Evaluating Quality of Anesthesiologists' Supervision

- This talk includes many similar slides
  - Paging through produces animation
  - Use right/ left arrow keys, → and ←
- PDF viewers
  - Adobe Acrobat will open directly into Single Page
  - Presentation: Preferences, Full Screen, No Transition
- Google Chrome, Microsoft Edge, Firefox, or Safari
  - Select: "Fit to page", "Page fit", or "Single page"

Updated 6/30/25

© 2025 Franklin Dexter

Evaluating Quality of Anesthesiologists' Supervision of Anesthesia Residents and Nurse Anesthetists

Franklin Dexter, MD PhD FASA
Director, Division of Management Consulting
Professor, Department of Anesthesia
University of Iowa
Franklin-Dexter@UIowa.edu
www.FranklinDexter.net

Financial Disclosure

- I am employed by the University of Iowa, in part, to consult and analyze data for hospitals, anesthesia groups, and companies
- Department of Anesthesia bills for my time, and the income is used to fund our research
  - I receive no funds personally other than my salary and allowable expense reimbursements from the University of Iowa, and have tenure with no incentive program
  - I own no healthcare stocks (other than indirectly through mutual funds)

ACGME Clinician Educator Milestones

- Pillar 1: Reflective Practice
  - Evaluate teaching activities
- Pillar 3: Recognition and Mitigation of Bias
  - Mitigate the effect of bias
- Pillar 4: Professional Responsibilities
  - Exemplary professional behavior
    - Punctual and timely

ACGME. Clinician educator supplemental guide, August 2022

ACGME Clinician Educator Milestones

- Pillar 1: Reflective Practice
  - ✓Evaluate teaching activities
- Pillar 3: Recognition and Mitigation of Bias
  - ✓Mitigate the effect of bias
- Pillar 4: Professional Responsibilities
  - ✓Exemplary professional behavior

  - ✓Supervision scale applied as described in this lecture

Ongoing Professional Practice Evaluation and Supervision

Ongoing Professional Practice Evaluation and Supervision

- Example of hospital accreditation standards; these from The Joint Commission

Ongoing Professional Practice Evaluation and Supervision

- Example of hospital accreditation standards; these from The Joint Commission
  - Information collected about every practitioner

Ongoing Professional Practice Evaluation and Supervision

- Example of hospital accreditation standards; these from The Joint Commission
  - Information collected about every practitioner
  - ➢ OPPE used at least annually to decide whether to continue, limit, or revoke hospital privileges

Ongoing Professional Practice Evaluation and Supervision

- Example of hospital accreditation standards; these from The Joint Commission
  - Information collected about every practitioner
  - OPPE used at least annually to decide whether to continue, limit, or revoke hospital privileges

"Current competence in performing the requested privilege(s) is verified by peers knowledgeable about the applicant's professional performance"

TJC Standard MS.06.01.03

Ongoing Professional Practice Evaluation and Supervision

- Performance report for past 6-months sent to Chief Medical Officer in undesirable format

Ongoing Professional Practice Evaluation and Supervision

- Performance report for past 6-months sent to Chief Medical Officer in undesirable format

Name	Score	Evaluations
Dr. B	3.58	10
Dr. M	3.65	53
Dr. X	3.71	29
Dr. G	3.77	37
…	…	…
Dr. K	3.85	114
…	…	…
Dr. Z	4.00	6

Ongoing Professional Practice Evaluation and Supervision

- Performance report for past 6-months sent to Chief Medical Officer in undesirable format

Name	Score	Evaluations
Dr. B	3.58	10
Dr. M	3.65	53
Dr. X	3.71	29
Dr. G	3.77	37
…	…	…
Dr. K	3.85	114
…	…	…
Dr. Z	4.00	6

- Scores invalid and unreliable with N Evaluations

Ongoing Professional Practice Evaluation and Supervision

- Performance report for past 6-months sent to Chief Medical Officer in undesirable format

Name	Score	Evaluations	
Dr. B	3.58	10	"Worst" in department?
Dr. M	3.65	53	
Dr. X	3.71	29	
Dr. G	3.77	37	
…	…	…	
Dr. K	3.85	114	
…	…	…	
Dr. Z	4.00	6	"Best" in department?

Ongoing Professional Practice Evaluation and Supervision

- Performance report for past 6-months sent to Chief Medical Officer in undesirable format

Name	Score	Evaluations	
Dr. B	3.58	10	"Worst" in department?
Dr. M	3.65	53	
Dr. X	3.71	29	
Dr. G	3.77	37	
…	…	…	
Dr. K	3.85	114	
…	…	…	
Dr. Z	4.00	6	"Best" in department?

- Ranks invalid and unreliable with N Evaluations

Ongoing Professional Practice Evaluation and Supervision

- Monitoring supervision relies on anesthesia residents, nurse anesthetists, and other anesthesia practitioners' review
  - Paired daily in actual (*in situ*) clinical practice
  - Frequent ongoing sampling from many independent raters
  - Psychometrically reliable and valid

Ongoing Professional Practice Evaluation and Supervision

- Monitoring supervision relies on anesthesia residents, nurse anesthetists, and other anesthesia practitioners' review
  - Paired daily in actual (*in situ*) clinical practice
  - Frequent ongoing sampling from many independent raters
  - Psychometrically reliable and valid

➢ Ongoing professional practice evaluation (OPPE) is mandatory, so alternative is to rely on other quantitative metrics

Ongoing Professional Practice Evaluation and Supervision

- Monitoring supervision relies on anesthesia residents, nurse anesthetists, and other anesthesia practitioners' review
  - Paired daily in actual (*in situ*) clinical practice
  - Frequent ongoing sampling from many independent raters
  - Psychometrically reliable and valid

➢ Ongoing professional practice evaluation (OPPE) is mandatory, so alternative is to rely on other quantitative metrics

Alternatives to Monitoring Supervision for OPPE

- Low incidence clinical outcomes
  - Mortality
  - Post-anesthesia care unit reintubation
  - Wrong-side regional nerve block placement
- Low sensitivity to detect differences among anesthesiologists once apply appropriate statistical methods to avoid false detection

Glance LG et al. Anesth Analg 2016
Glance LG et al. Anesthesiology 2016
Dexter F, Hindman BJ. Anesthesiology 2016

Alternatives to Monitoring Supervision for OPPE

- Relatively high incidence clinical outcomes
  - Postoperative patient satisfaction
  - Post-anesthesia care unit arrival pain scores
  - Prolonged times to tracheal extubation
  - Hypotension during induction of anesthesia
  - Length of stay >1 night, w/without ICU stay

Kynes JM et al. Anesth Analg 2013

Chen Y et al. Anesth Analg 2016

Freundlich RE et al. J Clin Anesth 2020

Wanderer JP et al. Anesth Analg 2015

Bayman EO et al. Anesthesiology 2016

Epstein RH et al. Br J Anaesth 2017

Dexter F et al. Periop Care Oper Room Manag 2024

Wohl E et al. A&A Practice 2024

Alternatives to Monitoring Supervision for OPPE

- Relatively high incidence clinical outcomes
  - Postoperative patient satisfaction
  - Post-anesthesia care unit arrival pain scores
  - Prolonged times to tracheal extubation
  - Hypotension during induction of anesthesia
  - Length of stay >1 night, w/without ICU stay
- ➢ Risk adjusted scores fail to discriminate among anesthesiologists and/or lack validity

Alternatives to Monitoring Supervision for OPPE

- Systems-based practice measures
  - Perioperative temperature management
  - Surgical Care Improvement Project (SCIP) antibiotic guidelines
  - Unscheduled absences
- Limited validity as measures of individual anesthesia practitioners' quality of care
  - Do not reliably differentiate either

Schonberger RB et al. Anesth Analg 2015
Epstein RH et al. Anesth Analg 2018
Epstein RH et al. J Clin Anesth 2019

Attributes of Supervision

Attributes of Supervision

- Supervision
  - Department's functional definition for purposes of evaluating anesthesiologists
    - All anesthetic activities contributing to patient care, when the anesthesiologist being evaluated is not the provider continually present with the patient

Attributes of Supervision

- Supervision incorporates several attributes
  - Each attribute is included in de Oliveira Filho et al.'s scale for measuring anesthesiologists' supervision of anesthesia residents during clinical operating room care

de Oliveira Filho GR et al. Anesth Analg 2008

Attributes of Supervision

1) The faculty provided me timely, informal, non-threatening comments on my performance and showed me ways to improve
2) The faculty was promptly available to help me solve problems with patients and procedures
3) The faculty used real clinical scenarios to stimulate my clinical reasoning, critical thinking and theoretical learning

Attributes of Supervision

4) The faculty demonstrated theoretical knowledge, proficiency at procedures, ethical behavior, and interest/compassion/respect for patients
5) The faculty was present during the critical moments of the anesthetic procedure (e.g., anesthesia induction, critical events, complications)
6) The faculty discussed with me the perianesthesia management of patients prior to starting an anesthetic procedure and accepted my suggestions, when appropriate

Attributes of Supervision

7) The faculty taught and demanded the implementation of safety measures during the perioperative period (e.g., anesthesia machine checkout, universal precautions, prevention of medication errors, etc.)
8) The faculty treated me respectfully, and strived to create and maintain a pleasant environment during my clinical activities
9) The faculty gave me opportunities to perform procedures and encouraged my professional autonomy

Answering the 9 Questions

Answering the 9 Questions

- Choices beneath each question
  1. never
  2. rarely
  3. frequently
  4. always
- Questions presented daily in same sequence
- Generally, takes < 90 seconds per evaluation
  - End of workday after patient care completed

Hindman BJ et al. Anesth Analg 2013

Dexter F et al. Anesth Analg 2014

Answering the 9 Questions

- Score = mean of answers to the 9 questions
- For each combination of rater (e.g., resident) and ratee (e.g., anesthesiologist), calculate mean of the scores
- For each ratee, calculate average of the means among all raters
  - Equally weighting each rater

Dexter F et al. Anesth Analg 2014a,b

Indications that Supervision is Single Dimension Construct

Indications that Supervision is Single Dimension Construct

- Scale designed to include all attributes
- Scale includes each attribute in residents' written comments made when providing a score below the overall average among anesthesiologists in the department

de Oliveira Filho GR et al. Anesth Analg 2008

Dexter F et al. Anesth Analg 2016

Indications that Supervision is Single Dimension Construct

- Scale designed to include all attributes
- Scale includes each attribute in residents' written comments made when providing a score below the overall average among anesthesiologists in the department
  - Cronbach α in routine use 0.948 (SE 0.001)

