Using Service Indicators to Improve Efficiency

North Carolina's Experience

Public Schools of North Carolina
State Board of Education
Department of Public Instruction

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Background

- **State funding for pupil transportation**
  - 90+ % state-funded
  - Districts can't raise revenue
    - Subject to county commissioners
- **Early 1980s – State Energy Office wanted to save fuel**
- **Evolved into statewide contract for routing software**
- **NC's TIMS program**
  - Transportation Information Management System
  - Training, implementation through university staff
- **Funding Formula**
  - Incentive for Efficiency
  - Budget ratings (95% = 95% of eligible expenses paid by state)

Gathering Operational Data

‣ **State reporting – TDTIMS**

    ‣ District certifies that all routing data up to date

    ‣ Routing data submitted to state office

‣ **Funding decision-making**

Transportation Funding Formula
3 Basic Steps

1. Determine Funding Base
2. Determine Budget Rating
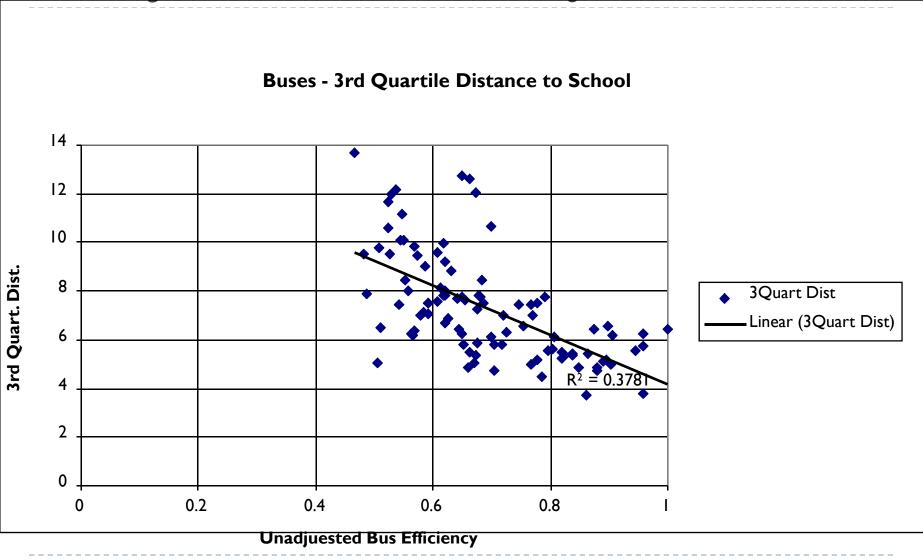3. Multiply (1) x (2)

Linear Regression to Level the Playing Field

