# A Study in Equity: Oregon's 9th Grade Transition

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# Presentation Outline

- Policy context and intervention
- Oregon's State Longitudinal Data System (SLDS)
- Study design and analysis: Interrupted time series models
- Results and interpretation
- Limitations and future directions

# Policy Context

- High school success/dropout prevention in Oregon
- Oregon has had high dropout rates historically
- In AY 2013-14, the Oregon Department of Education (ODE) started collecting a ninth grade on track to graduate metric (9G-OTG): completion of 25% of coursework
- Why?
  - Ninth grade is a critical transition point for students: those who stay on track with their coursework are more likely to graduate high school on time
  - On-track metrics serve as an early warning indicator to identify students at risk of not completing high school (Allensworth, 2013; Allensworth & Easton, 2005)

# Policy Context

- In November 2016, Oregon voters passed ballot Measure 98, initiating the state's High School Success (HSS) fund

- ODE allocated > $150 million across approximately 200 districts for high school success efforts

- Districts applied for funding to establish and/or expand programs in three areas:
  - Dropout prevention ***— of most relevance here***
  - Career & technical education
  - College-level education opportunities

HIGH SCHOOL SUCCESS

# Oregon's Student Success Teams

- Across the state, most districts utilized HSS funding to develop and implement 9th grade student success teams for dropout prevention

- Success teams:
  - Hired and trained school-based coaches
  - School-level data system utilization
  - Weekly meetings to review data
    - Student course-taking patterns, absences, grades, and earned credits towards graduation
  - Provided ongoing counseling and support to at-risk students
    - Offered tutoring support
    - Provided mechanisms for credit recovery
    - Directed students to school sanctioned academic and health resources

# Implementation (2017-18)

- Ninth grade success teams were classified as full, partial, or not implemented by ODE, based on fidelity checks and ongoing operational metric review

- Full implementation
  - Data usage plan was approved and implemented
  - 9th grade coaches (i.e., student success teams) were funded and trained
  - Data systems for monitoring 9G-OTG were utilized
  - Awareness raised of the importance of 9G-OTG to teachers, students, parents, and other stakeholders

- Partial implementation
  - Funds were allocated for tracking metrics and raising awareness
  - Coaching funds were reserved for other innovations at later high school grades

- No implementation:
  - Some schools did not use funding for 9$^{th}$ grade success team programming

# Oregon's Statewide Longitudinal Data System (SLDS)

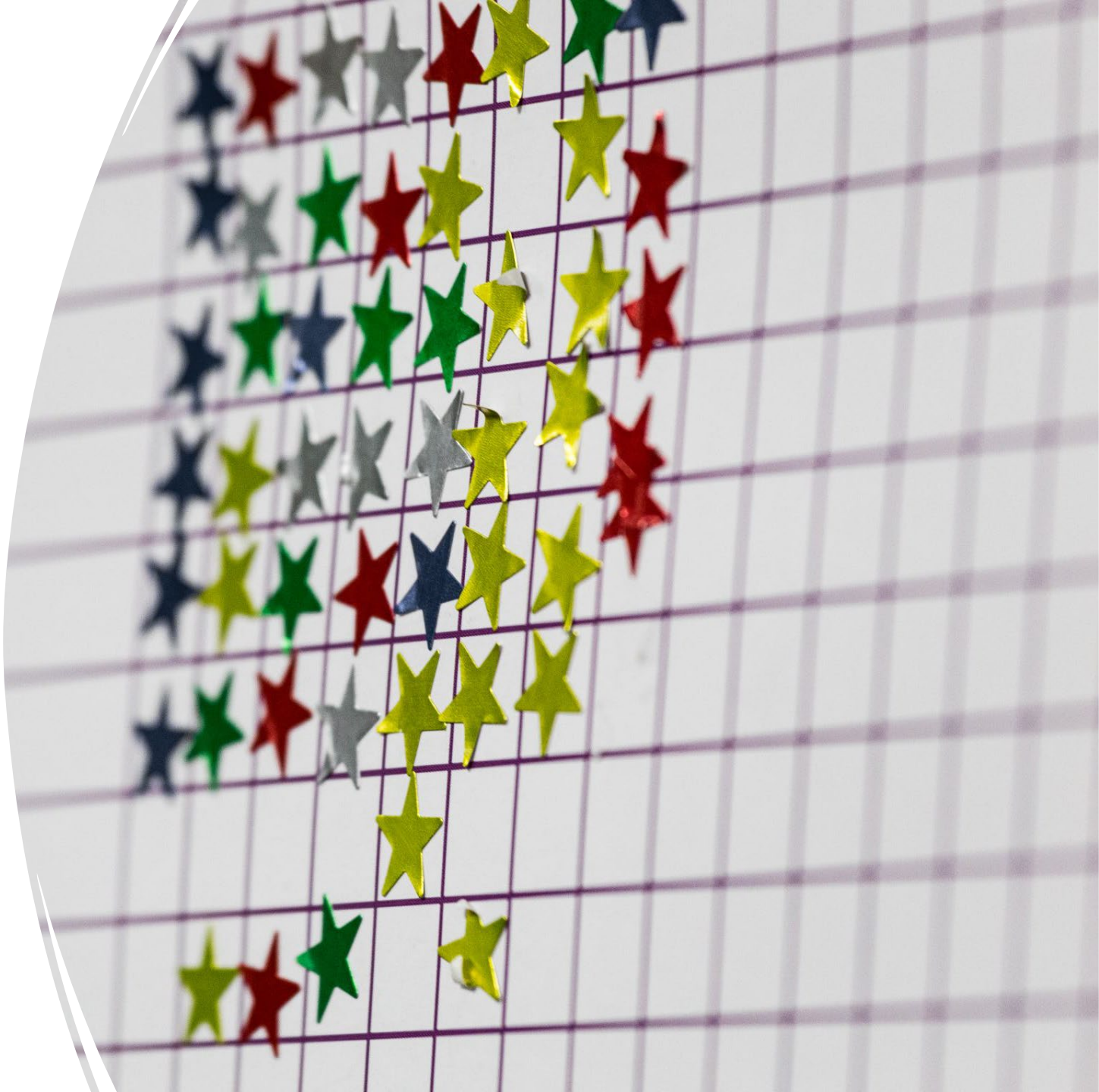
In 2001-2002, Oregon began longitudinal tracking of student data

From 2007-2009, Oregon received over $18.8 million in federal funds to further develop their SLDS

SLDS funding has enabled streamlined and expanded data access for decision-makers

# On Track to Graduation

- In AY 2013-14, Oregon added 9th Grade on Track to Graduation status (9G-OTG) to its SLDS
- 9G-OTG is a binary indicator that captures the number of core courses students pass in 9th grade
- Students are classified as on track to graduate if they have completed 25% of the coursework needed to graduate by the end of their freshman year



# A Study in Equity: Oregon's 9th Grade Transition

In 2021, IES funded a collaboration between the Oregon Department of Education (ODE) and the University of Oregon (UO) to evaluate the efficacy of HSS funding on on-track to graduation rates

The primary goal was to determine if the high school success team initiative had a positive impact on Oregon's 9G-OTG trajectory, and whether outcomes varied by the strength of implementation

With the SLDS's longitudinal tracking of 9G-OTG (2013-14) and with the start of the HSS initiative in 2017-18, we leveraged interrupted time series (ITS) models to investigate short- and longer-term program outcomes

# Design and Analytic Procedures

- Use of data from Oregon's SLDS and ODE primary data on implementation fidelity

- A multilevel comparative interrupted time series (CITS) design (districts > schools > observations)
  - Fit piecewise growth models to estimate 9G-OTG trajectories:
    - Baseline (2013-14 to 2016-17)
    - Dummy variables for each year after onset of intervention (2017-18, 2018-19)
    - Then COVID!