de Oliveira Filho GR et al. Anesth Analg 2008

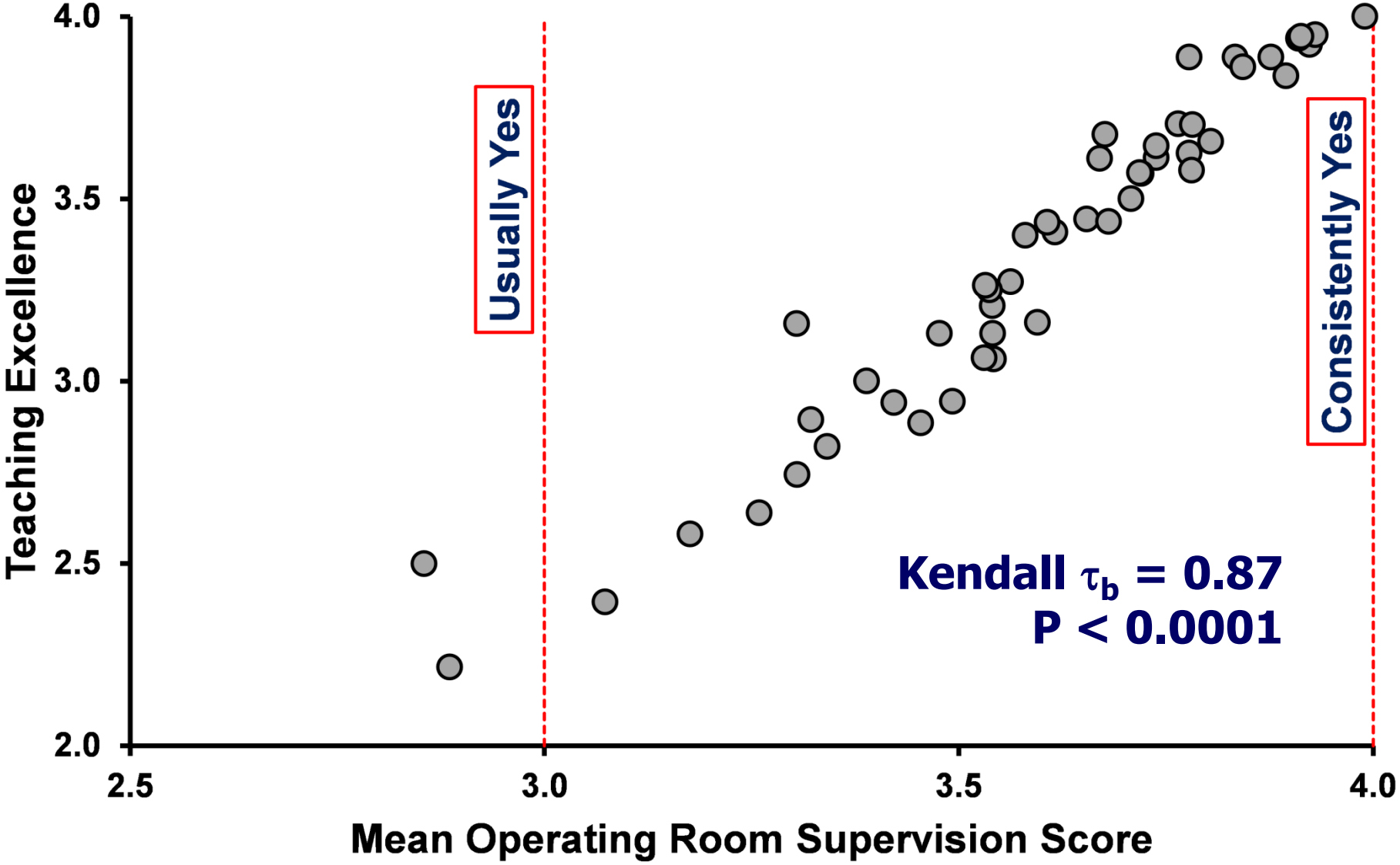
Dexter F et al. Anesth Analg 2016

Indications that Supervision is Single Dimension Construct

- Teaching is attribute important to the supervision of residents (trainees)

Hindman BJ et al. Anesth Analg 2013

Concordance between Teaching Evaluations and Supervision Score



Indications that Supervision is Single Dimension Construct

- Each increase in the anesthesiologist's number of resident comments of the anesthesiologist teaching poorly was associated with a lower average score ($P = 0.0002$)
- Evaluations with comments related to teaching poorly had lower scores than other evaluations with comments ($P < 0.0001$)

Dexter F et al. Anesth Analg 2016

ACGME Clinician Educator Milestones

- Pillar 1: Reflective Practice
  - ✓Evaluate teaching activities **Confirmed**
- Pillar 3: Recognition and Mitigation of Bias
  - – Mitigate the effect of bias
- Pillar 4: Professional Responsibilities
  - – Exemplary professional behavior

ACGME. Clinician educator supplemental guide, August 2022

Indications that Supervision is Single Dimension Construct

- Each anesthesiologist evaluated not only by residents (trainees) but also by nurse anesthetists (experienced providers)
  - Averages were correlated, $P < 0.0001$
  - Cronbach $\alpha = 0.895$ (SE 0.003)
  - Most common score = 4.00 for both groups, $P < 0.0001$

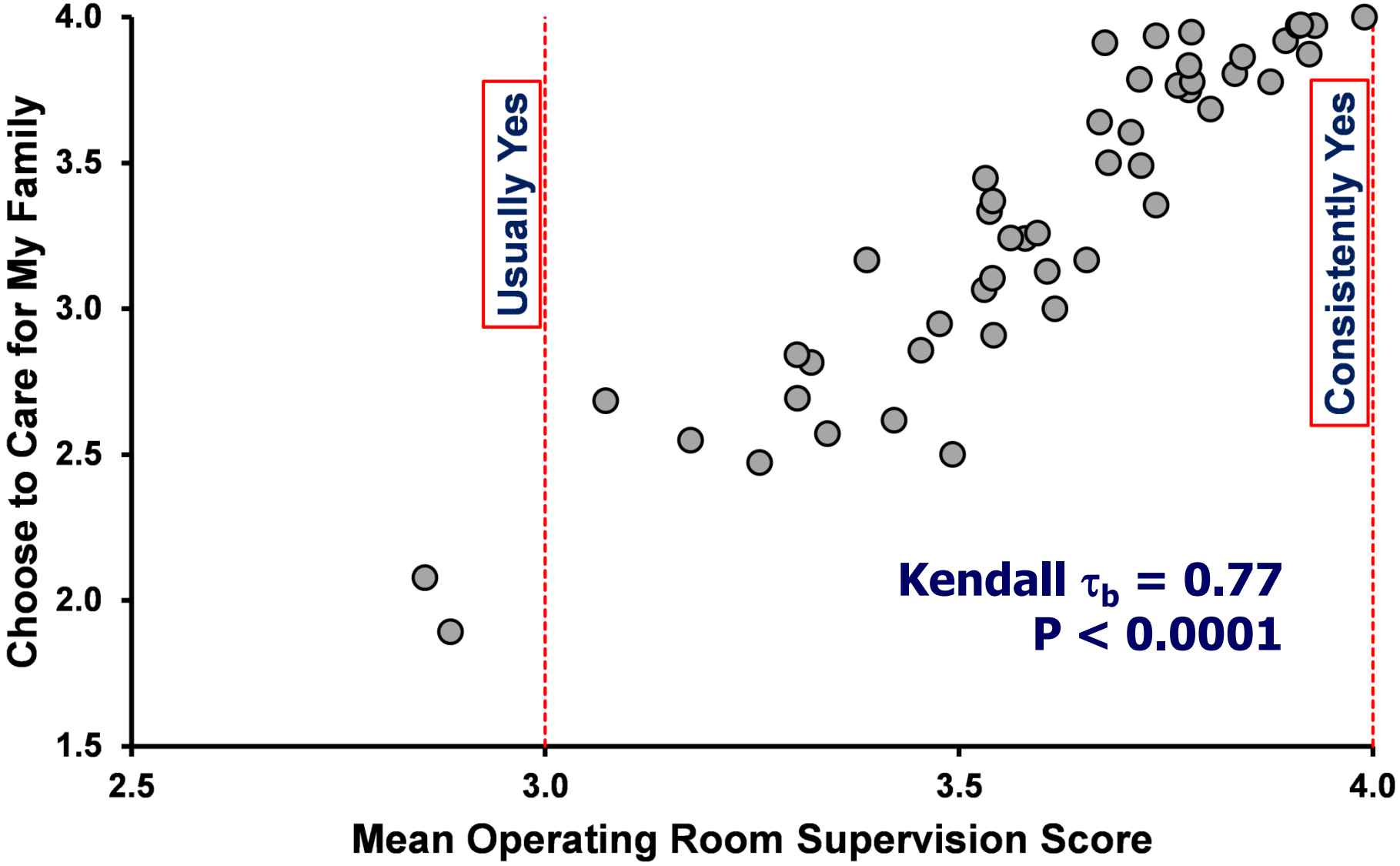
Dexter F et al. Anesth Analg 2014

Dexter F et al. Anesth Analg 2015

Indications that Quality of Supervision Matters

Hindman BJ et al. Anesth Analg 2013

"I would choose this instructor to care for … my family"



Indications that Quality of Supervision Matters

- Residents reporting overall supervision of department < 3.00 ("frequent") reported making more "mistakes that had negative consequences for the patient"
  - Accuracy (area under the curve) of 89% (99% confidence interval, 77% to 95%)
- Supervision < 3.00 predicted "medication errors (dose or incorrect drug) in" last year
  - Accuracy of 93% (99% CI 77% to 98%)

De Oliveira GS Jr et al. Anesth Analg 2013

Indications that Quality of Supervision Matters

- Residents reporting overall supervision during current rotation < 3.00 ("frequent") reported 3 (75th percentile) and 6 (95th) errors in past year with negative consequences for patients
  - Residents reporting supervision ≥3.00 reported fewer errors (2 and 4; P < .0001)
    - Resident burnout not correlated (all P >.134) with numbers of reported errors while controlling for quality of supervision

De Oliveira GS Jr et al. Anesth Analg 2015

Indications that Quality of Supervision Matters

- Nurse anesthetists' written comments' theme "I did not see the anesthesiologist during the case(s) together" increased odds (48.2) of supervision score < 3.00 ($P < 0.0001$)
- Resident comments of insufficient presence associated with scores less than those of other evaluations with comments ($P < 0.0001$)
  - Anesthesiologists with ≥ 1 such comment had lower average scores than others ($P = 0.0071$)

Dexter F et al. Anesth Analg 2015

Dexter F et al. Anesth Analg 2016

Indications that Quality of Supervision Matters

- Positive correlations between residents' evaluation of overall departmental supervision and safety culture (all $P < 0.0001$)
  - Overall perceptions of patient safety
  - Non-punitive response to errors
  - Handoffs and transitions
  - Feedback and communication about errors
  - Communication openness
  - Teamwork within the unit

De Oliveira GS Jr et al. Anesth Analg 2015

Indications that Quality of Supervision Matters

- Among the dozens of variables studied in national survey of residents' perceptions of their current rotation, supervision score most closely predicted by same one variable using multiple types of regression trees
  - Teamwork within the unit

De Oliveira GS Jr et al. Anesth Analg 2015

Indications that Quality of Supervision Matters

- Among the dozens of variables studied in national survey of residents' perceptions of their current rotation, supervision score most closely predicted by same one variable using multiple types of regression trees
  - Teamwork within the unit

De Oliveira GS Jr et al. Anesth Analg 2015

Professionalism

- Departments required to provide hospitals with physician-specific metrics demonstrating competence in professional practice
  - How anesthesiologists maintain privileges
  - Preceding section of lecture on Ongoing Professional Practice Evaluation (OPPE)
- Such assessments include the core competency of professionalism

Professionalism

- Supervision scale includes 8 phrases pertaining to professionalism
- Multiple written comments provided by residents with below average supervision scores pertained to professionalism

Dexter F et al. Can J Anesth 2017

Professionalism

- Each increase in the anesthesiologist's number of resident comments of the anesthesiologist being disrespectful was associated with a lower average score (P = 0.0002)
- A supervision score < 3.00 ("frequent") had odds ratio of 85 for resident written comment of disrespectful faculty behavior (P < 0.0001)