Site Characteristics Used in Funding

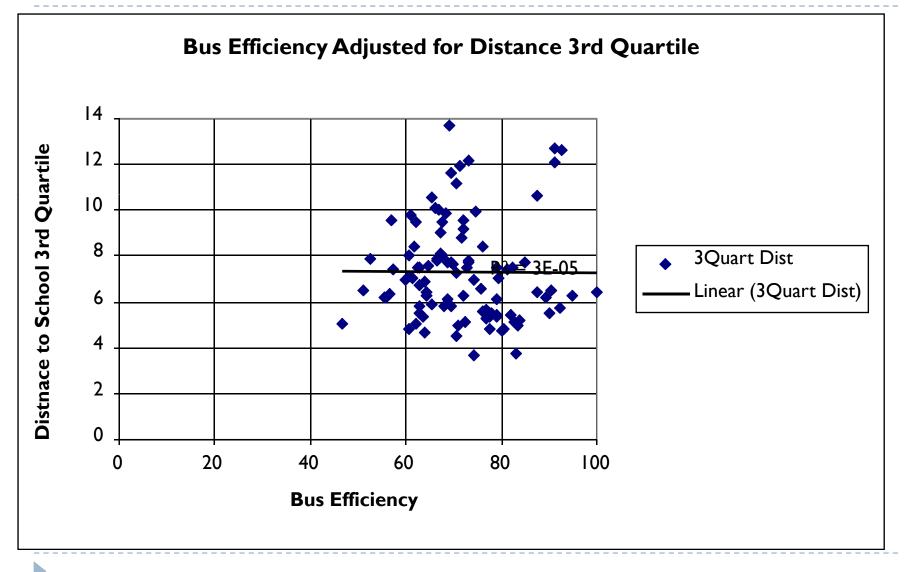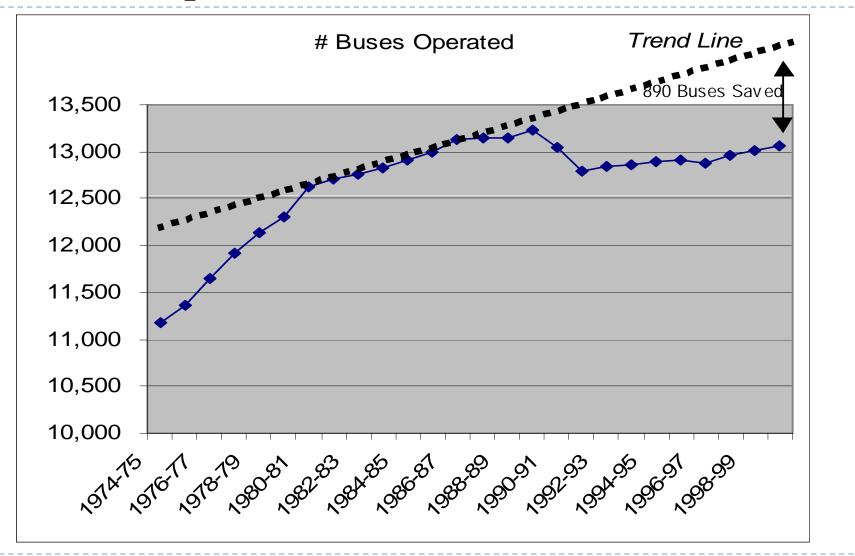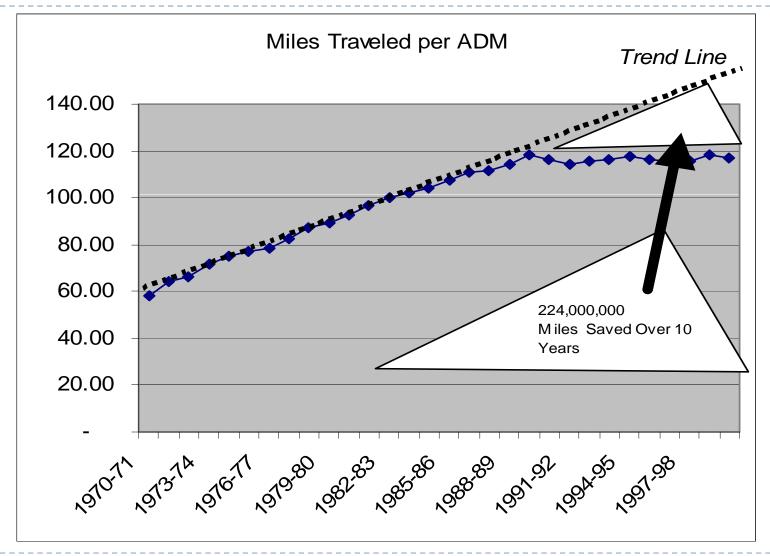|	Urban District X	Rural District Y	State Average
Pupil Density	17.1 students per road mile	5.4 students per road mile	6.2 students per road mile
Avg Distance to School	4.5 miles	7.8 miles	5.27 miles
Circuity (ratio of actual to crow-flight)	1.47	2.68	1.42

Unadjusted Bus Efficiency

Buses - 3rd Quartile Distance to School

$R^2 = 0.3781$

Bus Efficiency Adjusted for Distance to School 3rd Quartile

Bus Efficiency Adjusted for Distance 3rd Quartile

Buses Operated – 1974-2002

Annual Miles per Student 1970-2002

Miles Traveled per ADM

Trend Line

224,000,000 Miles Saved Over 10 Years

Concern: Service Delivery vs. Efficiency

‣ Evidence this may be taking place

‣ Student enrollment up 12%

‣ Transported students up 5 ½%

‣ Active buses up 5%

‣ Transported students as % of all students:

   ‣ -6.2%

‣ Bus capacity utilization: essentially no change

‣ Miles (per bus) up 13%

‣ Longer ride times as other options disappear?