- Analyses estimate heterogeneity in 9G-OTG trajectories by:
  - Level of implementation (full, partial, none)
  - Time-varying demographics (e.g., %FRL, %minority)

# Sample Characteristics

- Students and schools (*N* = ~350) from all of Oregon's 197 districts, gathered from Oregon's SLDS
  - Student N ~300,000

- Analyses were weighted by freshman class size to prevent undue influence from small schools and K-12 schools

- Data from seven 9th grade cohorts (2013-14 to 2018-19, 2020-21)

| Grade | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 | 2020-21 |
| 9 | X | X | X | X | X | X | | X |

# Sample Characteristics

| | | Implementation Category | | | |
|---|---|---|---|---|---|
| School Year | Wave | None | Partial | Full | Total |
| 2013 - 2014 | -3 | n = 36 | n = 121 | n = 195 | N = 352 |
| 2014 - 2015 | -2 | n = 34 | n = 119 | n = 189 | N = 342 |
| 2015 - 2016 | -1 | n = 34 | n = 117 | n = 188 | N = 339 |
| 2016 - 2017 | 0 | n = 34 | n = 117 | n = 190 | N = 341 |
| 2017 - 2018 | 1 | n = 35 | n = 118 | n = 186 | N = 339 |
| 2018 - 2019 | 2 | n = 36 | n = 122 | n = 195 | N = 353 |
| 2020 - 2021 | 4 | n = 38 | n = 114 | n = 182 | N = 334 |

| No Implementation | | | |
|---|---|---|---|
| **School Year** | **Mean Proportion FRL (SD)** | **Mean Proportion Non-White (SD)** | **Mean 9th Grade Class Size (SD)** |
| 2013 - 2014 | 0.59 (0.27) | 0.08 (0.09) | 76.86 (109.93) |
| 2014 - 2015 | 0.58 (0.26) | 0.08 (0.09) | 79.65 (106.06) |
| 2015 - 2016 | 0.6 (0.28) | 0.08 (0.08) | 84.65 (113.49) |
| 2016 - 2017 | 0.59 (0.28) | 0.09 (0.08) | 84 (113.4) |
| 2017 - 2018 | 0.57 (0.28) | 0.09 (0.06) | 79.89 (104.22) |
| 2018 - 2019 | 0.53 (0.27) | 0.07 (0.05) | 82.25 (110.2) |
| 2020 - 2021 | 0.67 (0.33) | 0.05 (0.04) | 82.42 (110.81) |
| **Partial Implementation** | | | |
| **School Year** | **Mean Proportion FRL (SD)** | **Mean Proportion Non-White (SD)** | **Mean 9th Grade Class Size (SD)** |
| 2013 - 2014 | 0.57 (0.23) | 0.11 (0.14) | 118.54 (153.79) |
| 2014 - 2015 | 0.56 (0.23) | 0.12 (0.13) | 121.05 (158.47) |
| 2015 - 2016 | 0.58 (0.27) | 0.12 (0.13) | 118.15 (153.13) |
| 2016 - 2017 | 0.58 (0.28) | 0.11 (0.12) | 117.43 (155.44) |
| 2017 - 2018 | 0.56 (0.28) | 0.11 (0.11) | 118.81 (157.58) |
| 2018 - 2019 | 0.56 (0.29) | 0.1 (0.1) | 116.02 (156.31) |
| 2020 - 2021 | 0.65 (0.34) | 0.09 (0.09) | 127.33 (160.85) |
| **Full Implementation** | | | |
| **School Year** | **Mean Proportion FRL (SD)** | **Mean Proportion Non-White (SD)** | **Mean 9th Grade Class Size (SD)** |
| 2013 - 2014 | 0.51 (0.24) | 0.16 (0.18) | 131.36 (165.77) |
| 2014 - 2015 | 0.5 (0.24) | 0.16 (0.15) | 137.04 (171.45) |
| 2015 - 2016 | 0.51 (0.25) | 0.15 (0.15) | 141.59 (175.71) |
| 2016 - 2017 | 0.49 (0.25) | 0.15 (0.14) | 138.42 (170.67) |
| 2017 - 2018 | 0.48 (0.24) | 0.15 (0.14) | 142.89 (171.44) |
| 2018 - 2019 | 0.51 (0.26) | 0.15 (0.15) | 138.21 (170.42) |
| 2020 - 2021 | 0.6 (0.33) | 0.13 (0.13) | 150.43 (173.46) |

# Modeling Framework: ITS

ITS models are a diverse class of models, and the same model is often referred to differently by discipline

Before presenting the evaluation results, we briefly discuss the ITS framework

We primarily use the Hallberg et al. (2018) naming conventions

# What is an Interrupted Time Series (ITS)?

- A series of observations on the same dependent variable over time (within a unit or case)
- At some known point, the time series is ‘interrupted’ by an internal or external event
- If the treatment has a causal impact, the post-intervention series will have a different level or slope than the pre-intervention series, all else equal
- ITS is thus a special type of longitudinal design where a treatment/intervention/policy is introduced at a known point along the time continuum

# ITS Design Requirements

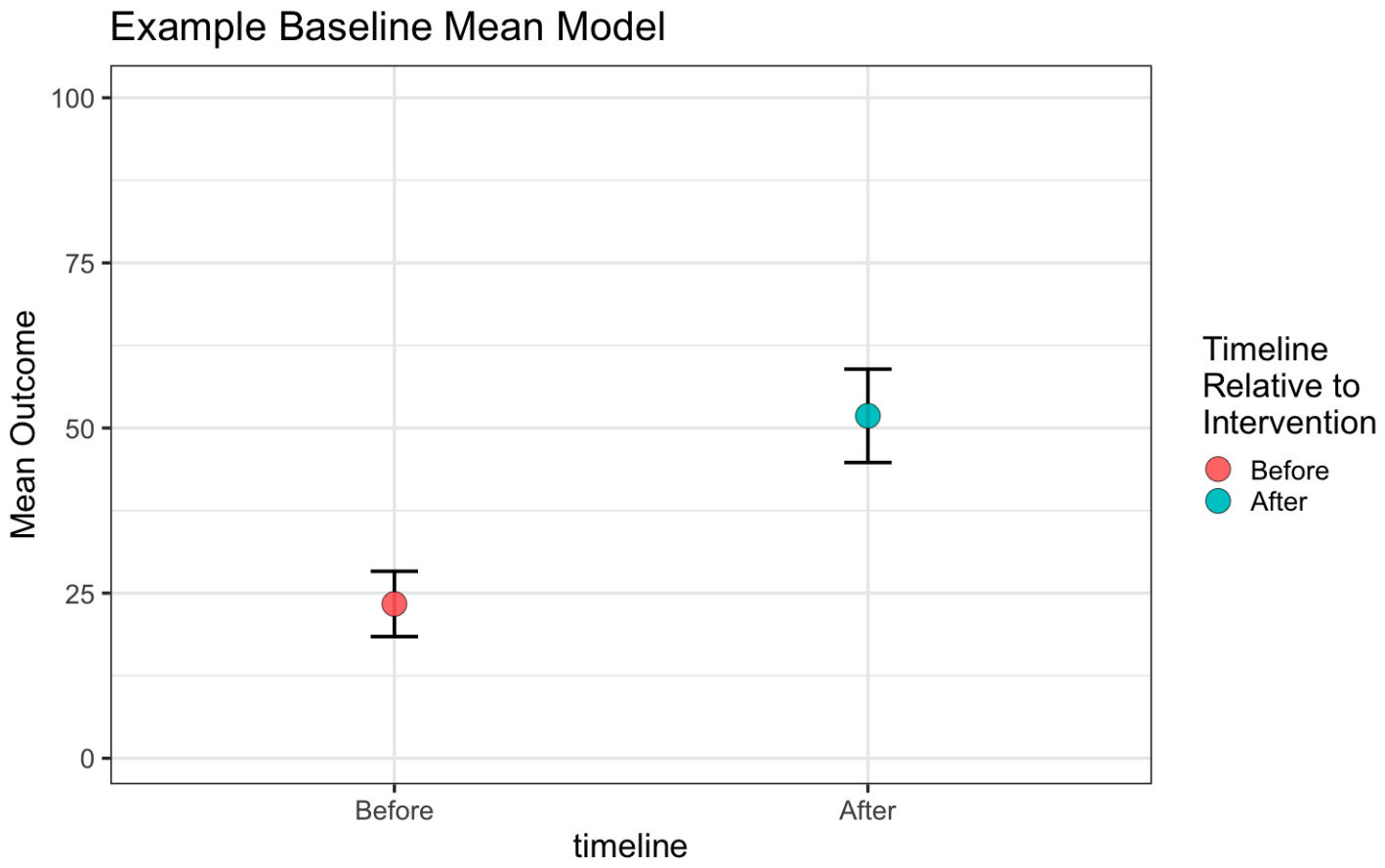
- Time series data on a relevant outcome available for periods before and after the onset of the intervention