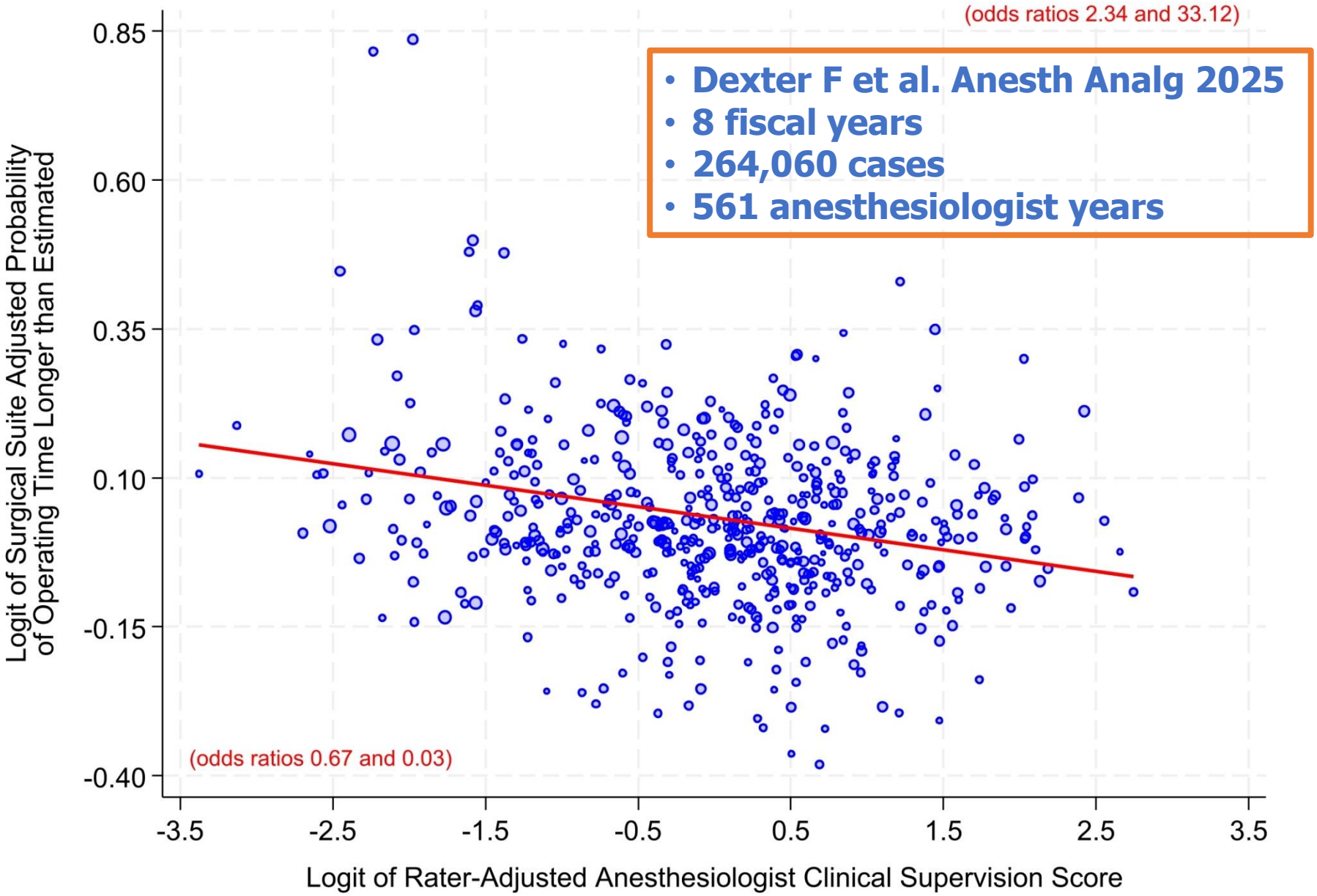
Dexter F et al. Anesth Analg 2016

ACGME Clinician Educator Milestones

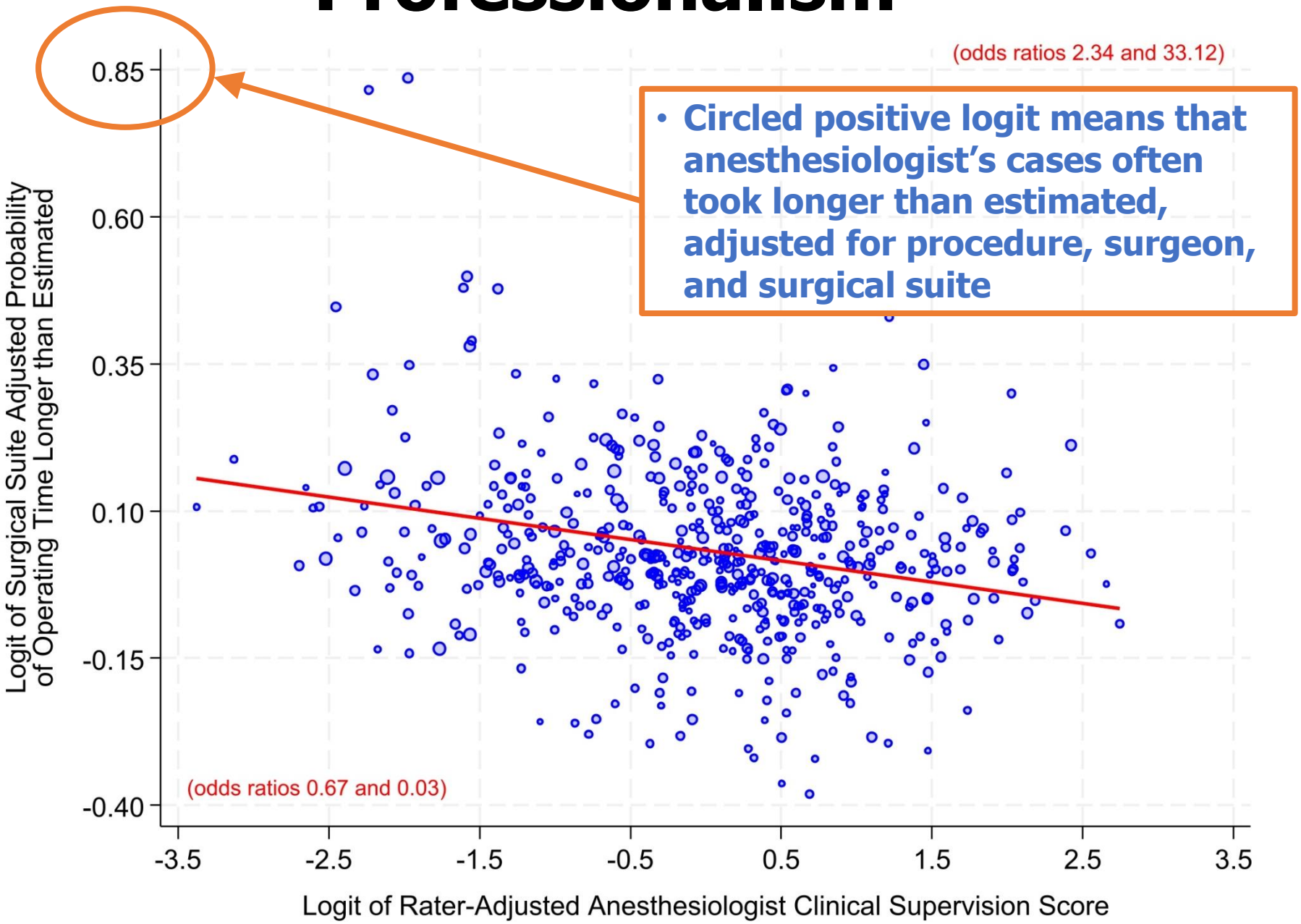
- Pillar 1: Reflective Practice
  - Evaluate teaching activities
- Pillar 3: Recognition and Mitigation of Bias
  - Mitigate the effect of bias
- Pillar 4: Professional Responsibilities
  - Exemplary professional behavior
    - "Punctual,"
    - "Timely in the performance of duties"

ACGME. Clinician educator supplemental guide, August 2022

Professionalism

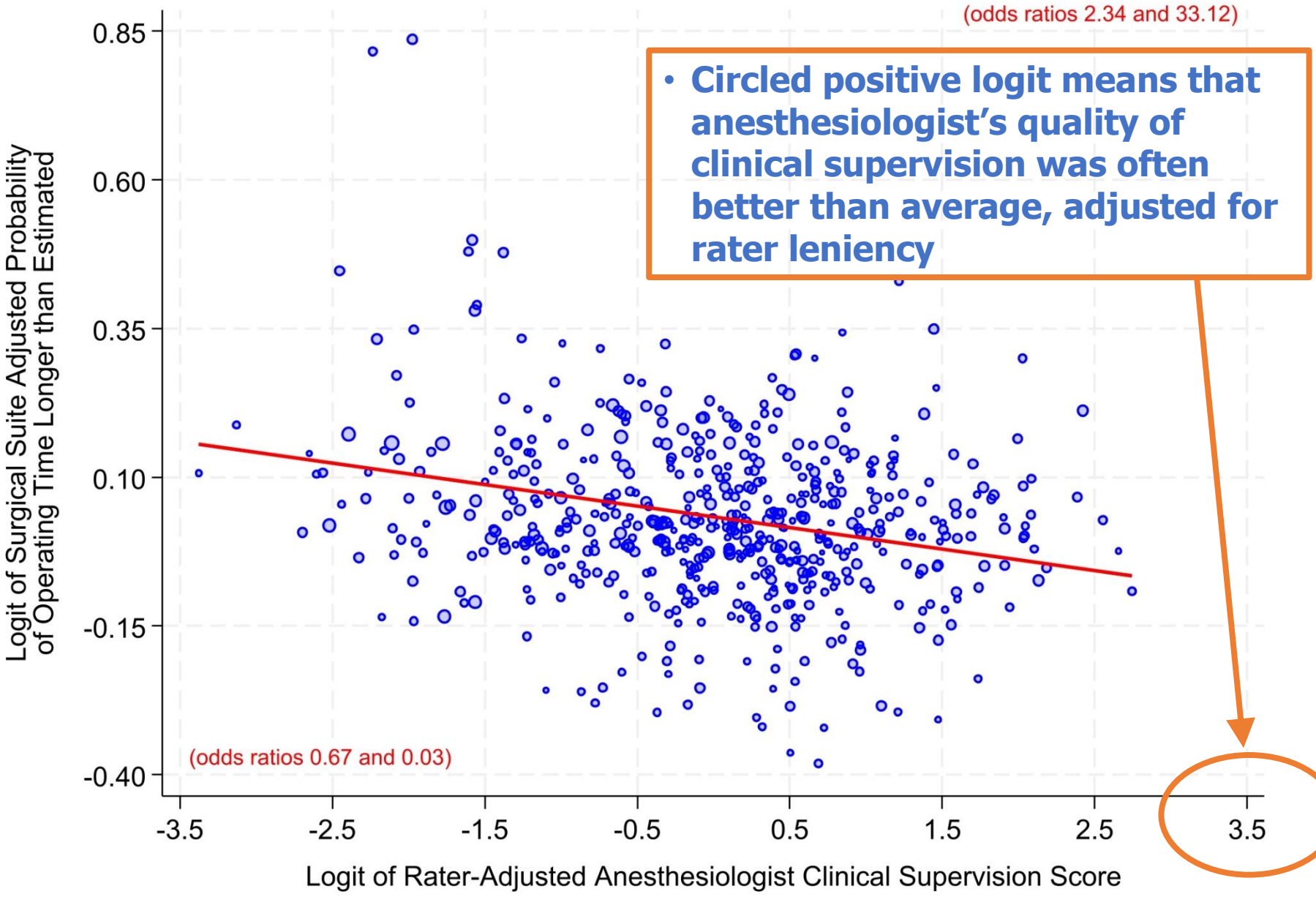


Professionalism

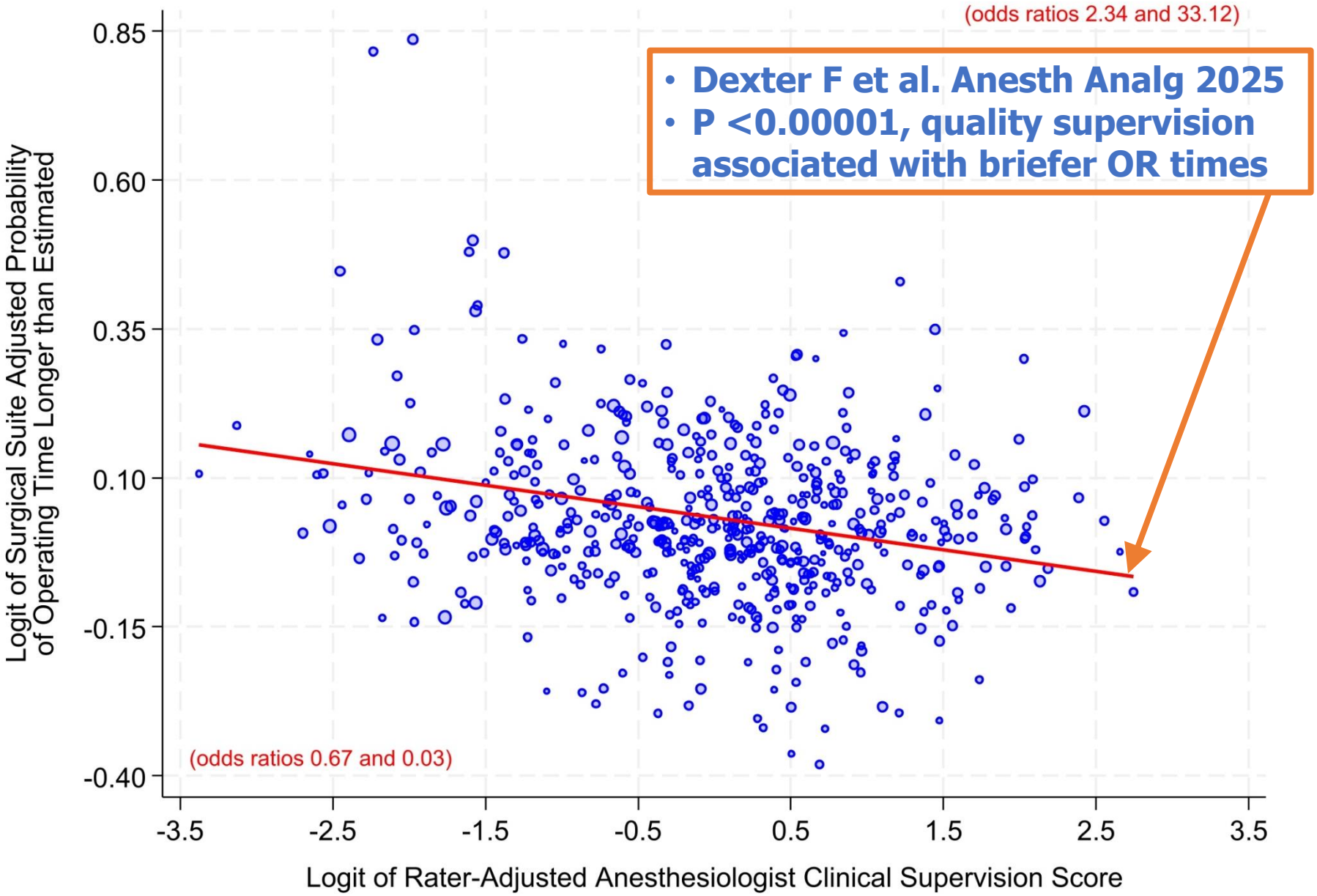


- **Circled positive logit means that anesthesiologist's cases often took longer than estimated, adjusted for procedure, surgeon, and surgical suite**

