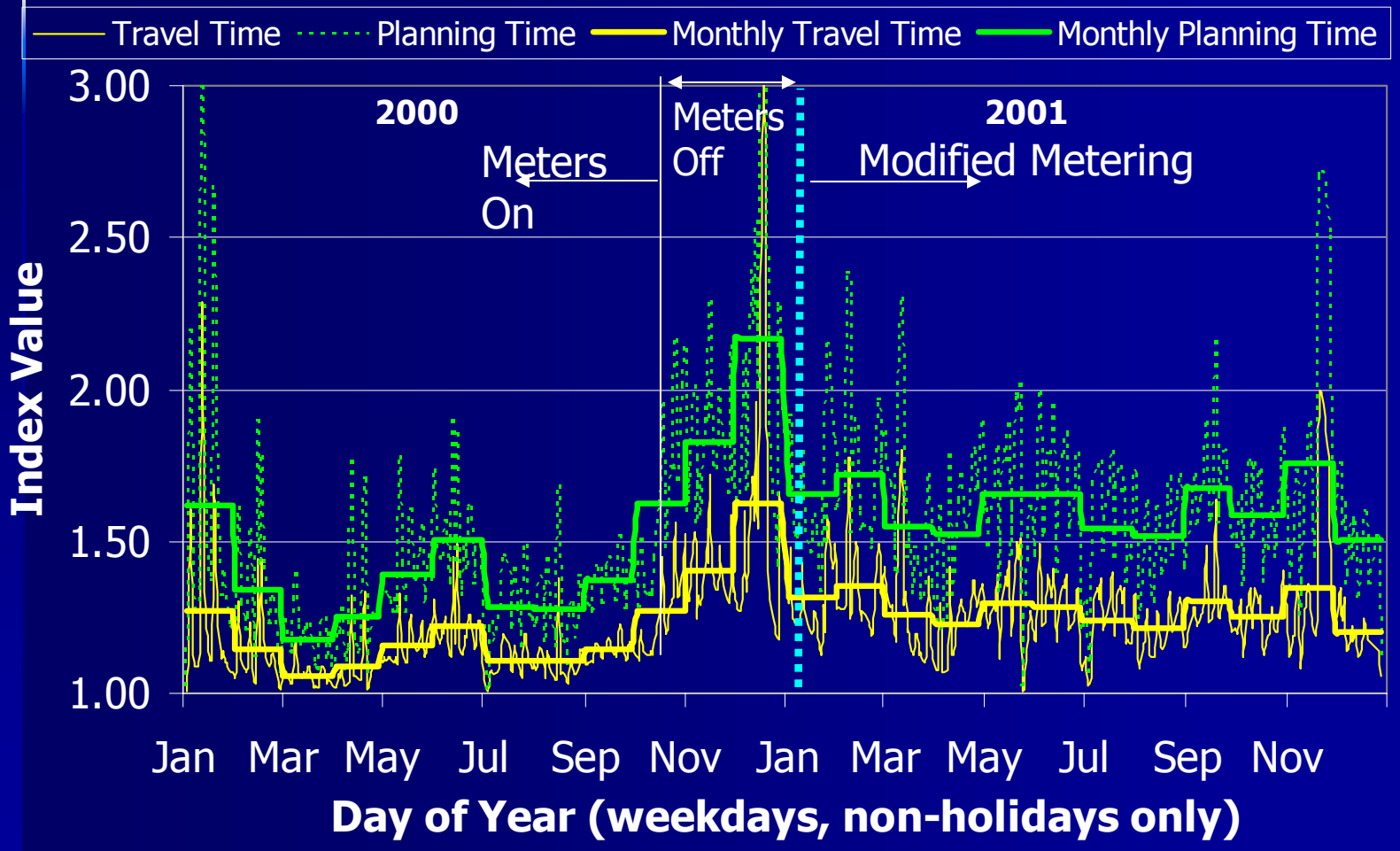
Signal Coordination Benefits (progressive)