- Sufficient data points available, with no change in the measure, to establish stable pre and post intervention statistical trends

- In multiple group designs, availability of a comparison time series obtained from similar units not or differentially exposed to the intervention

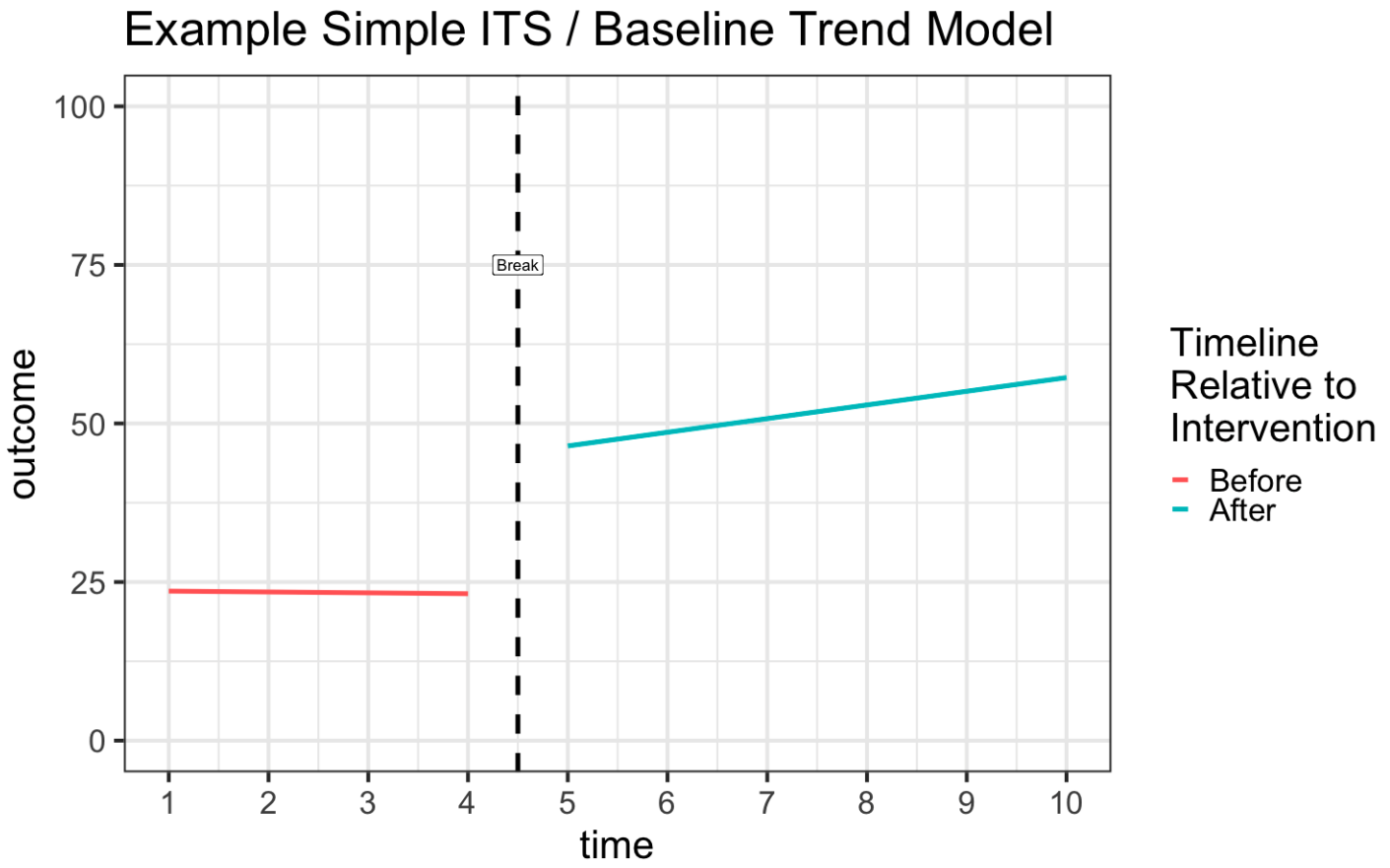
# Baseline Mean Model

- Simplest ITS model is sometimes referred to as a ***baseline mean model***. This compares the average pre-treatment effect to the average post-treatment effect
- Such a model would look like this



# Baseline Trend Model

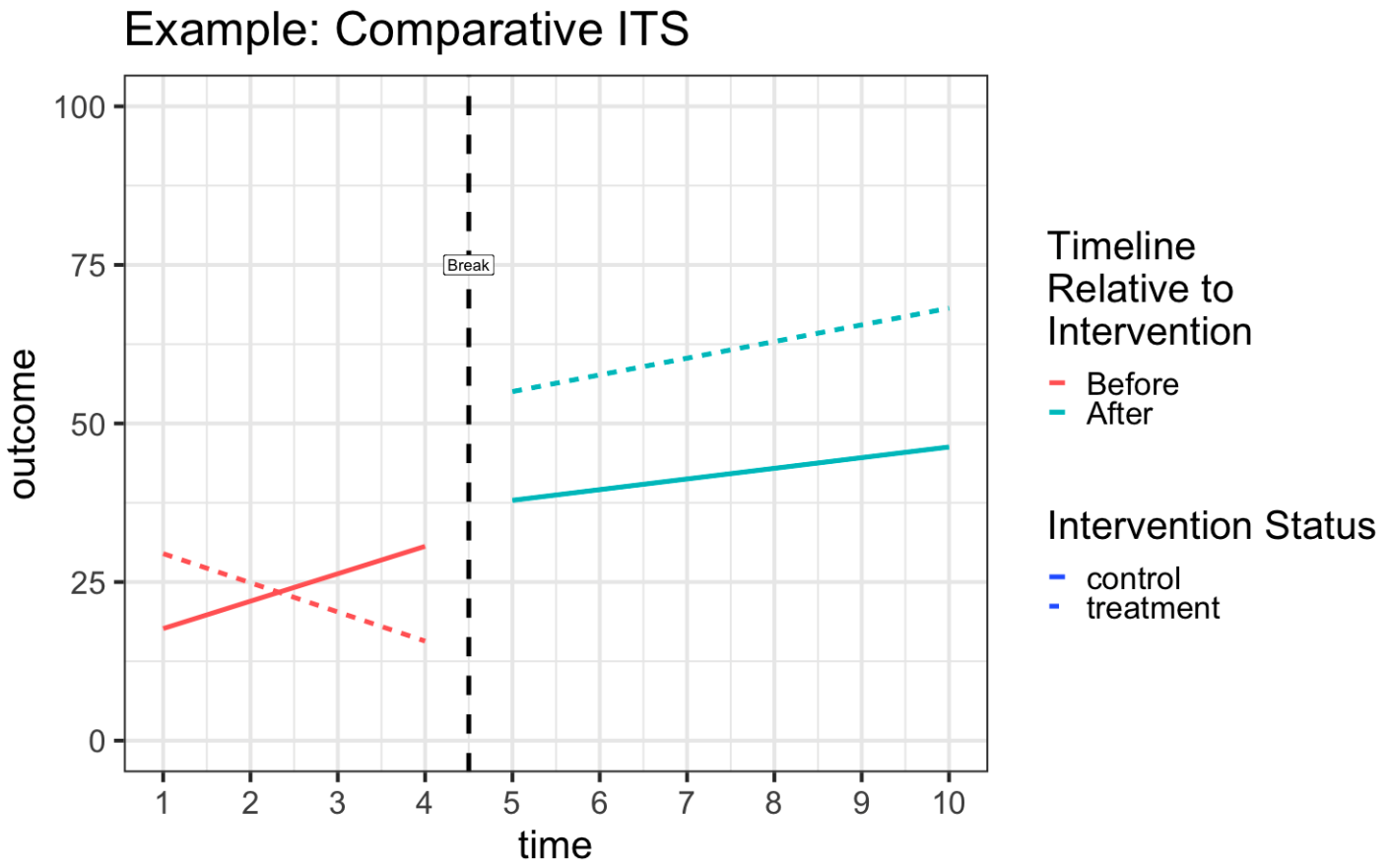
- With multiple time points, slopes can be estimated
- Hallberg et al. (2018) call this a ***baseline trend model***, but is perhaps more commonly known as a “Simple ITS model”
- Can test if the effect was immediate and/or over time