Professionalism



Professionalism



ACGME Clinician Educator Milestones

- Pillar 1: Reflective Practice
  - Evaluate teaching activities
- Pillar 3: Recognition and Mitigation of Bias
  - Mitigate the effect of bias
- Pillar 4: Professional Responsibilities
  - ✓Exemplary professional behavior **Confirmed**

ACGME. Clinician educator supplemental guide, August 2022

Summary of Attributes of Quality Supervision

- Attributes in sequence of earlier presentation
  - Quality of clinical teaching
  - Clinical performance
  - Engagement
  - Safety culture
  - Teamwork
  - Professionalism
    - Including punctuality and timeliness

Influence of Reporting Scores on the Supervision Scores

Influence of Reporting Scores on the Supervision Scores

- Monitoring anesthesiologists' supervision and reporting them resulted in greater scores for both residents and nurse anesthetists
  - Multiple comparisons, all $P \leq 0.0011$
- Among nurse anesthetists, increase due mostly to questions associated with teaching (e.g., "stimulate my clinical reasoning, critical thinking, and theoretical learning")

Dexter F, Hindman BJ. Anesth Analg 2015

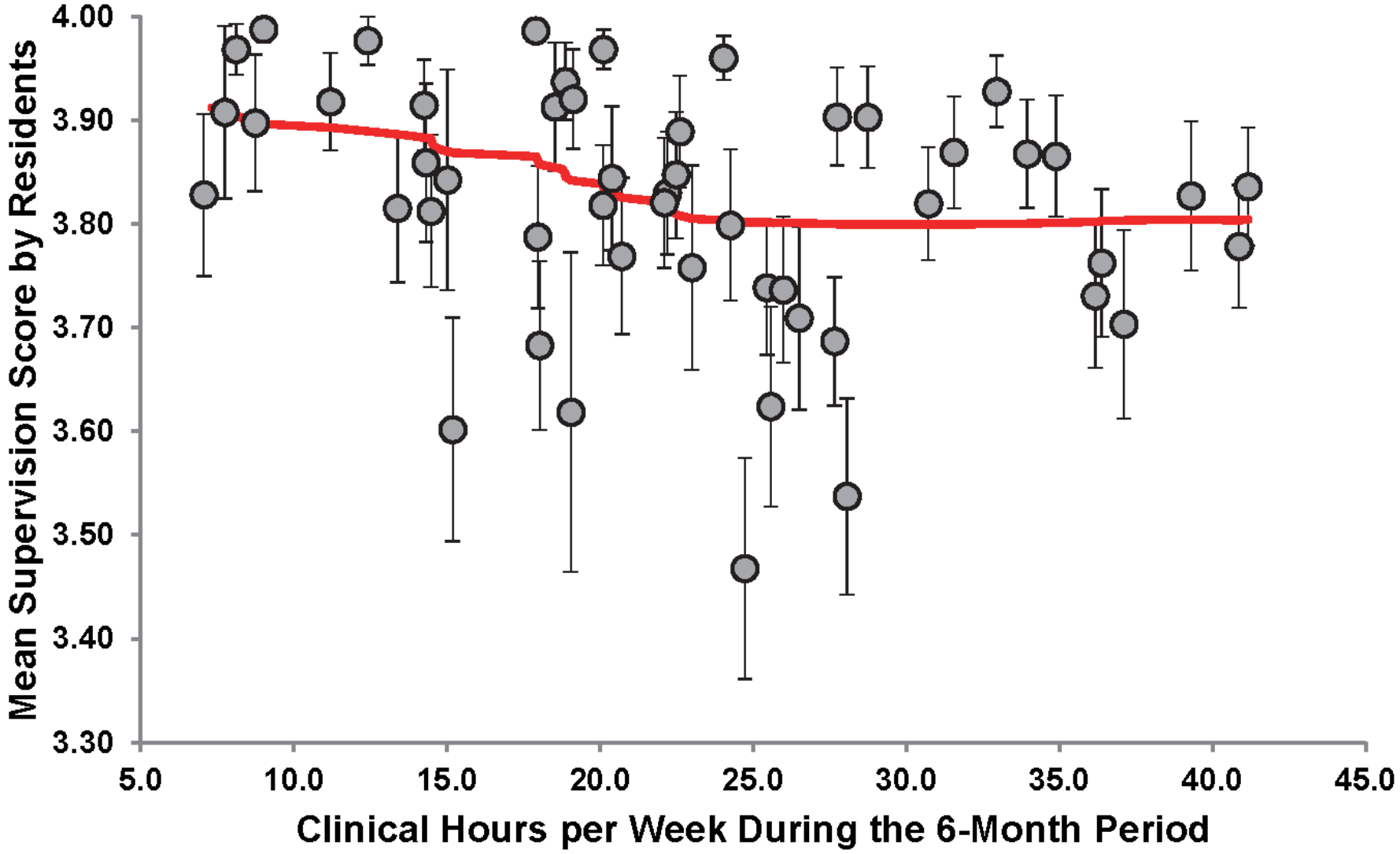
Value of Evaluating Supervision Scores for Anesthesiologists

Value of Evaluating Supervision Scores for Anesthesiologists

- Anesthesiologists' mean supervision scores provided both by residents and nurse anesthetists were not positively correlated with hours of faculty clinical activity
  - Multiple comparisons, all $P > 0.65$

Dexter F, Hindman BJ. Anesth Analg 2015

Value of Evaluating Supervision Scores for Anesthesiologists



Value of Evaluating Supervision Scores for Anesthesiologists

- Active anesthesiologist can provide ineffective supervision and a less frequent anesthesiologist can be very effective
  - Evaluating quality of supervision serves as independent measure of the value each anesthesiologist adds to care of the patients

Dexter F, Hindman BJ. Anesth Analg 2015

Value of Evaluating Supervision Scores for Department

Value of Evaluating Supervision Scores for Department

- Anesthesiologists' supervision of residents is mandatory and evaluated for reaccreditation
- Residents' mean ± SD of daily supervision score meeting expectations is 3.40 ± 0.30
- Evaluations of department and of individual anesthesiologists using their averages are correlated (Kendall τ_b = 0.35, P = 0.0032)
  - Median ratio 86% (SE 1%)

Dexter F et al. Anesth Analg 2013

Hindman BJ et al. Anesth Analg 2015

Value of Evaluating Supervision Scores for Department

- Anesthesiologists' supervision of residents is mandatory and evaluated for reaccreditation
- Residents' mean ± SD of daily supervision score meeting expectations is 3.40 ± 0.30
- Evaluations of department and of individual anesthesiologists using their averages are correlated (Kendall τ_b = 0.35, P = 0.0032)
  - Median ratio 86% (SE 1%)

➢ Achieve departmental score ≥ 3.00 by achieving individual average ≥ 3.40

Evaluating Supervision Less Often than Daily?

- Instead of daily evaluation, maximum one evaluation of ratee by a rater weekly?
- Many fewer requests (14%), but evaluations then must be completed on day was requested
- However, most (78%) evaluations are completed after the day requested
- In practice, then, very small (2%) reduction in evaluation requests can be achieved in practice

Dexter F et al. Cureus 2023

Covariates

Covariates Not Important

- Residency class
  - No association between residents' perception of supervision by anesthesiologists that meets expectations and years since start of training (P = 0.77)
  - Small differences among classes in scores
    - Mean differences ≤ 0.07 units

Dexter F et al. Anesth Analg 2013

Hindman BJ et al. Anesth Analg 2013

Covariates Not Important

- Negligible differences in residents' scores when
  - Resident had more units of work that day with the anesthesiologist (τ_b = +0.083 [SE 0.014])
  - Anesthesiologist had more units of work that day with other providers (τ_b = −0.057 [SE 0.014])
- No association between residents' scores and
  - Patients cared for together (τ_b = +0.01, P=0.71)
  - Days worked together (τ_b = −0.01, P=0.46)

Dexter F et al. Anesth Analg 2014

Hindman BJ et al. Anesth Analg 2013

Covariates Not Important

- Absence (P > 0.10) of correlation between residents' ratings of their rotations and:
  - Residents' age
    hours worked per week
    gender
  - Program size (number of residents)
    rotation (specialty)

De Oliveira GS Jr et al. Anesth Analg 2013

Covariates Not Important

- Absence (P > 0.10) of correlation between residents' ratings of supervision quality and:
  - Cases performed at night,
  - Cases of high physiological complexity,
  - Cases with high physical status of patients,
  - Cases with pediatric patients,
  - Cases with elderly patients