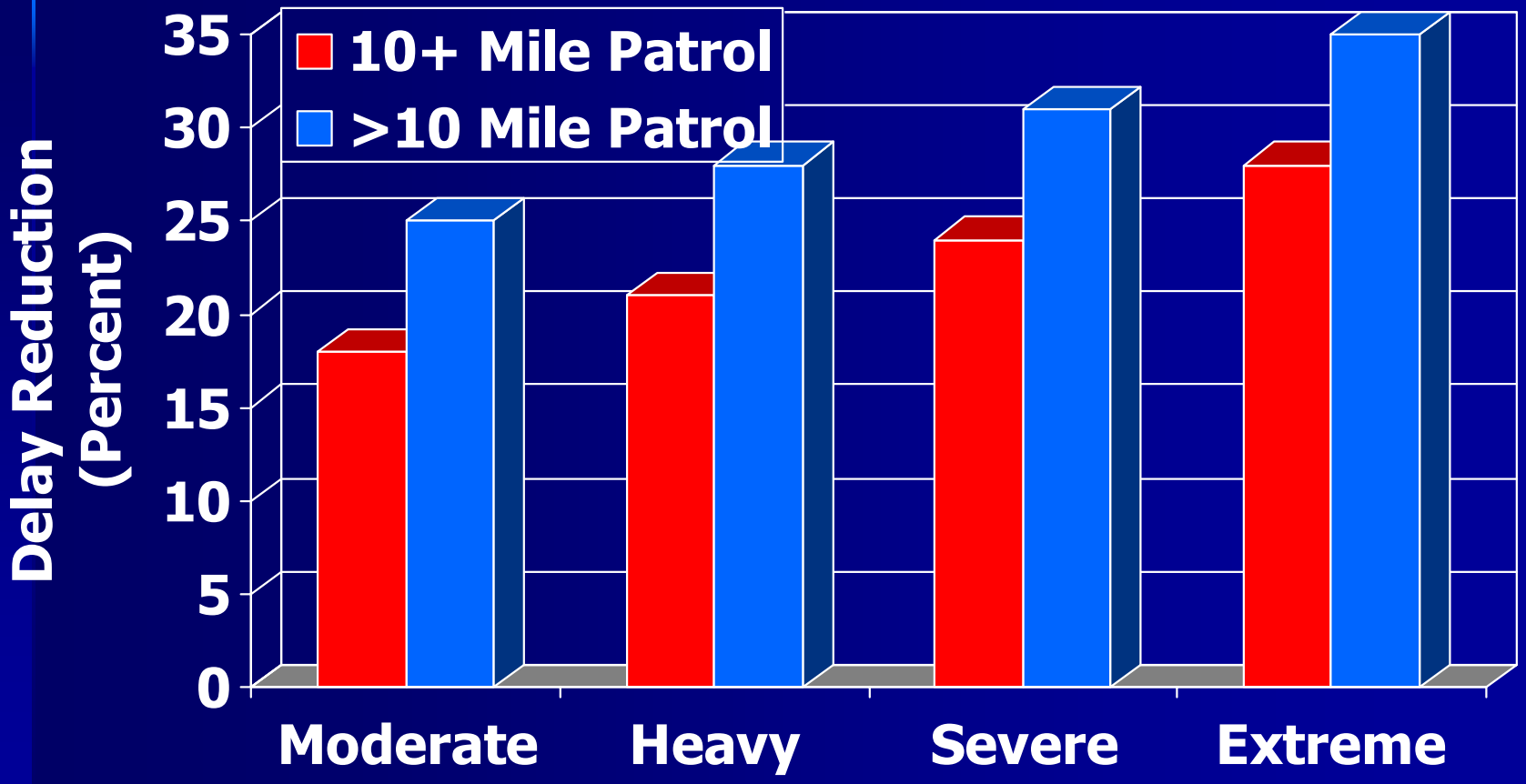
Ramp Metering Delay Reduction



Ramp Metering Effects



Benefits of Freeway Service Patrols



Contributions of Public Transportation

- Basis is person-miles of travel
  - More riders = more effect
- What are expectations?
  - On-time travel
  - Reliable trip
  - Longer travel time for most trips
- So, focus on similar expectations rather than speed
- Does not "double-penalize" transit

Public Transportation Mobility

- On-time transit trip equals uncongested road travel
- Peak-period ridership in person-miles
- On-time arrival percentage
- Add transit person-miles to uncongested road person-miles and recalculate

High-Occupancy Vehicles

- High-Speed
- One or only a few stops
- High number of persons per vehicle
- Not included in previous method
- Add Person-Miles and Speed

Can Now Estimate More Delay Savings…..

… But, Still Have Some Improvements to Make

Summary

- Congestion is growing
- Solutions are multimodal policies, programs and projects
- More aggressive operation and deployment
- Achievable and measurable goals
  - Stop the growth of congestion
  - Improve reliability
  - Provide more travel options

Any Questions or Improvement Tips?