# CITS

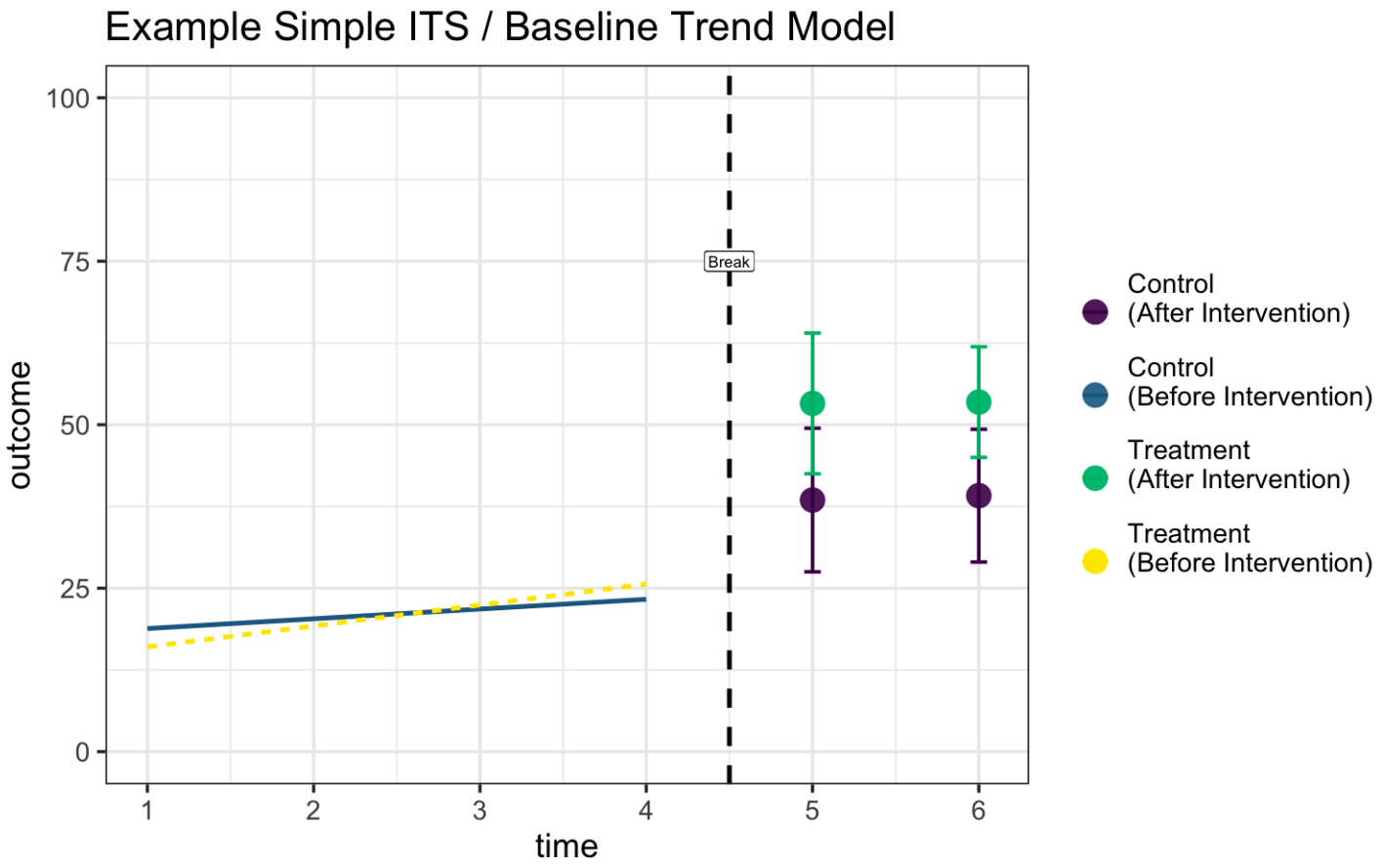
- With multiple groups, differential impacts can be estimated

- With enough time points:
  - Differences in intercepts (immediate change) and,
  - Differences in slopes (change over time) can be estimated



# CITS with yearly post-test effects

- With only two-waves of post-intervention data, post-test slopes cannot be estimated
- This is a comparative approach which mirrors the
  - Baseline Trend Model *Before the Intervention*
  - Baseline Means *After the Intervention*



# CITS with yearly post-test effects

- We used this CITS model due to the COVID-19 disruption:
  - 2016-17 intercept coded as zero (i.e., wave = -3,-2,-1,0,1,2,4)

$$Y_{ti} = \pi_{0i} + \pi_{1i}(Pre\ TxSlope)_{ti} + \pi_{2i}(TxDosage)_{ti} + \pi_{3i}(TxLevel:\ year\ 1)_{ti} + \pi_{4i}(TxLevel:\ year\ 2)_{ti} + \pi_{5i}(TxDosage * TxLevel:\ year\ 1)_{ti} + \pi_{6i}(TxDosage * TxLevel:\ year\ 2)_{ti} + \ldots + \pi_{ti}(Time\ Varying\ Covariates)_{ti} + e_{ti}$$

- Benefits:
  - Makes fewer assumptions regarding functional form
  - Can test for immediate and delayed effects (relative to pre-intervention intercept)
  - Controls for the pre-intervention slope