Dexter F et al. Cureus 2024

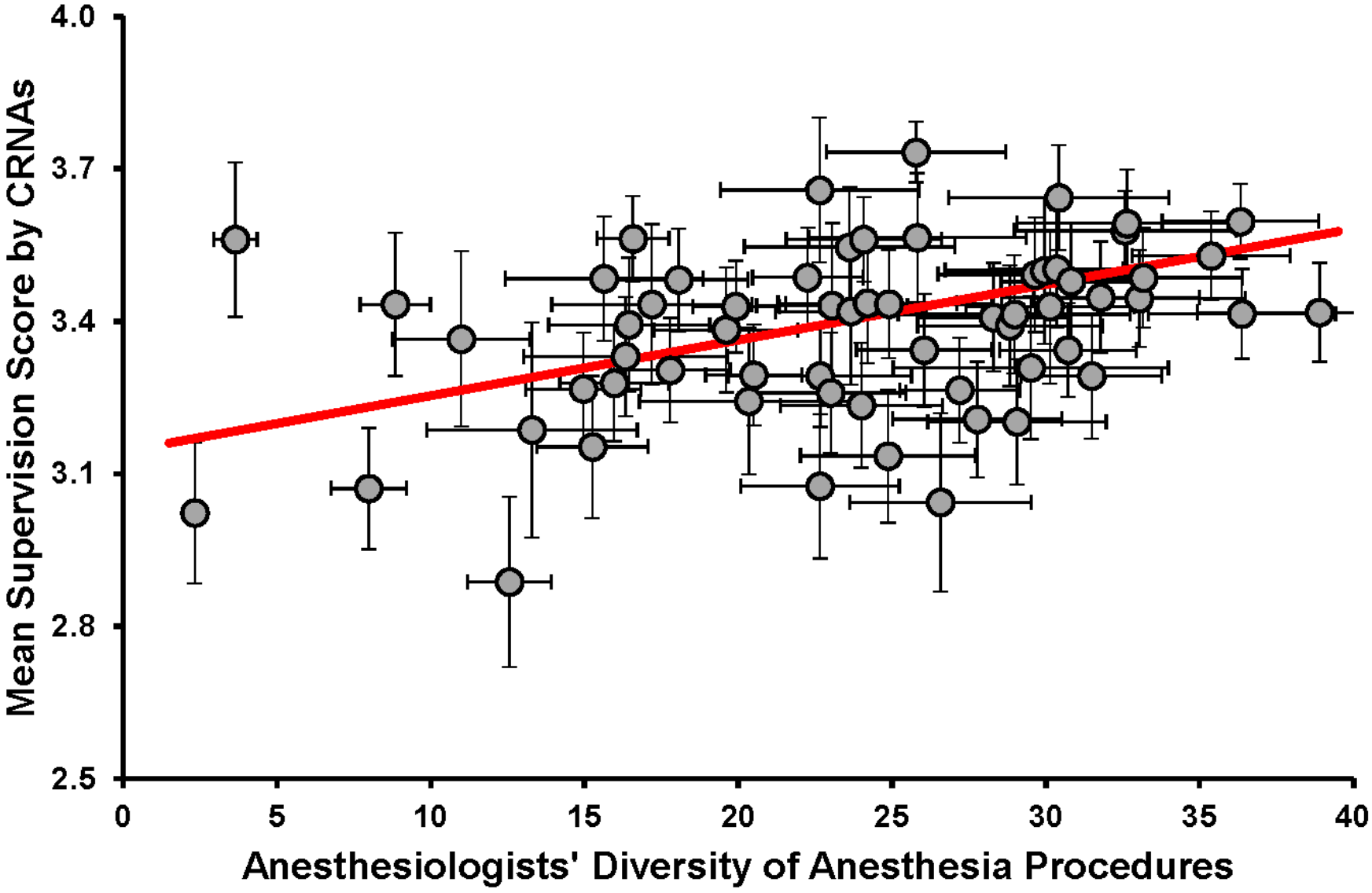
Covariates Not Important

- Specialization of anesthesiologist
  - Calculate Herfindahl of distribution of each anesthesiologist's anesthesia CPT codes
  - Herfindahl^{-1} = number of common procedures
  - No association between specialization and quality of supervision of residents (P = 0.31)
  - Specialization is associated with lesser quality scores among nurse anesthetists (P = 0.0001), but differences are small

Dexter F et al. Anesth Analg 2016

Dexter F et al. Anesth Analg 2017

Covariates Not Important



Covariates to Include

- Control for resident vs. nurse anesthetist
  - Scores provided by residents greater than by nurse anesthetists ($P < 0.0001$)
  - Pairwise differences by anesthesiologist greater than zero too ($P < 0.0001$)

Dexter F et al. Anesth Analg 2014
Dexter F et al. Anesth Analg 2015

Covariates to Include

- Leniency of the resident (or nurse anesthetist)
  - Scientific term for heterogeneity among raters

Dexter F et al. Health Care Manag Sci 2020

Dexter F et al. Can J Anesth 2017

Covariates to Include

- Leniency of the resident (or nurse anesthetist)
  - Scientific term for heterogeneity among raters
  - ➢ Unless adjust for rater leniency, evaluations of anesthesiologists' clinical performance will be biased, even if evaluations qualitative

Bayman EO et al. Perioper Care Oper Room Manag 2017

Dexter F et al. Perioper Care Oper Room Manag 2022

Dexter F et al. J Clin Anesth 2017

Dexter F et al. J Clin Anesth 2020

Dexter F et al. Health Care Manag Sci 2020

Dexter F et al. Can J Anesth 2017

Dexter F et al. Anesth Analg 2020

Covariates to Include

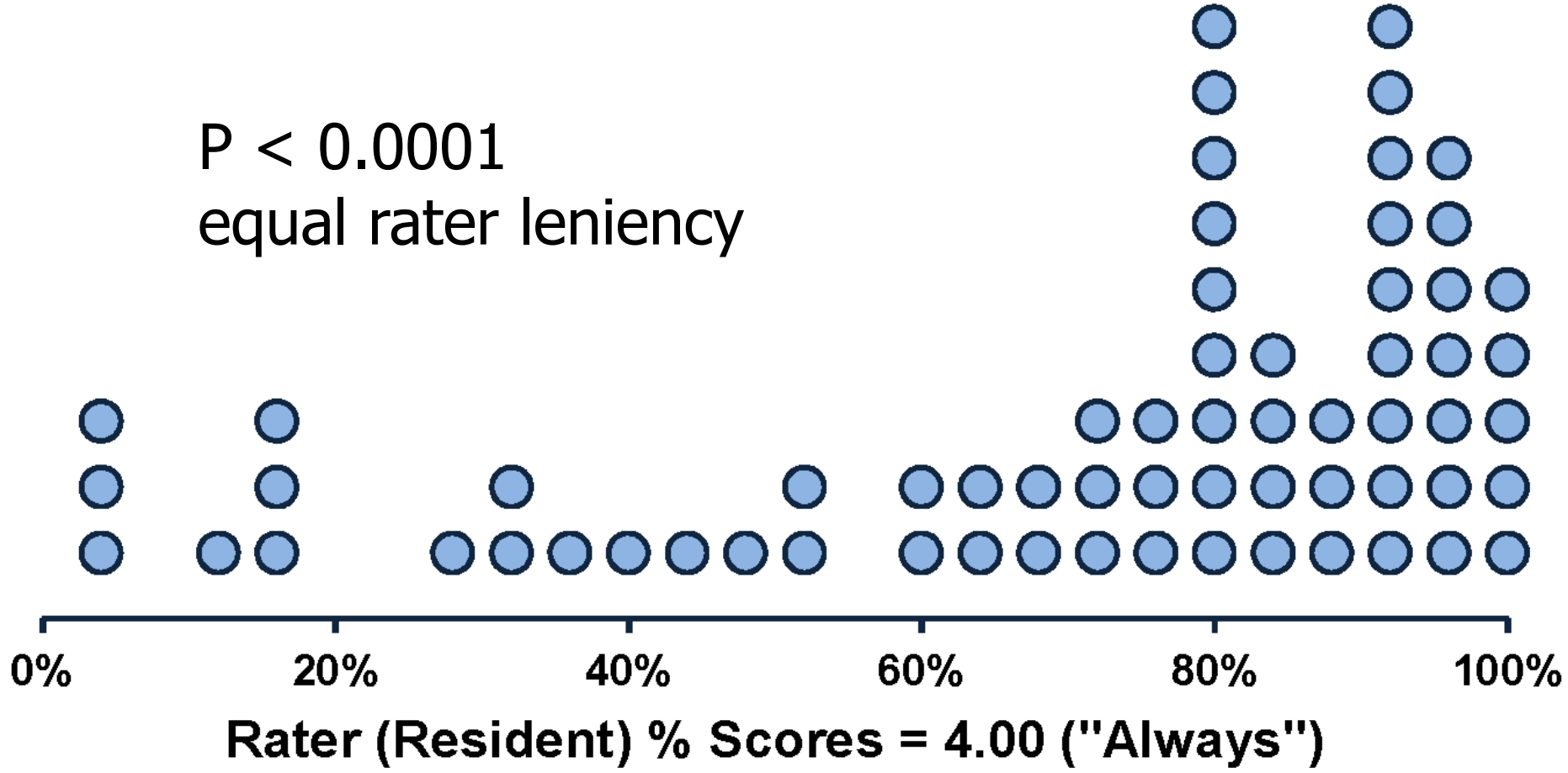
- Leniency of the resident (or nurse anesthetist)
  - Scientific term for heterogeneity among raters
  - Unless adjust for rater leniency, evaluations of anesthesiologists' clinical performance will be biased, even if evaluations qualitative
  - ➢ Raw scores are not just hypothetically influenced by implicit bias, subsequent results show that they are biased

Covariates to Include

- Leniency of the resident (or nurse anesthetist)
  - Scientific term for heterogeneity among raters
  - From cumulative effect of all questions
    - For each rater, calculate mean answer to each of the 9 questions among all ratees
    - Cronbach α = 0.98, very large

Dexter F et al. Can J Anesth 2017

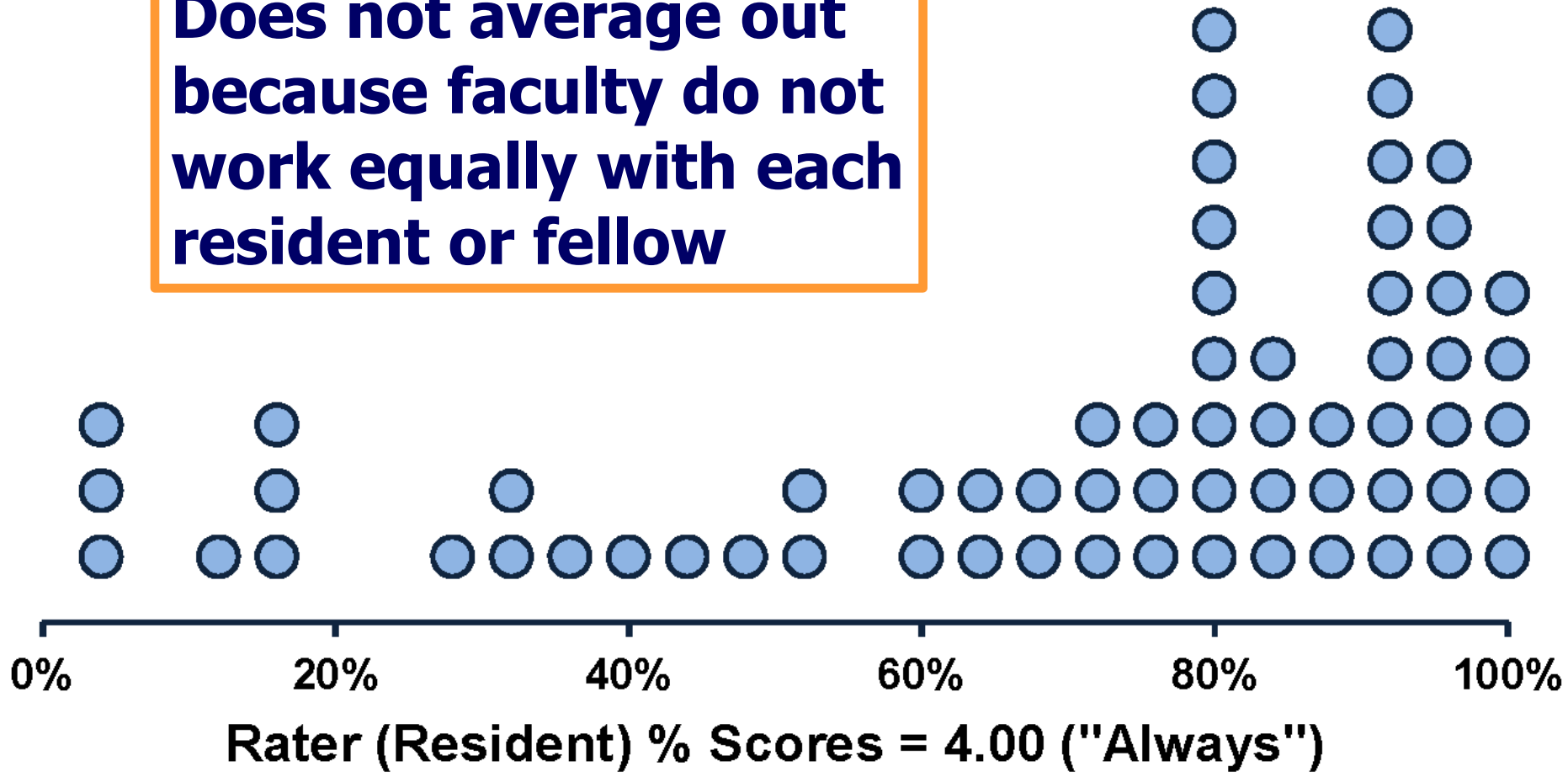
Covariates to Include



Dexter F et al. Can J Anesth 2017

Covariates to Include

Does not average out because faculty do not work equally with each resident or fellow