‣

Conflicting Objectives

Efficiency

▸ Save fuel – high cost / gallon

▸ Increase walking distance

  ▸ SAFETY CONSIDERATIONS!!

▸ Improve budget rating

Service

- Stops located close to students
  - Improved safety
- More buses, shorter ride time

Service Indicators

▶ Concept suggested by consultants reviewing the funding formula

▶ Concern that state's push for efficiency had come at the expense of service delivery at the local level

▶ Derek created current list of Indicators

    ▶ More could be added in the future

▶

Indicators – First Year

▸ Student Ride Time

▸ Fleet Use

▸ Early Pickup Times

▸ School Bell Times

Average AM Ride Times
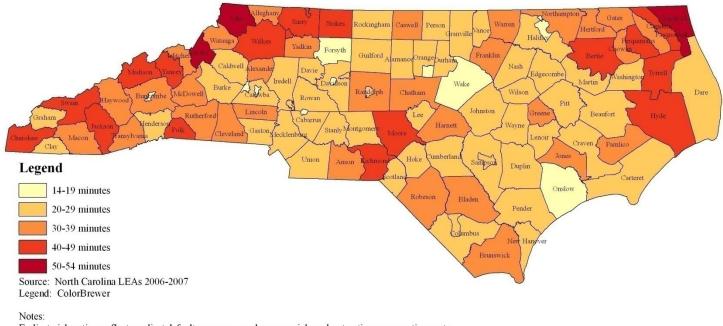
▸ Include all the time a student is on a bus.

  ▸ Sum the time on legs of transfers.

▸ Affected by anything that causes incorrect times on runs

  ▸ Bad stop locations

  ▸ Bad run directions

  ▸ Incorrect ell times

Student Ride Time by District

TIMS 2006-2007 Service Indicators: **Student Ride Time**

Legend

14-19 minutes
20-29 minutes
30-39 minutes
40-49 minutes
50-54 minutes

Source: North Carolina LEAs 2006-2007
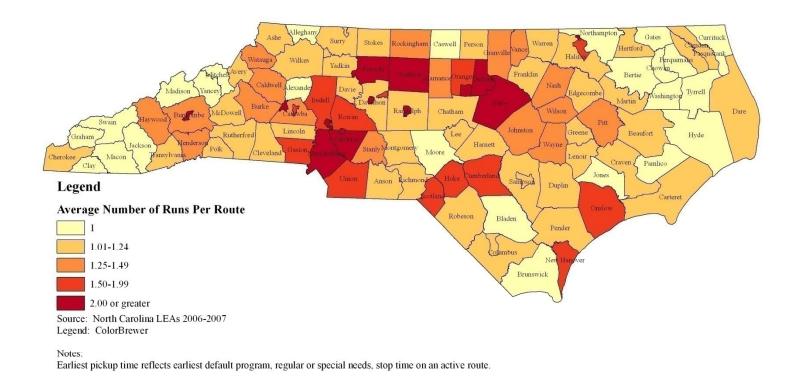Legend: ColorBrewer

Notes:
Earliest pickup time reflects earliest default program, regular or special needs, stop time on an active route.