- Limitations:
  - Post-intervention slope not specified or tested

# Models

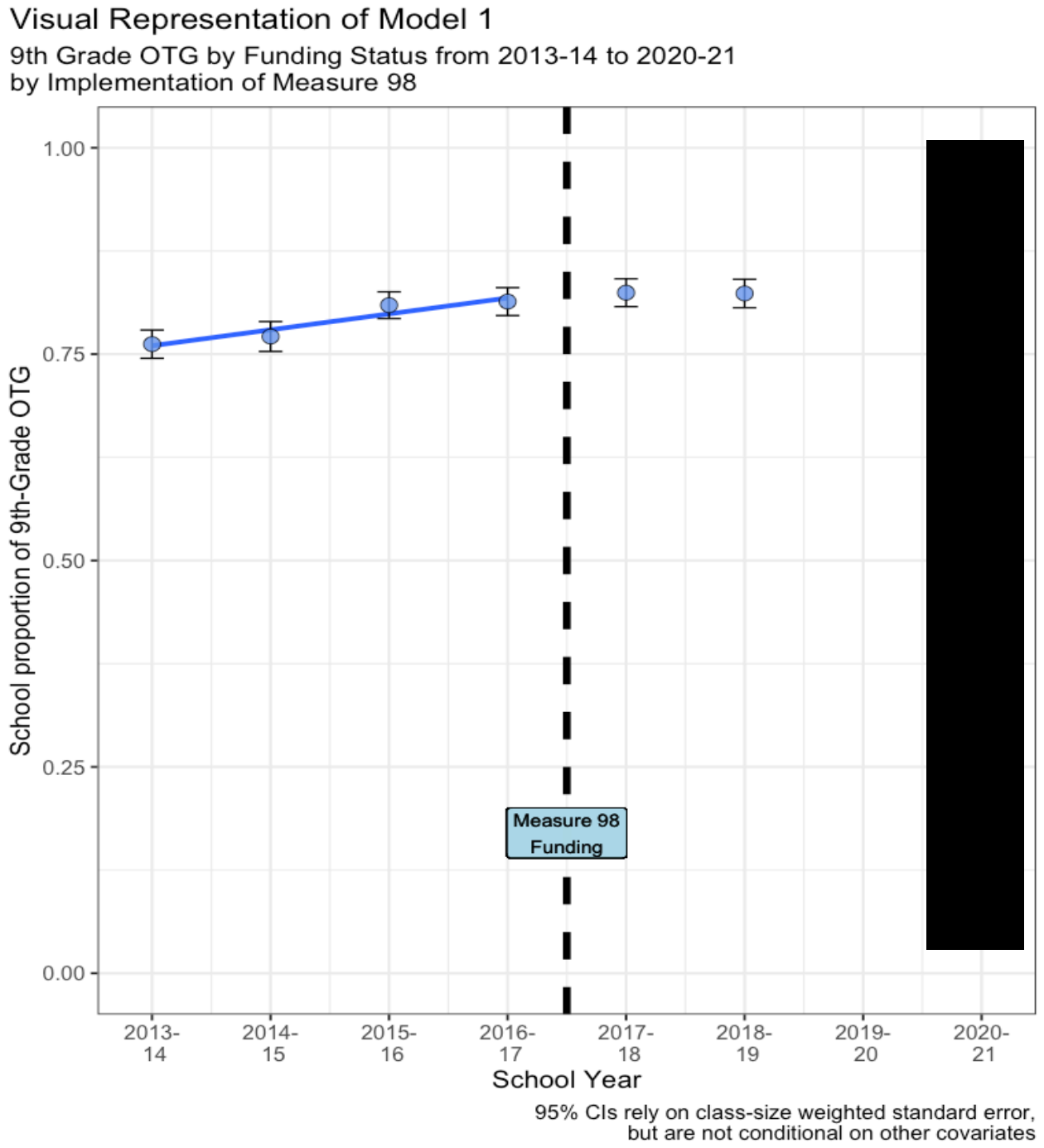
- Simple ITS pre- and post-COVID
- Comparative ITS pre- and post-COVID
- Comparative ITS w/time varying covariates

# Results: Pre-COVID Simple ITS

| Coefficient | Estimate | Standard Error | t-value | Degrees of Freedom | p |
|---|---|---|---|---|---|
| 2016-17 (Intercept) | 0.686 | 0.014 | 49.168 | 313 | <0.001 |
| Difference in 9G-OTG in 2017-18 (Relative to 2016-17) | -0.011 | 0.005 | -2.073 | 1621 | 0.038 |
| Difference in 9G-OTG in 2018-19 (Relative to 2016-17) | -0.027 | 0.007 | -4.146 | 1622 | <0.001 |
| Wave (Pre-Funding Change over Time) | 0.019 | 0.002 | 11.978 | 1622 | <0.001 |

Satterwaite df are non-integers, but have been rounded to nearest integer

# Results: Pre-COVID Simple ITS



# Interpretation

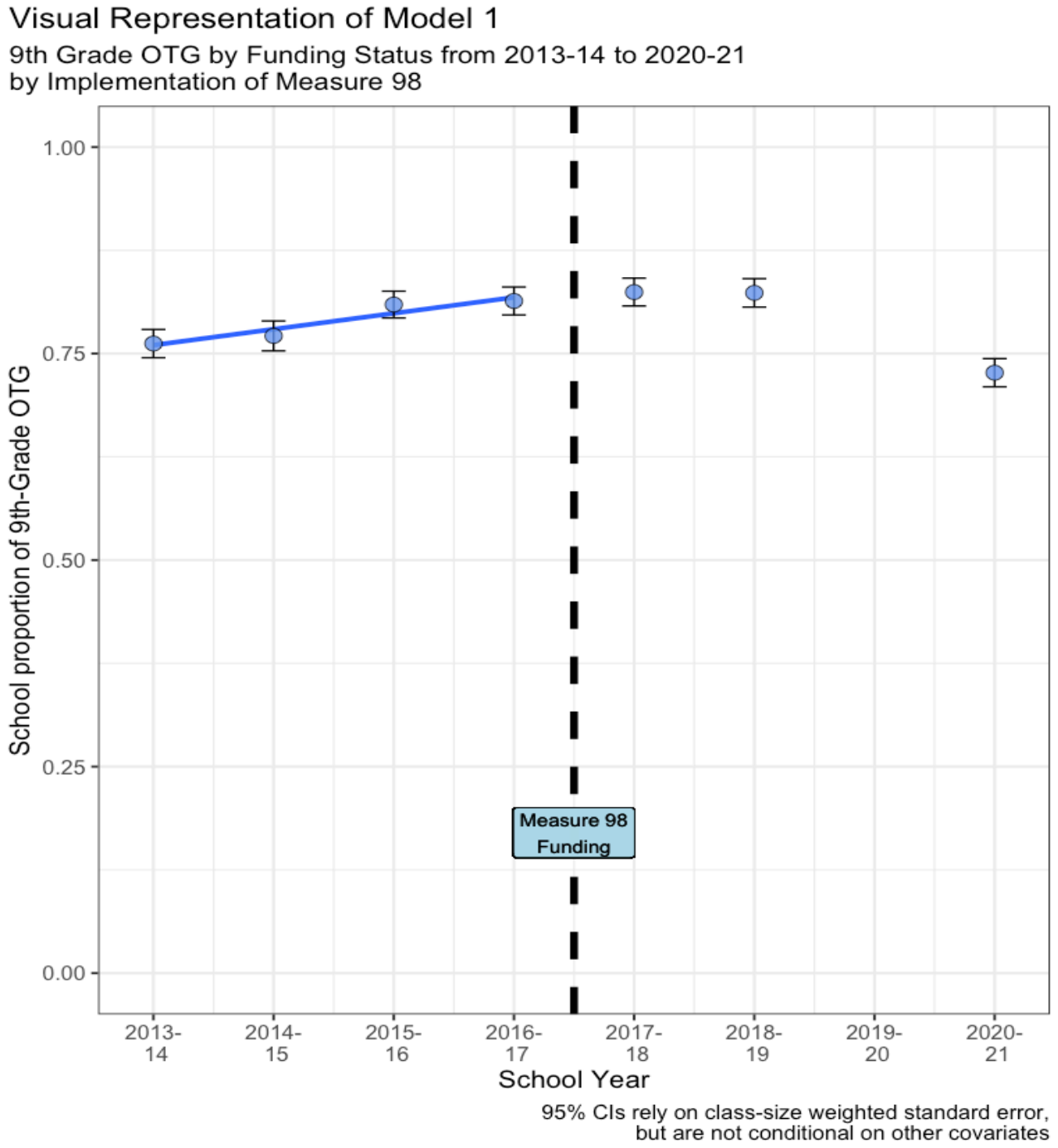
- 9G-OTG rates were increasing at roughly ~1.9% per year over the pre-intervention period, with the average 9G-OTG at the end of 2016-17 at ~68.6%

- Small but statistically significant deviations *below* the projected levels after the intervention, meaning growth did not continue at the pre-intervention rate