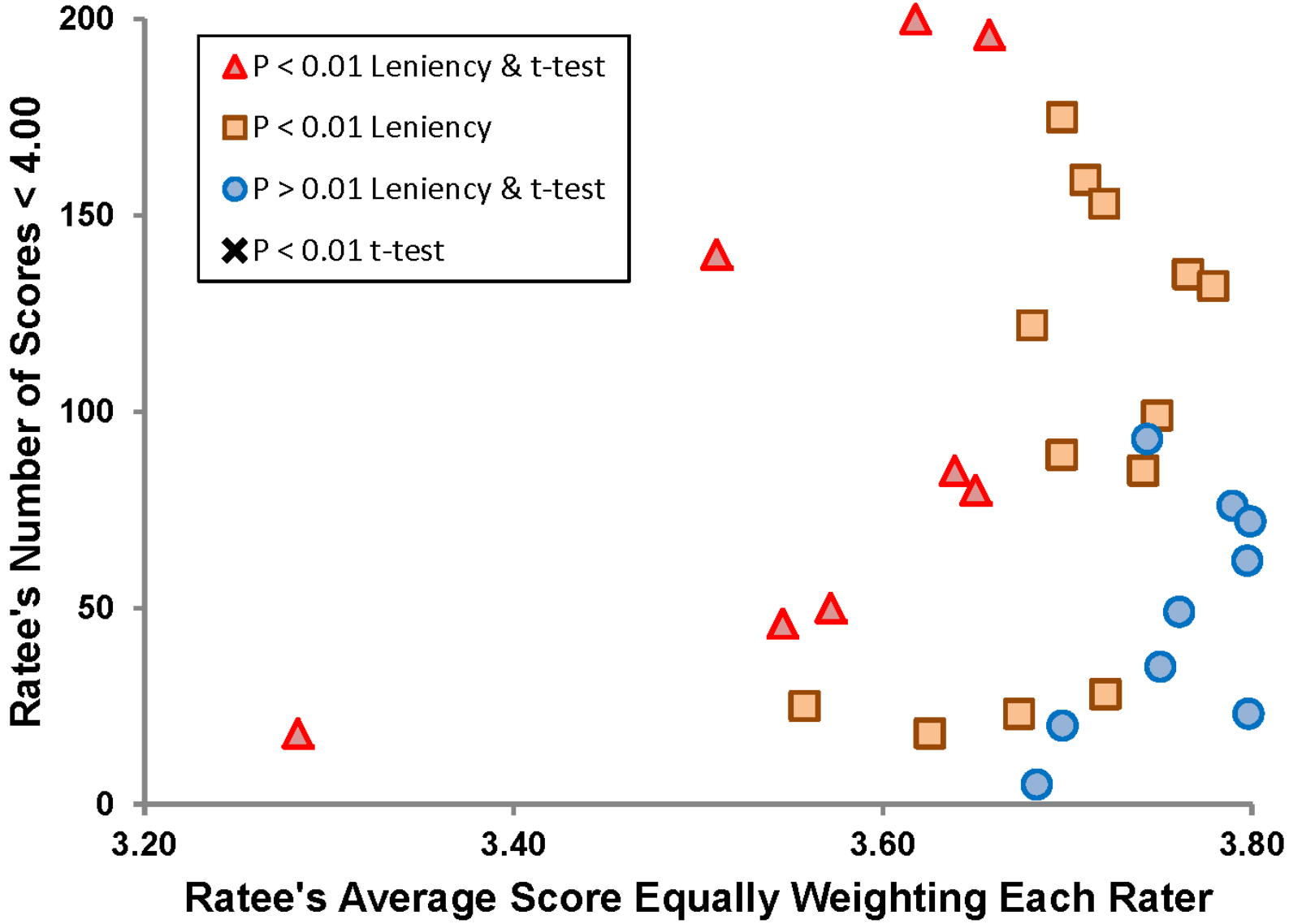
Dexter F et al. Can J Anesth 2017

Covariates to Include

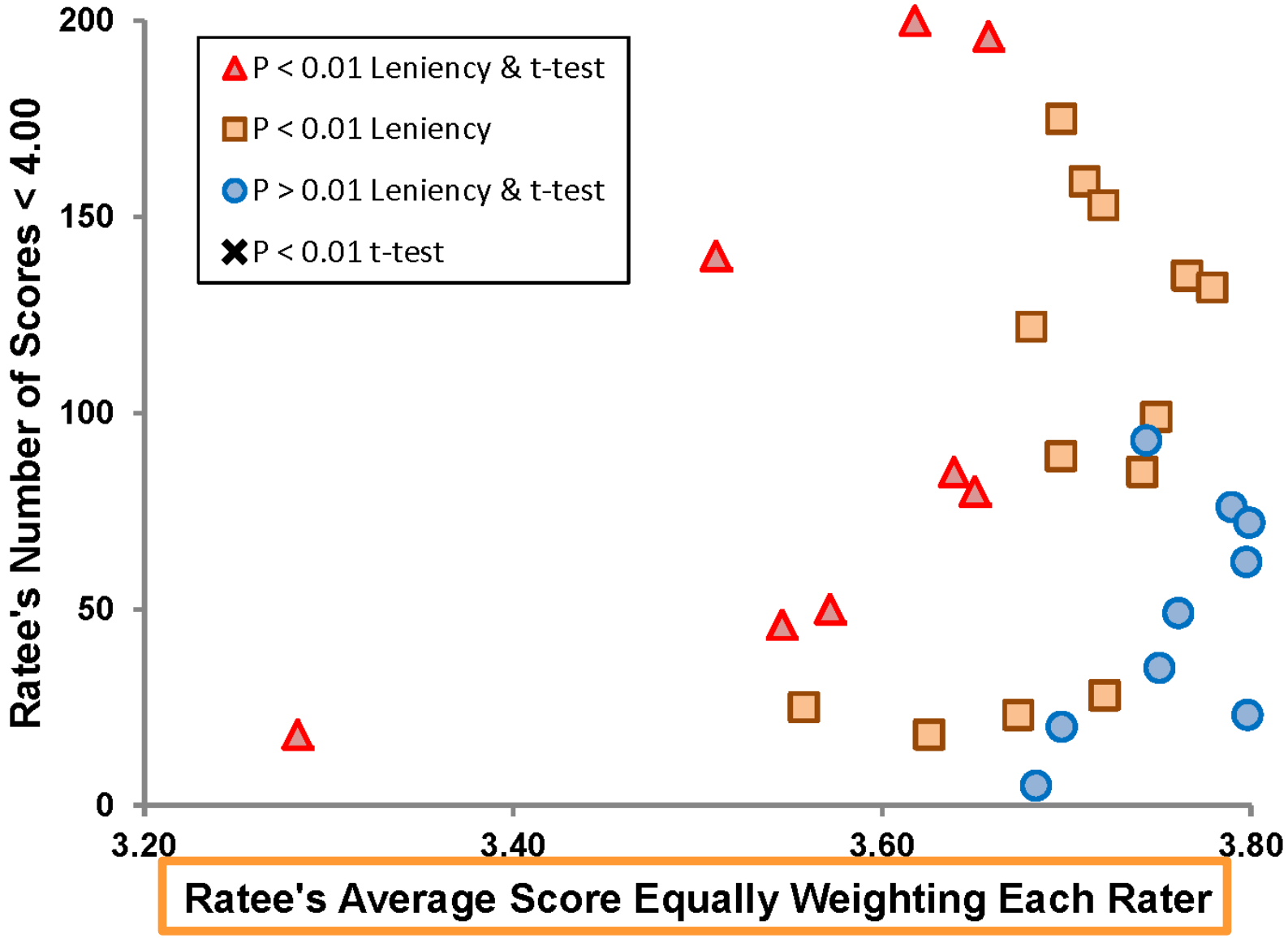
- For assessment and progressive quality improvement within a department, use logistic regression of % scores = 4.00, treating the rater as a covariate