Fleet Use and Double Runs

▸ The average number of runs per route gives an indication of how many times during the morning or afternoon that a district uses their buses

▸ Double runs are those that use a bus to serve the same school more than once
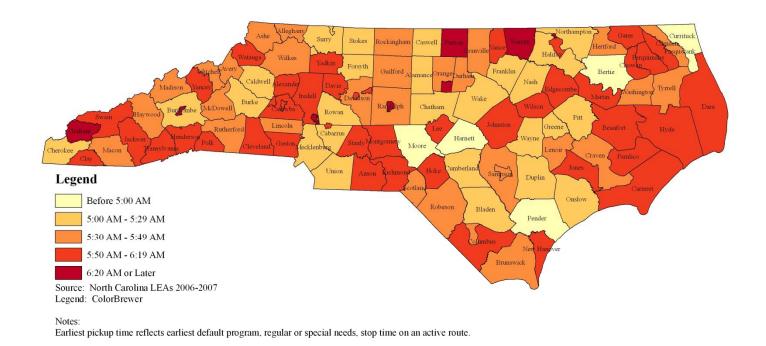
Fleet Use by District

TIMS 2006-2007 Service Indicators: **Fleet Use and Double Runs**

Legend

Average Number of Runs Per Route

- 1
- 1.01-1.24
- 1.25-1.49
- 1.50-1.99
- 2.00 or greater

Source: North Carolina LEAs 2006-2007
Legend: ColorBrewer

Notes:
Earliest pickup time reflects earliest default program, regular or special needs, stop time on an active route.

Earliest AM Pickup

TIMS 2006-2007 Service Indicators: *Earliest AM Pickup Time*

Legend

- Before 5:00 AM
- 5:00 AM - 5:29 AM
- 5:30 AM - 5:49 AM
- 5:50 AM - 6:19 AM
- 6:20 AM or Later

Source: North Carolina LEAs 2006-2007
Legend: ColorBrewer

Notes:
Earliest pickup time reflects earliest default program, regular or special needs, stop time on an active route.
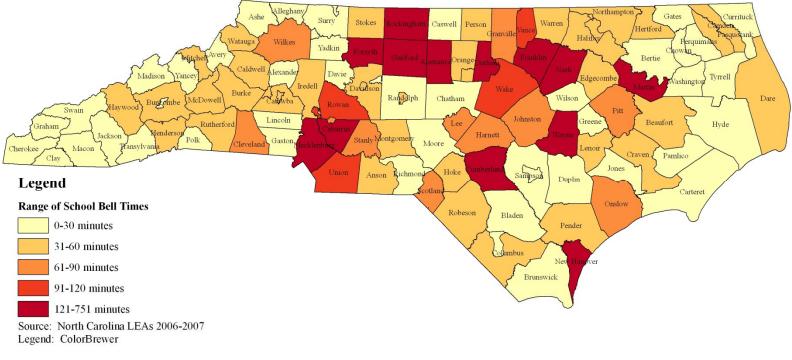
School Bell Times

▸ First AM bell time is the earliest AM bell time in the school district

▸ Last AM bell time is the latest bell time in the district

▸ Zero minutes difference indicates that all AM bell times are the same throughout the district

School Bell Times

TIMS 2006-2007 Service Indicators: **School Bell Times**

Legend

Range of School Bell Times

- 0-30 minutes
- 31-60 minutes
- 61-90 minutes
- 91-120 minutes
- 121-751 minutes

Source: North Carolina LEAs 2006-2007
Legend: ColorBrewer

Notes:
Earliest pickup time reflects earliest default program, regular or special needs, stop time on an active route.

Preliminary Goal

- ▸ Best and most efficient use of resources
- ▸ Safest and best service possible
- ▸ Identify good models of low cost/high service provision

Lower service to higher service axis

| **Low Cost** **High Service** | High Cost High Service |
| Low Cost Low Service | High Cost Low Service |

Low cost to high cost axis

Statewide Indicators – Changes So Far

Indicator	2006-07	2007-08
Ave Stu. Ride Time AM	**25 min.**	**24 min↓**
Ave Dist. To Sch (riders only)	4.33 miles	4.37 miles ↑
Ave Dist to Sch (all students)	4.19 miles	4.20 miles ↑
Ave # PM Runs/Rte	1.59	1.62 ↑
Rtes w/2+ Runs	54.63%	46.38% ↓
Rtes w/multi. PM Runs to same Sch	**6.68%**	**8.49% ↑**
Range of Morning Bell Times	41.8 min.	46.4 min ↑