# Results: Simple ITS w/COVID Year

| Coefficient | Estimate | Standard Error | t-value | Degrees of Freedom | p |
|---|---|---|---|---|---|
| 2016-17 (Intercept) | 0.700 | 0.013 | 53.862 | 311 | <0.001 |
| Difference in 9G-OTG in 2017-18 (Relative to 2016-17) | -0.011 | 0.006 | -1.820 | 1932 | 0.069 |
| Difference in 9G-OTG in 2018-19 (Relative to 2016-17) | -0.028 | 0.008 | -3.659 | 1933 | <0.001 |
| **Difference in 9G-OTG in 2020-21 (Relative to 2016-17)** | **-0.165** | **0.011** | **-15.511** | **1934** | **<0.001** |
| Wave (Pre-Funding Change over Time) | 0.018 | 0.002 | 10.367 | 1934 | <0.001 |
| Satterwaite df are non-integers, but have been rounded to nearest integer | | | | | |

# Results: Simple ITS w/COVID Year



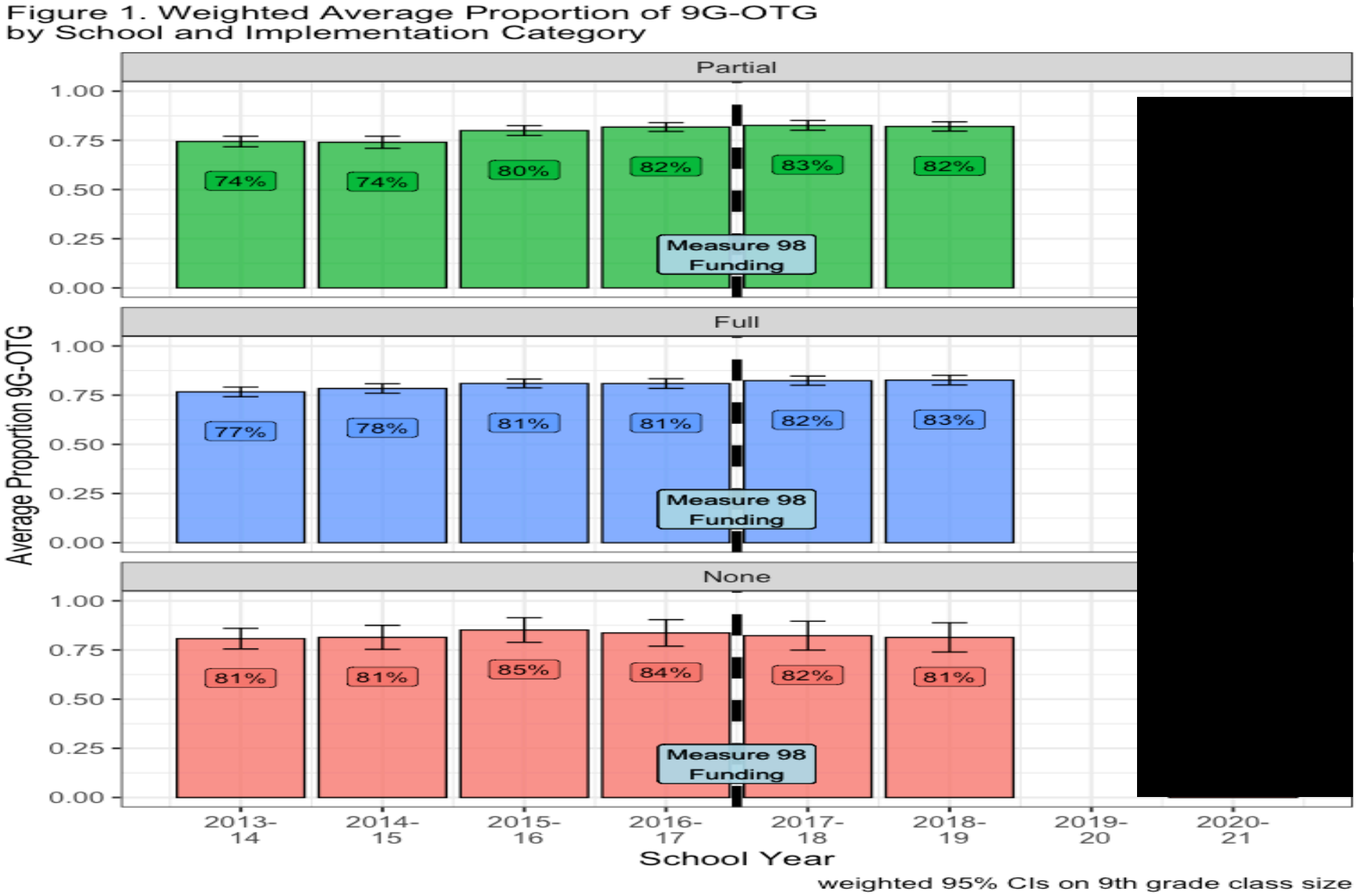
# Interpretation

- Statistically and practically significant decrease in 9G-OTG after the COVID-19 disruption (~16.5% lower than pre-test projected slope)