Dexter F et al. Can J Anesth 2017

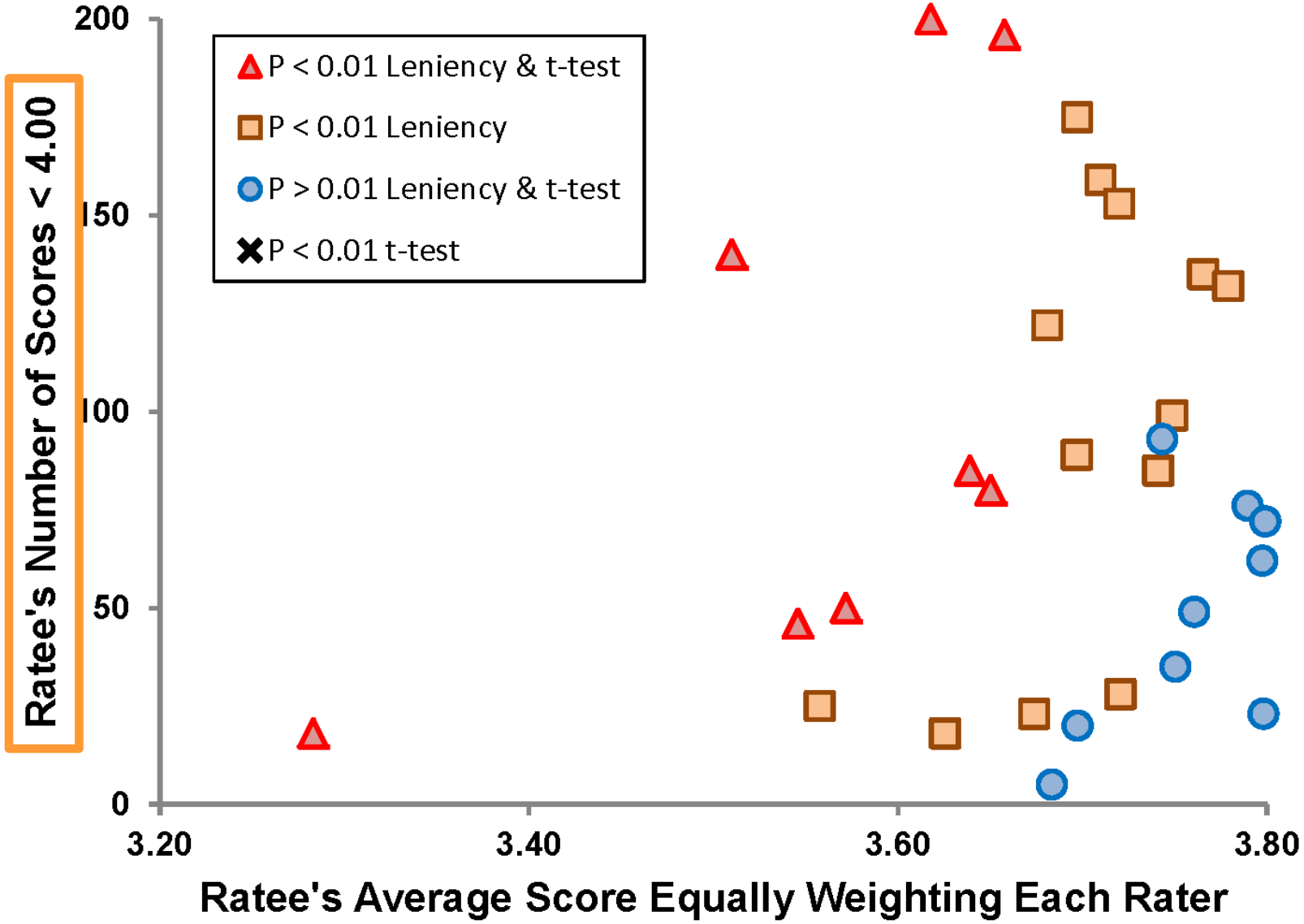
Covariates to Include



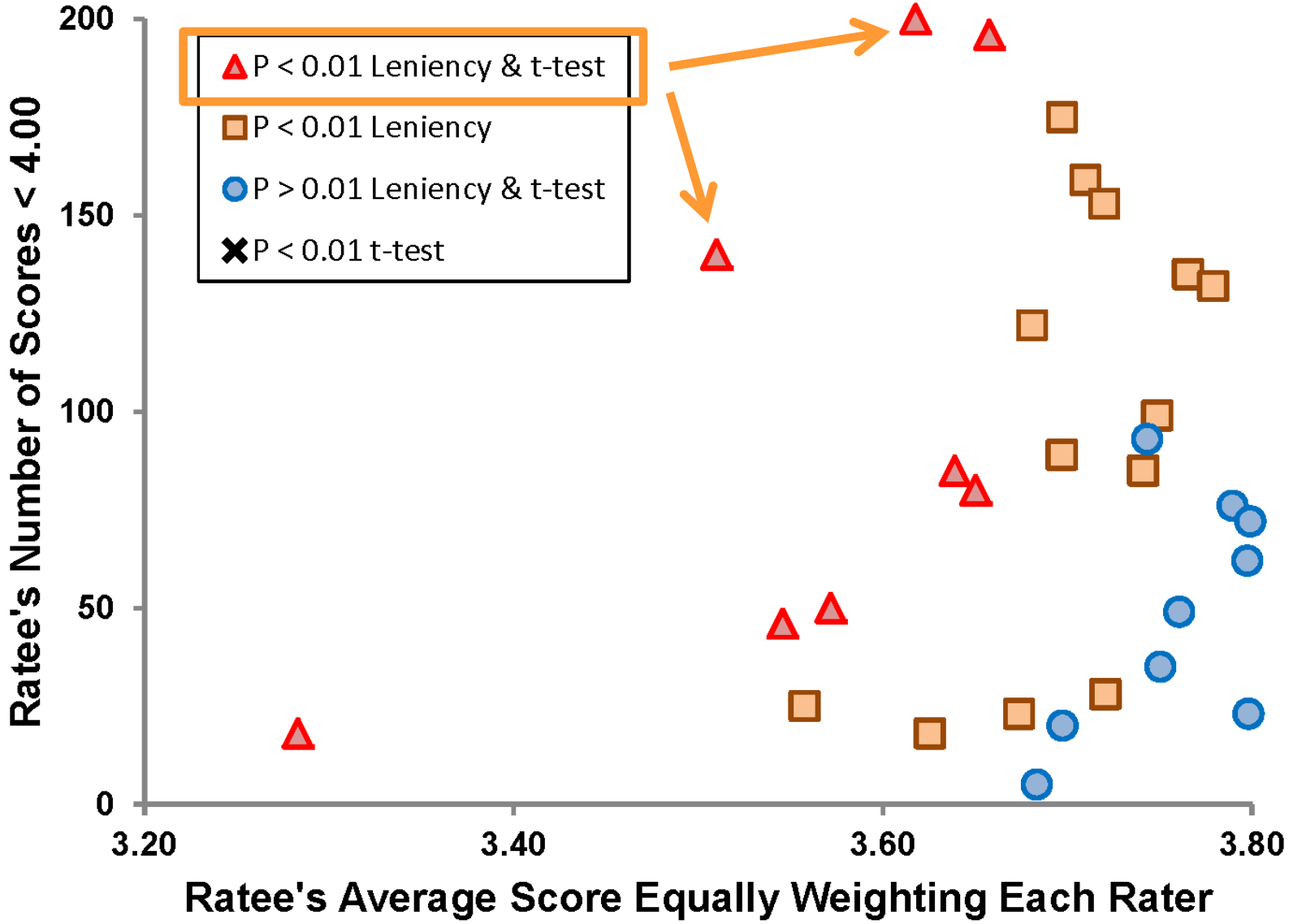
Covariates to Include



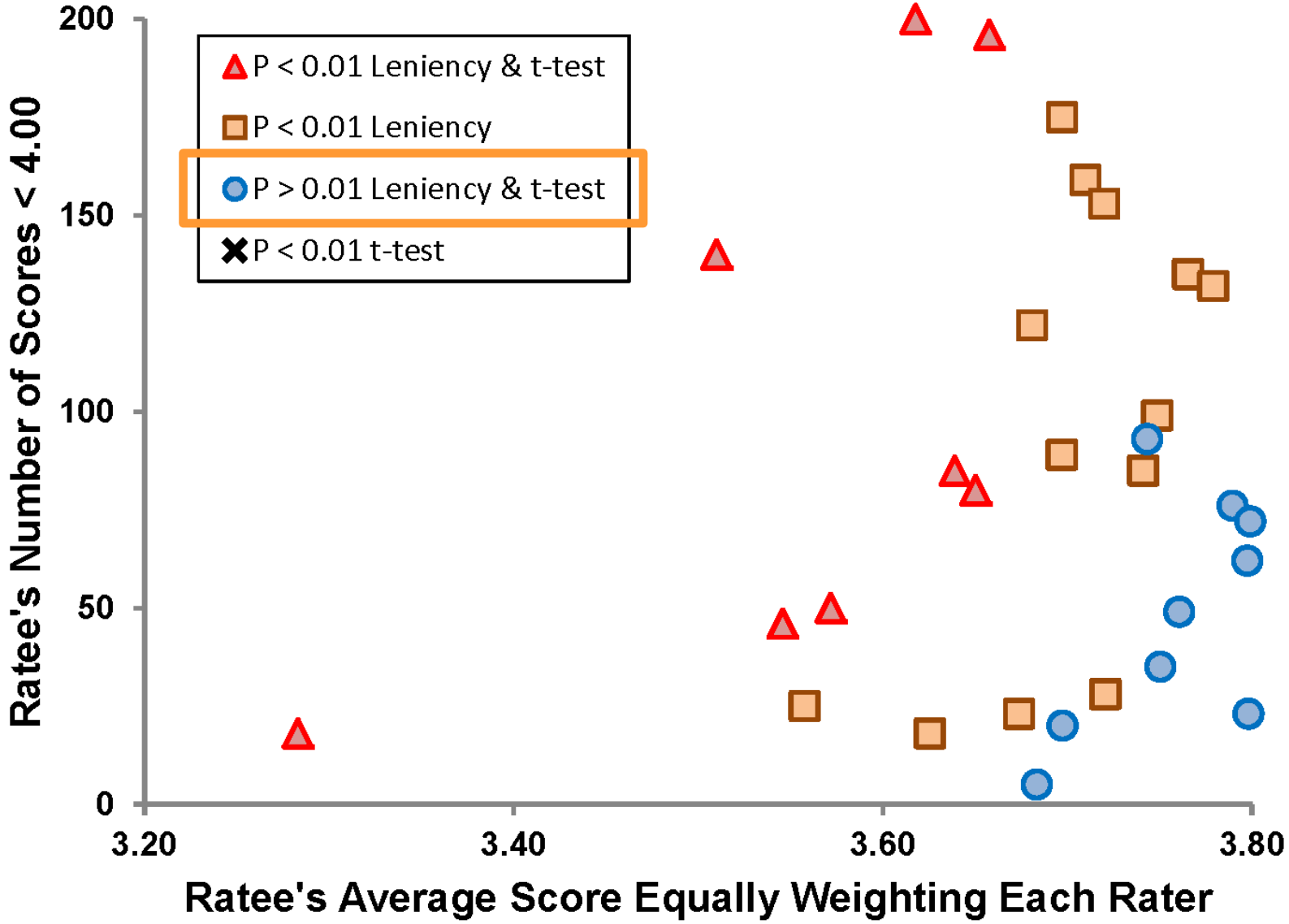
Covariates to Include



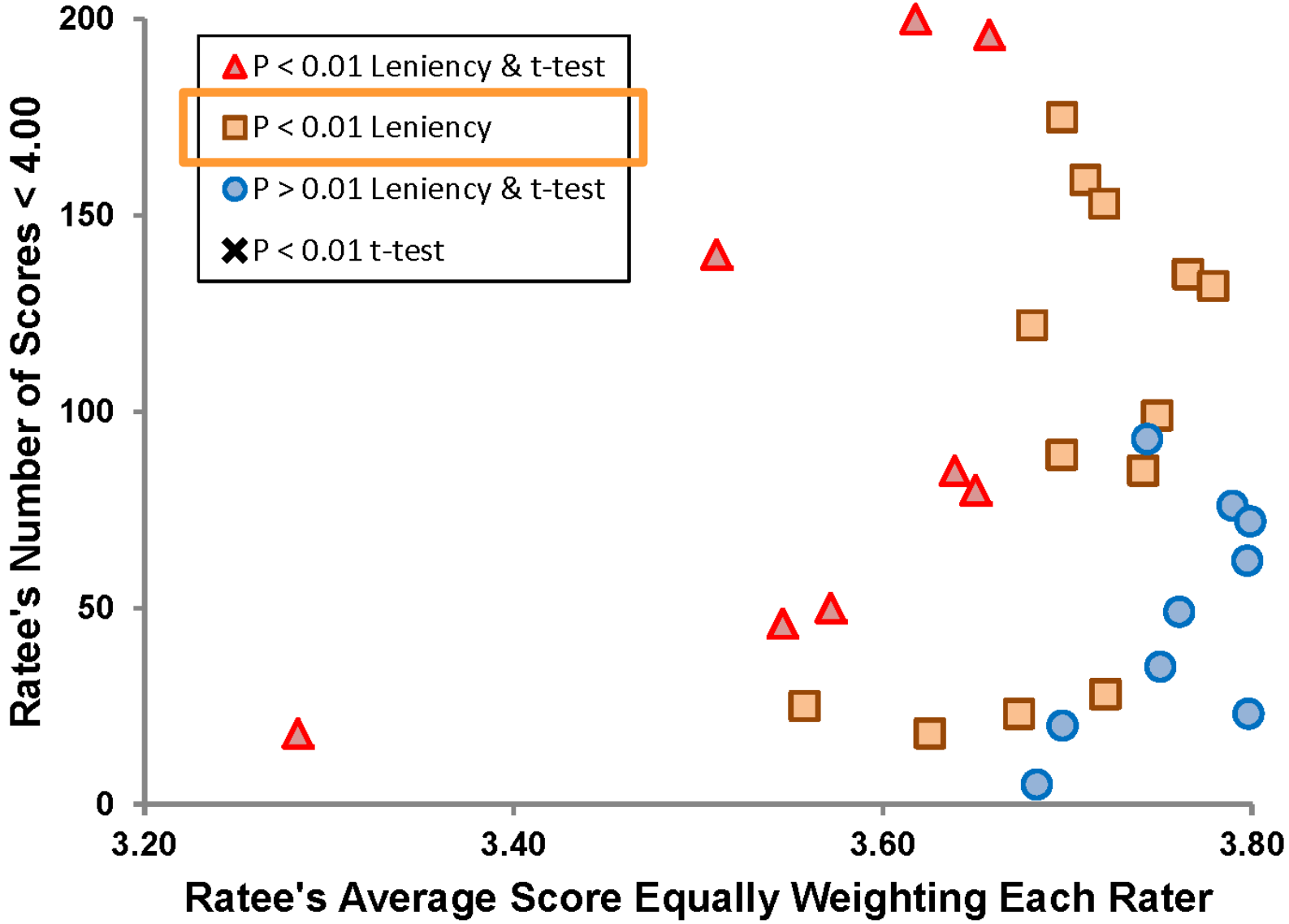
Covariates to Include



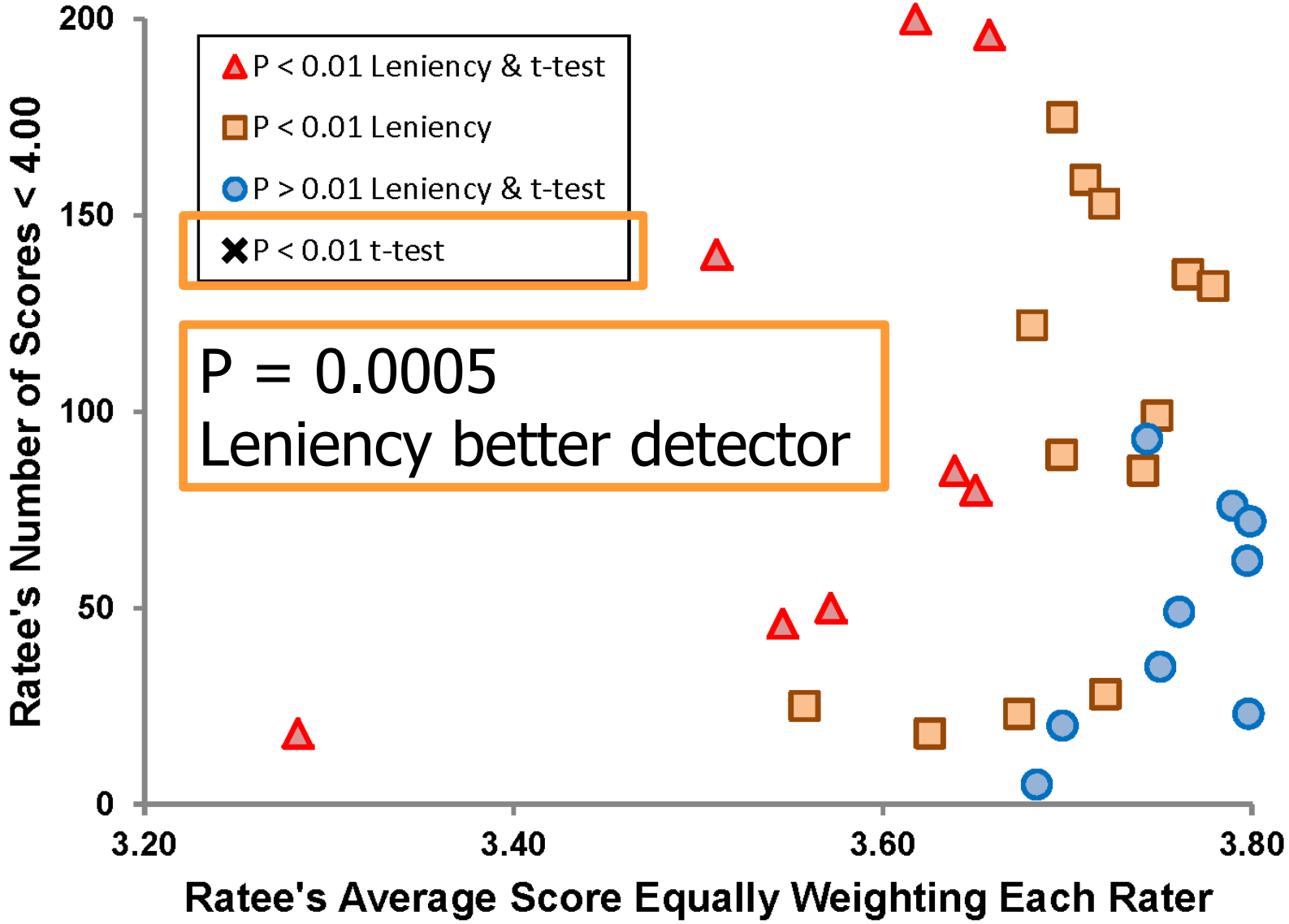
Covariates to Include



Covariates to Include



Covariates to Include



Example OPPE Report to Department Chair

Ratee	Odds ratio (99% interval) (max score / raw count)
20207057	0.08 (< 0.26) (15/31)
20202896	0.17 (< 0.38) (51/78)
20203404	0.24 (< 0.64) (54/70)
20205255	0.31(< 0.76) (45/65)
20200888	4.81 (> 1.26) (58/63)
20203008	4.93 (> 1.29) (52/60)
20203267	13.44 (> 1.93) (25/28)
20205510	0.17 (< 1.71) (6/11)
20207156	0.19 (< 1.03) (13/20)
20201272	1.15 (> 0.29) (35/41)

Example OPPE Report to Department Chair

Ratee	Odds ratio (99% interval) (max score / raw count)
20207057	0.08 (< 0.26) (15/31)
20202896	0.17 (< 0.38) (51/78)
20203404	0.24 (< 0.64) (54/70)
20205255	0.31(< 0.76) (45/65)
20200888	4.81 (> 1.26) (58/63)
20203008	4.93 (> 1.29) (52/60)
20203267	13.44 (> 1.93) (25/28)
20205510	0.17 (< 1.71) (6/11)
20207156	0.19 (< 1.03) (13/20)
20201272	1.15 (> 0.29) (35/41)

Benefit of Adjusting for Rater Leniency with 1 Year Data

Unadjusted logistic regression failed to detect that anesthesiologist significantly in lower half, but mixed effects model found odds ratio less than 1.00	7% (5/73)
Unadjusted logistic regression falsely detected that anesthesiologist significantly in lower half, while mixed effects model found odds ratio not significantly different than 1.00	3% (2/73)
Unadjusted logistic regression failed to detect that anesthesiologist significantly in upper half, but mixed effects model found odds ratio greater than 1.00	11% (8/73)
Overall misclassification (just for above or below average) using unadjusted analysis	21% (15/73)

Dexter F et al. J Clin Anesth 2020

Benefit of Adjusting for Rater Leniency with 1 Year Data

Unadjusted logistic regression failed to detect that anesthesiologist significantly in lower half, but mixed effects model found odds ratio less than 1.00	7% (5/73)
Unadjusted logistic regression falsely detected that anesthesiologist significantly in lower half, while mixed effects model found odds ratio not significantly different than 1.00	3% (2/73)
Unadjusted logistic regression failed to detect that anesthesiologist significantly in upper half, but mixed effects model found odds ratio greater than 1.00	11% (8/73)
Overall misclassification (just for above or below average) using unadjusted analysis	**21%** (15/73)

Dexter F et al. J Clin Anesth 2020

Benefit of Adjusting for Rater Leniency with 1 Year Data

Unadjusted logistic regression failed to detect that anesthesiologist significantly in lower half, but mixed effects model found odds ratio less than 1.00	7% (5/73)
Unadjusted logistic regression falsely detected that anesthesiologist significantly in lower half, while mixed effects model found odds ratio not significantly different than 1.00	3% (2/73)
Unadjusted logistic regression failed to detect that anesthesiologist significantly in upper half, but mixed effects model found odds ratio greater than 1.00	11% (8/73)
Overall misclassification (just for above or below average) using unadjusted analysis	**21%** (15/73)

Dexter F et al. J Clin Anesth 2020

Benefit of Adjusting for Rater Leniency with 1 Year Data

- Reproducible with different University (Florida) and using different instrument