▸ Bold are best service indicators with statewide numbers

▸ Morning pickup time is not averaged

Note: Arrows indicate change from last year. Color indicates impact on service, green arrow is positive for service, red is negative. Double arrow is unchanged from last year. (↑ ↔ ↓)
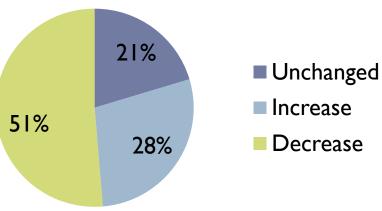
▸

Indicator – Student Ride Time

Student Ride Time	Number
LEAs Shorter Ride Time	58 ↓
LEAs Longer Ride Time	32 ↑
LEAs Unchanged	23 ↔

▶ Statewide change:
  ▶ 25 minutes to 24 minutes
  ▶ A majority of districts have improved on this measure since last year

Student Ride Time 2006-07 to 2007-08

- 21% Unchanged
- 28% Increase
- 51% Decrease

Note: Arrows indicate change from last year. Color indicates impact on service, green arrow is positive for service, red is negative. Double arrow is unchanged from last year. (↑ ↔ ↓)
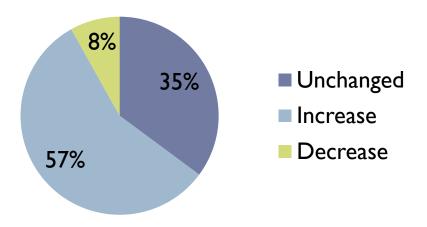
▶

Indicator – Multi Runs to Same School

% Multi Runs PM	Number
LEAs with decreased use	9 ↓
LEAs with increased use	63 ↑
LEAs Unchanged	39 ↔

▸ ## Statewide change:

- ▸ 6.68 % to 8.49%
- ▸ A majority of districts have gotten worse in this measure from last year
- ▸ 9 LEAs began using multi runs that did not last year
- ▸ 4 LEAs discontinued this practice

**Earliest Pickup
2006-07 to 2007-08**

- 8%
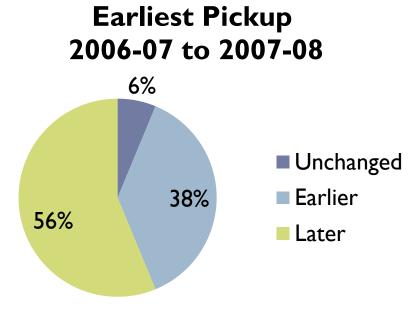- 35%
- 57%
- ■ Unchanged
- ■ Increase
- ■ Decrease

Note: Symbols indicate change from last year. Color indicates impact on service, green is positive for service, red is negative. Double arrow is unchanged from last year. (↑, ↓, ↔)

Indicator - Morning Pickup

Earliest Pickup	Number
LEAs later pickup	63 +
LEAs earlier pickup	42 (-)
LEAs unchanged	7 ↔

▶ This indicator does not have a statewide average

▶ A majority of districts have improved on this measure since last year

**Earliest Pickup
2006-07 to 2007-08**

- 6% Unchanged
- 38% Earlier
- 56% Later

Note: Symbols indicate change from last year. Color indicates impact on service, green is positive for service, red is negative. Double arrow is unchanged from last year. ((-), +, ↔)
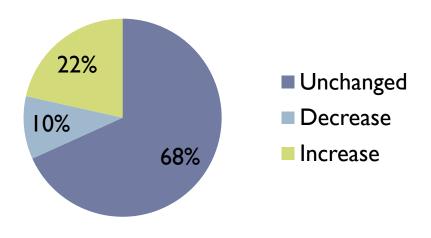
▶

Indicator – Range of Bell Times

Earliest Pickup	Number
LEAs Range increased	23
LEAs Earlier pickup	11
LEAs Unchanged	73