# Comparative ITS Models

- Pre- and post-COVID analyses
- By implementation and with covariates

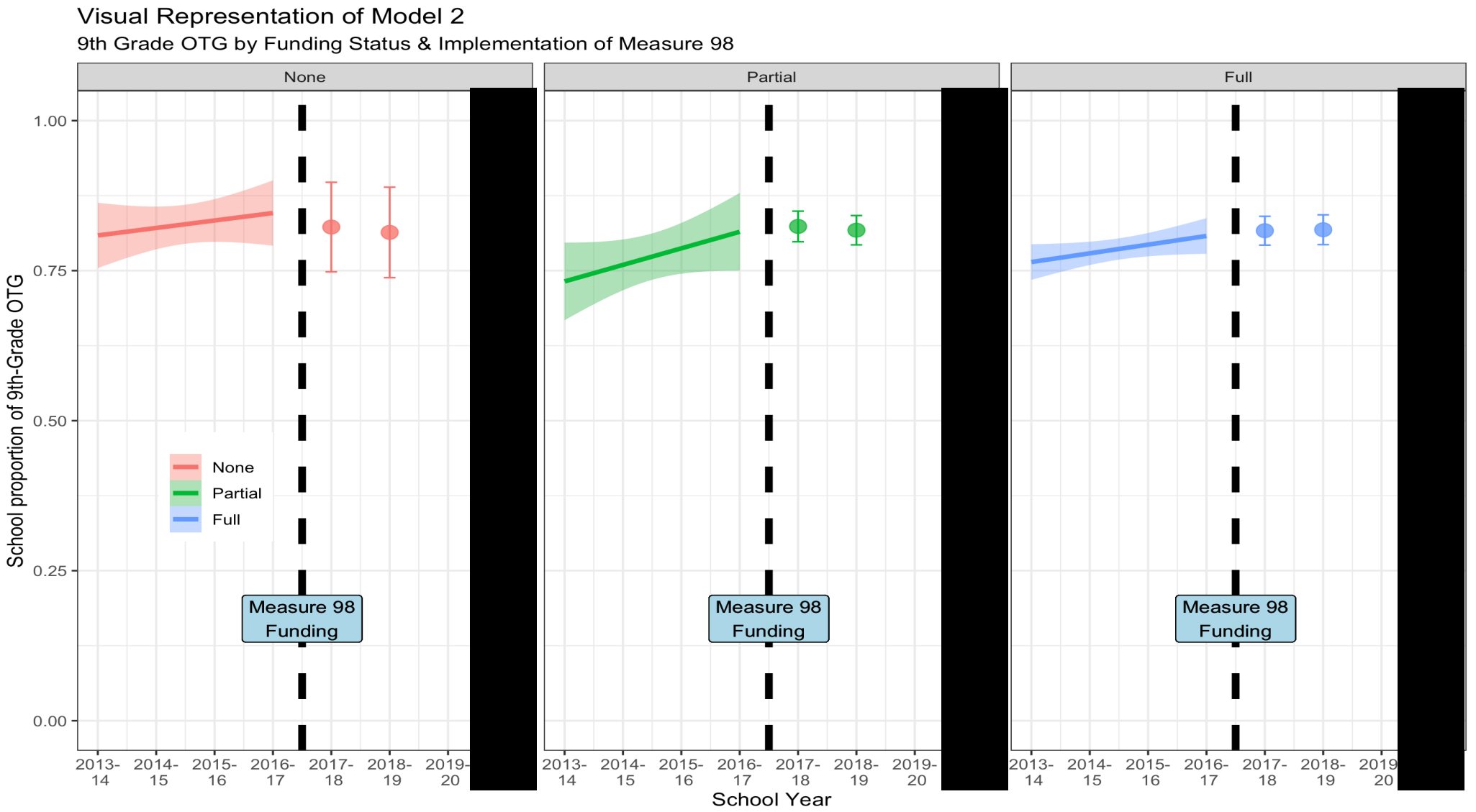
# 9G-OTG Rate by Implementation Status



# Results: Pre-COVID Comparative ITS

| Coefficient | Estimate | Standard Error | t-value | Degrees of Freedom | p |
|---|---|---|---|---|---|
| No Imp. 2016-17 (Intercept) | 0.754 | 0.038 | 19.643 | 515 | <0.001 |
| Difference in 9G-OTG for Partial Imp. in 2016-17 (Relative to No Imp.) | -0.016 | 0.041 | -0.396 | 638 | 0.692 |
| Difference in 9G-OTG for Full Imp. in 2016-17 (Relative to No Imp.) | -0.113 | 0.041 | -2.743 | 556 | 0.006 |
| Difference in 9G-OTG for No Imp. in 2017-18 (Relative to 2016-17) | -0.027 | 0.021 | -1.280 | 1622 | 0.201 |
| Difference in 9G-OTG for No Imp. in 2018-19 (Relative to 2016-17) | -0.055 | 0.026 | -2.137 | 1625 | 0.033 |
| Wave (Yearly Pre-Funding Change) | 0.022 | 0.006 | 3.677 | 1627 | <0.001 |
| Difference in 9G-OTG for Partial Imp. in 2017-18 (Relative to No Imp.) | 0.022 | 0.023 | 0.941 | 1622 | 0.347 |
| Difference in 9G-OTG for Full Imp. in 2017-18 (Relative No Imp.) | 0.013 | 0.022 | 0.606 | 1622 | 0.545 |
| Difference in 9G-OTG for Partial Imp. in 2018-19 (Relative to No Imp.) | 0.024 | 0.028 | 0.850 | 1625 | 0.395 |
| Difference in 9G-OTG for Full Imp. in 2018-19 (Relative No Imp.) | 0.030 | 0.027 | 1.129 | 1625 | 0.259 |
| Difference in pre-funding slope for Partial Imp. (Relative to No Imp.) | -0.003 | 0.007 | -0.404 | 1627 | 0.686 |
| Difference in pre-funding slope for Full Imp. (Relative to No Imp.) | -0.004 | 0.006 | -0.610 | 1627 | 0.542 |
| Satterwaite df are non-integers, but have been rounded to nearest integer | | | | | |

# Results: Pre-COVID Comparative ITS




95% CIs rely on class-size weighted standard error, but are not conditional on other covariates

# Interpretation

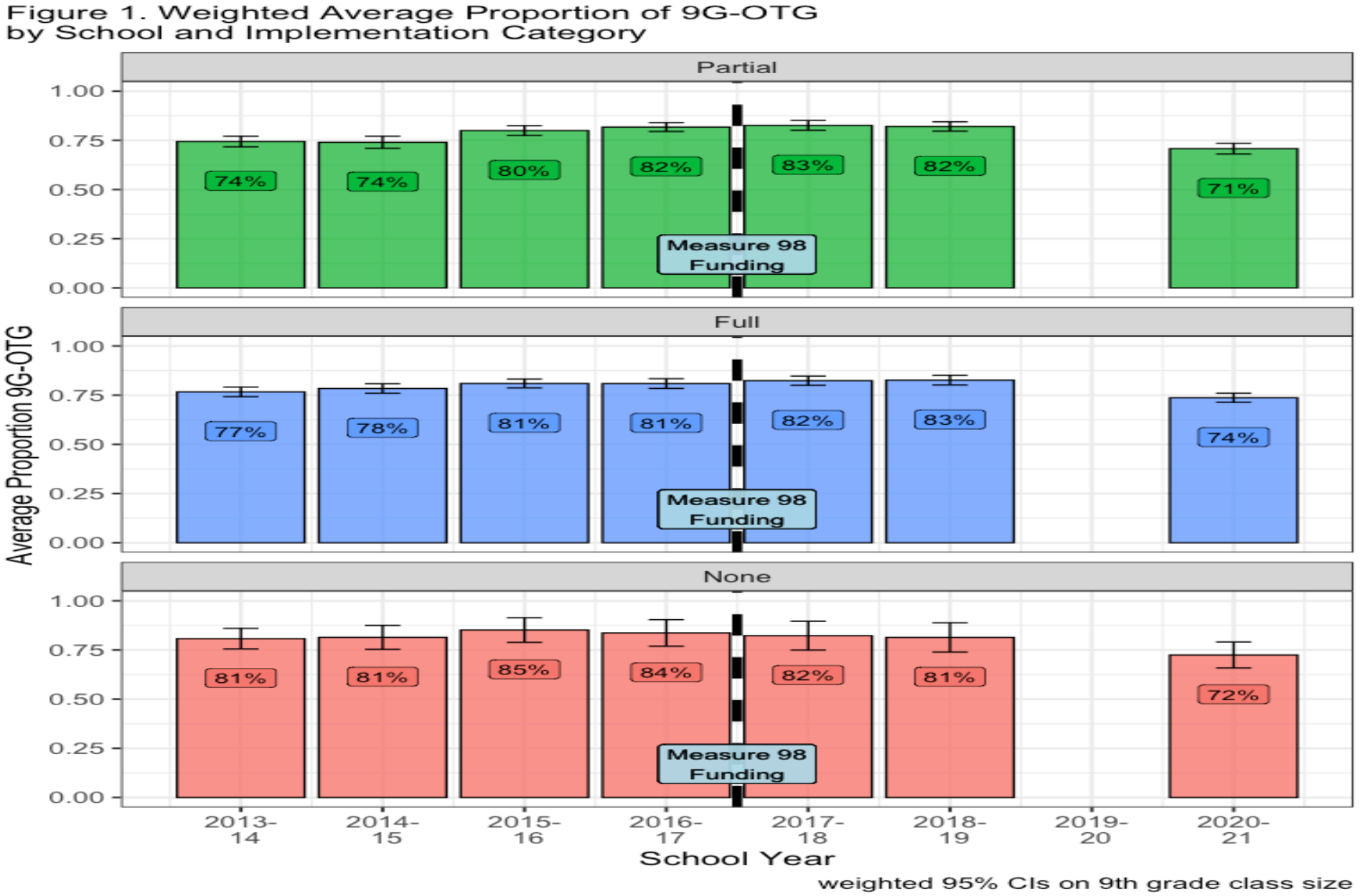
- In the year before the intervention, future non-implementers had:
  - A relatively large difference in 9G-OTG compared to those who would implement fully (~11% higher in “none” than “full”, $p < 0.01$)
  - A minimal and non-significant difference in 9G-OTG compared to those who would partially implement (~1.6% higher “none” than “partial”, $p > 0.05$)

- Pre-implementation slopes were roughly equivalent (~2.2% 9G-OTG), as interactions of (pre-intervention slope) x (condition) were not statistically significant ($|estimates| < 0.5\%$; $ps > 0.05$)

- A small, non-significant decrease from projected slope was observed in the “none” group in 2017-18, and this decrease was statistically significant the following year (2018-19; 5.5% lower; $p < 0.05$)

- The difference in expected deviations from the slope for partial and full were not statistically different from none in both post funding timepoints

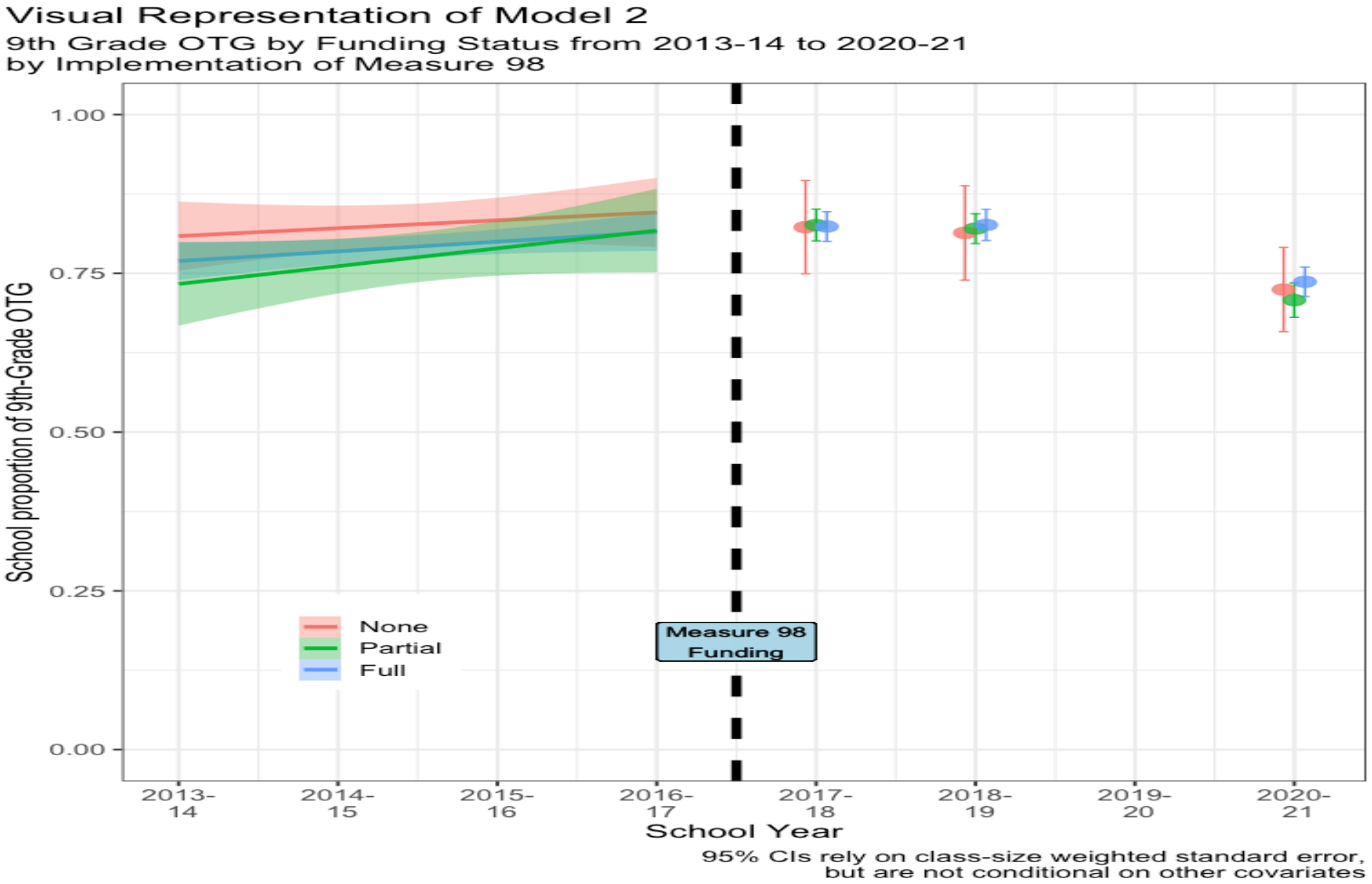
# 9G-OTG Rate by Implementation Status w/COVID Year



# Results: Comparative ITS w/COVID Year and Covariates

| Coefficient | Estimate | Standard Error | t-value | Degrees of Freedom | p |
|---|---|---|---|---|---|
| No Imp. 2016-17 (Intercept) | 0.764 | 0.036 | 21.007 | 471 | <0.001 |
| Difference in 9G-OTG for Partial Imp. in 2016-17 (Relative to No Imp.) | -0.028 | 0.040 | -0.696 | 558 | 0.487 |
| Difference in 9G-OTG for Full Imp. in 2016-17 (Relative to No Imp.) | -0.102 | 0.039 | -2.587 | 495 | 0.01 |
| Difference in 9G-OTG for No Imp. in 2017-18 (Relative to 2016-17) | -0.029 | 0.024 | -1.190 | 1924 | 0.234 |
| Difference in 9G-OTG for No Imp. in 2018-19 (Relative to 2016-17) | -0.066 | 0.029 | -2.247 | 1928 | 0.025 |
| Difference in 9G-OTG for No Imp. in 2020-21 (Relative to 2016-17) | -0.178 | 0.041 | -4.302 | 1932 | <0.001 |
| Wave (Yearly Pre-Funding Change) | 0.023 | 0.007 | 3.342 | 1932 | 0.001 |
| School Proportion Non-White (centered & scaled) | -0.014 | 0.007 | -2.054 | 2289 | 0.04 |
| School Proportion FRL (centered & scaled) | -0.016 | 0.004 | -4.031 | 2193 | <0.001 |
| Difference in 9G-OTG for Partial Imp. in 2017-18 (Relative to No Imp.) | 0.024 | 0.027 | 0.898 | 1924 | 0.369 |
| Difference in 9G-OTG for Full Imp. in 2017-18 (Relative No Imp.) | 0.016 | 0.026 | 0.609 | 1925 | 0.543 |
| Difference in 9G-OTG for Partial Imp. in 2018-19 (Relative to No Imp.) | 0.036 | 0.032 | 1.109 | 1928 | 0.268 |
| Difference in 9G-OTG for Full Imp. in 2018-19 (Relative No Imp.) | 0.043 | 0.031 | 1.395 | 1928 | 0.163 |
| Difference in 9G-OTG for Partial Imp. in 2020-21 (Relative to No Imp.) | -0.003 | 0.045 | -0.072 | 1931 | 0.942 |
| Difference in 9G-OTG for Full Imp. in 2020-21 (Relative No Imp.) | 0.026 | 0.043 | 0.598 | 1931 | 0.55 |
| Difference in pre-funding slope for Partial Imp. (Relative to No Imp.) | -0.004 | 0.008 | -0.506 | 1932 | 0.613 |
| Difference in pre-funding slope for Full Imp. (Relative to No Imp.) | -0.005 | 0.007 | -0.747 | 1933 | 0.455 |
| Satterwaite df are non-integers, but have been rounded to nearest integer | | | | | |

# Results: Comparative ITS w/COVID Year and Covariates



# Interpretation

- Large statistically significant decreases in 9G-OTG in the post-COVID year for all school types

- School implementation types not statistically different in any of the intervention years

- Statistical relationships between 9G-OTG rates and school demographics, both ~1.5% decrease in 9G-OTG with a 1 standard deviation increase in proportion FRL or proportion of non-white students

# Logistical Challenges and Limitations

- Data Sharing
  - Data access has proved to be challenging
  - Data screening has uncovered an array of coding and classification issues associated with non-traditional alternative schools, charters, and correctional schools
  - No data available during the primary COVID year (2019-20)

- Implementation
  - None, partial, and full are rough measurements based on funding plans and observed resource allocations
  - Time-invariant covariate is included, but it is possible variation in implementation occurred by year (particularly during and after COVID)

# Logistical Challenges and Limitations

- Clear selection effects into treatment condition at baseline
- Obvious confounding with COVID impacts
- Year-to-year sampling variation
  - Some small schools had 9$^{th}$ graders in some years and none in others
  - Weighting was used to account for variation in freshman class size

# Conclusions

- Some evidence of a closing of the 9G-OTG gap pre-COVID
- Still a work in progress
- More data forthcoming (21-22 and later 22-23)
- Differential COVID rebounds?

# Other Work: Validation and Exploration

- Logistic regression predicting on-time graduation
- Machine learning models exploring the classification of on-track status
- Teacher panels and survey to inform implementation coding

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