▸ **Statewide change:**

- ▸ Average bell range increased from 41.8 minutes to 46.4 minutes
- ▸ LEAs with zero range decreased from 7 to 5
- ▸ Reflects operations changes and flexibility, not a direct positive or negative service indicator

**Range of Bell Times
2006-07 to 2007-08**
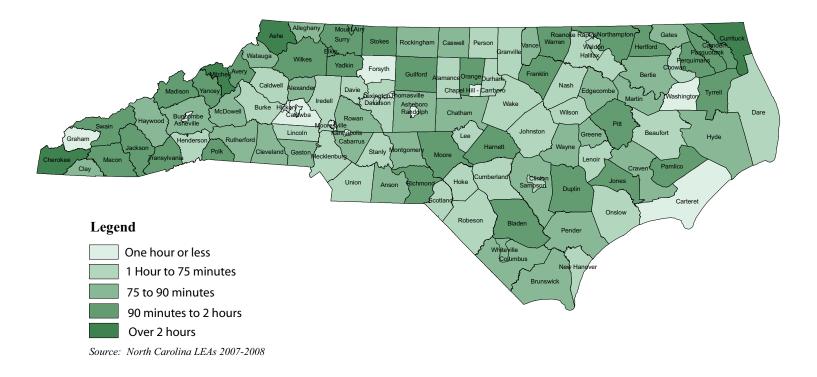

- Unchanged
- Decrease
- Increase

22%

10%

68%

Distribution of AM Ride Time by District

AM Ride Time: LEA Average

Ave of Longest 5% Student Ride Times

Average of Longest 5% Student Ride Times

Legend

- One hour or less
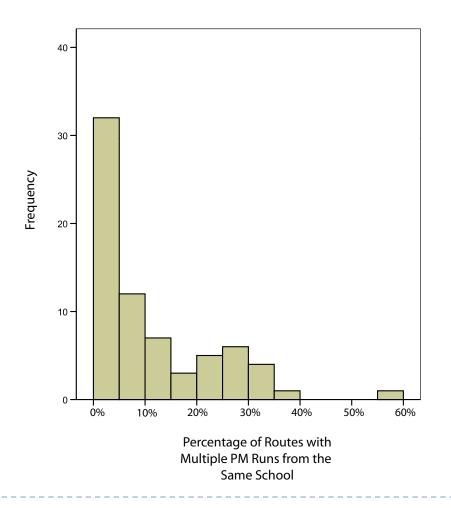- 1 Hour to 75 minutes
- 75 to 90 minutes
- 90 minutes to 2 hours
- Over 2 hours

Source: North Carolina LEAs 2007-2008

Ave Student to Stop Distance

Average Student-to-Stop Distance

Legend

Distances in Miles

- 0.01 - 0.02
- 0.03 - 0.05
- 0.06 - 0.08
- 0.09 - 0.12
- 0.13 - 0.17
- 0.18 - 0.23

Source: North Carolina LEAs 2007-2008

Service – Multiple Runs in PM

Multiple Runs from Same School PM : LEA Percentage

Percentage of Routes with
Multiple PM Runs from the
Same School

Distribution of Earliest AM Pickup

Morning Pickup Times: LEA Earliest

What We Do with These Data in NC

▸ Operational questions asked/answered

▸ Funding questions

▸ Legislature's requests – Funding Formula Study

Legislator Concerns

▶ Ride Times

▶ Pre-existing base – reshuffling the deck?

▶ Are extreme ride times to traditional programs or special programs (EC, alternative, etc?)

Legislator Concerns

Interest in extreme ride times raises the issue of service

Using these Data to Start Gathering in Your District

▸ Show operational advantages of having data

▸ Explore what your computer systems may already be able to produce

NC Data as a Resource in Your District

▸ Current reports available on-line

▸ Planned interactive reporting

▸

Wide Range of Operations in NC

▸ Range of system sizes and operational statistics

▸ Range of smallest to largest NC operations

▸ Average size

▸ Lots of options that could compare to your district

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