- Misclassification 22% (24/108 faculty years) comparable to the preceding 21%
  - Adjustment for rater leniency needed because greater heterogeneity of scores among raters (eta-squared 0.40) than among ratees (0.22)

Dexter F et al. Cureus 2025

ACGME Clinician Educator Milestones

- Pillar 1: Reflective Practice
  - Evaluate teaching activities
- Pillar 3: Recognition and Mitigation of Bias
  - ✓Mitigate the effect of bias — Yes
- Pillar 4: Professional Responsibilities
  - Exemplary professional behavior

ACGME. Clinician educator supplemental guide, August 2022

Feedback to Raters to Increase Information from Evaluations

- None of the following raters has provided incremental information about ratees
  - 100 evaluation requests, all completed, all ratees given maximum score of 4.00
  - 100 evaluation requests, 50 completed, no ratee given maximum score of 4.00
  - 100 evaluation requests, 0 completed

Dexter F et al. Perioper Care Oper Room Manag 2022

Feedback to Raters to Increase Information from Evaluations

- None of the following raters has provided incremental information about ratees
  - 100 evaluation requests, all completed, all ratees given maximum score of 4.00
  - 100 evaluation requests, 50 completed, no ratee given maximum score of 4.00
  - 100 evaluation requests, 0 completed

➢ Completing evaluations shows raters' work habits and conscientiousness, but objective of evaluation is to learn about the ratees

Dexter F et al. Perioper Care Oper Room Manag 2022

Feedback to Raters to Increase Information from Evaluations

- None of the following raters has provided incremental information about ratees
  - 100 evaluation requests, all completed, all ratees given maximum score of 4.00
  - 100 evaluation requests, 50 completed, no ratee given maximum score of 4.00
  - 100 evaluation requests, 0 completed

Scores, but provide no information

Dexter F et al. Perioper Care Oper Room Manag 2022

Feedback to Raters to Increase Information from Evaluations

- Insight from anesthesiologists' 40,027 evaluations of nurse anesthetists' work habits
  - Few (12%) consecutive ratings by same rater included >10 ratings with all scores the same

Dexter F et al. Perioper Care Oper Room Manag 2022

Feedback to Raters to Increase Information from Evaluations

- Insight from anesthesiologists' 40,027 evaluations of nurse anesthetists' work habits
  - Few (12%) consecutive ratings by same rater included >10 ratings with all scores the same
    - ➢ Those runs mattered, nonetheless, because ratees best evaluated by multiple raters

Dexter F et al. Perioper Care Oper Room Manag 2022

Feedback to Raters to Increase Information from Evaluations

- Insight from anesthesiologists' 40,027 evaluations of nurse anesthetists' work habits
  - Few (12%) consecutive ratings by same rater included >10 ratings with all scores the same
    - Those runs mattered, nonetheless, because ratees best evaluated by multiple raters
    - ➢ Those runs continued, median 13 additional ratings with scores the same

Dexter F et al. Perioper Care Oper Room Manag 2022

Bernoulli CUSUM Monitoring for Prompt Recognition Low Scores

Bernoulli CUSUM Monitoring for Prompt Recognition Low Scores

- Daily monitoring by server to detect changes in supervision scores promptly

Dexter F et al. Anesth Analg 2014

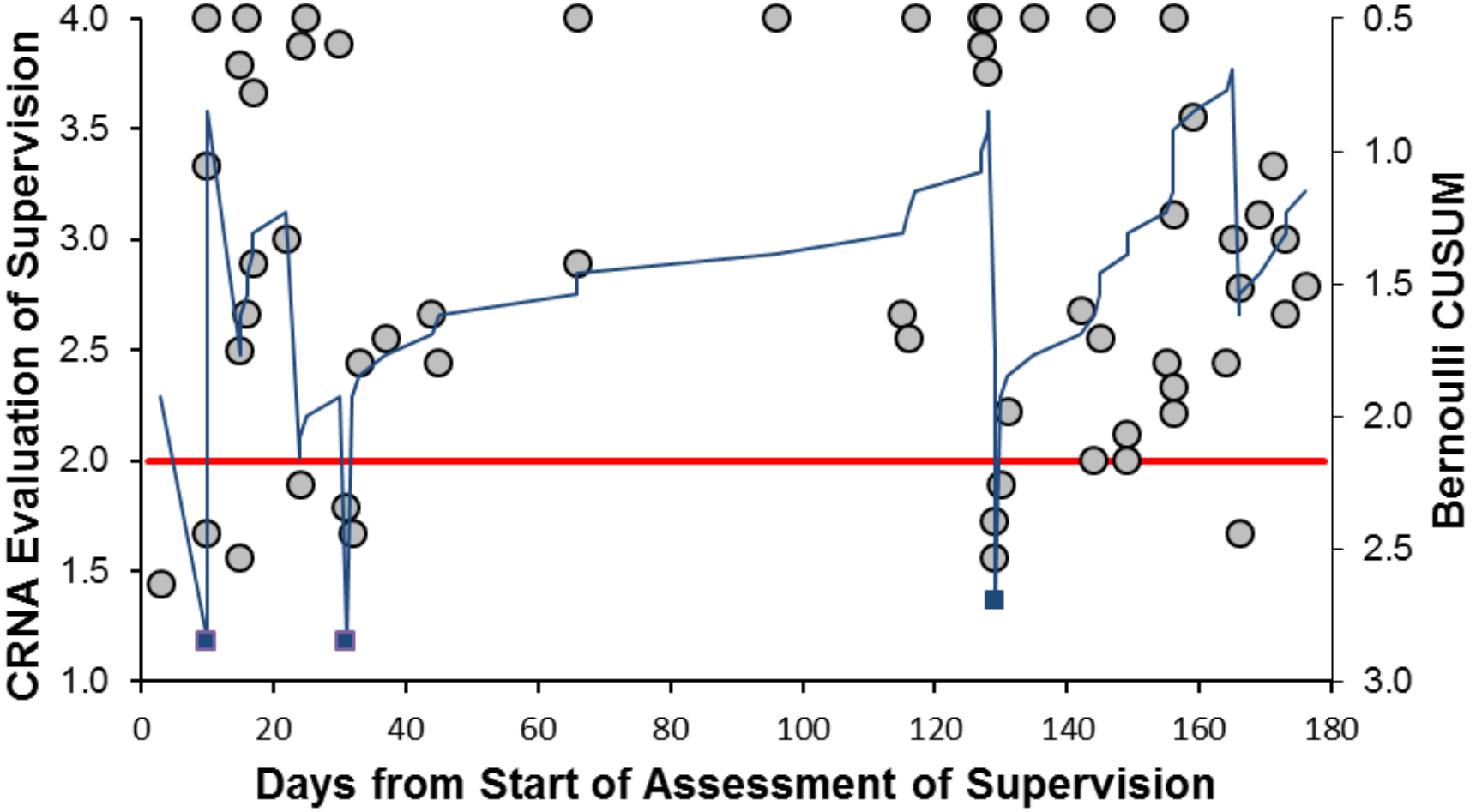
Dexter F et al. Can J Anesth 2017

Bernoulli CUSUM Monitoring for Prompt Recognition Low Scores

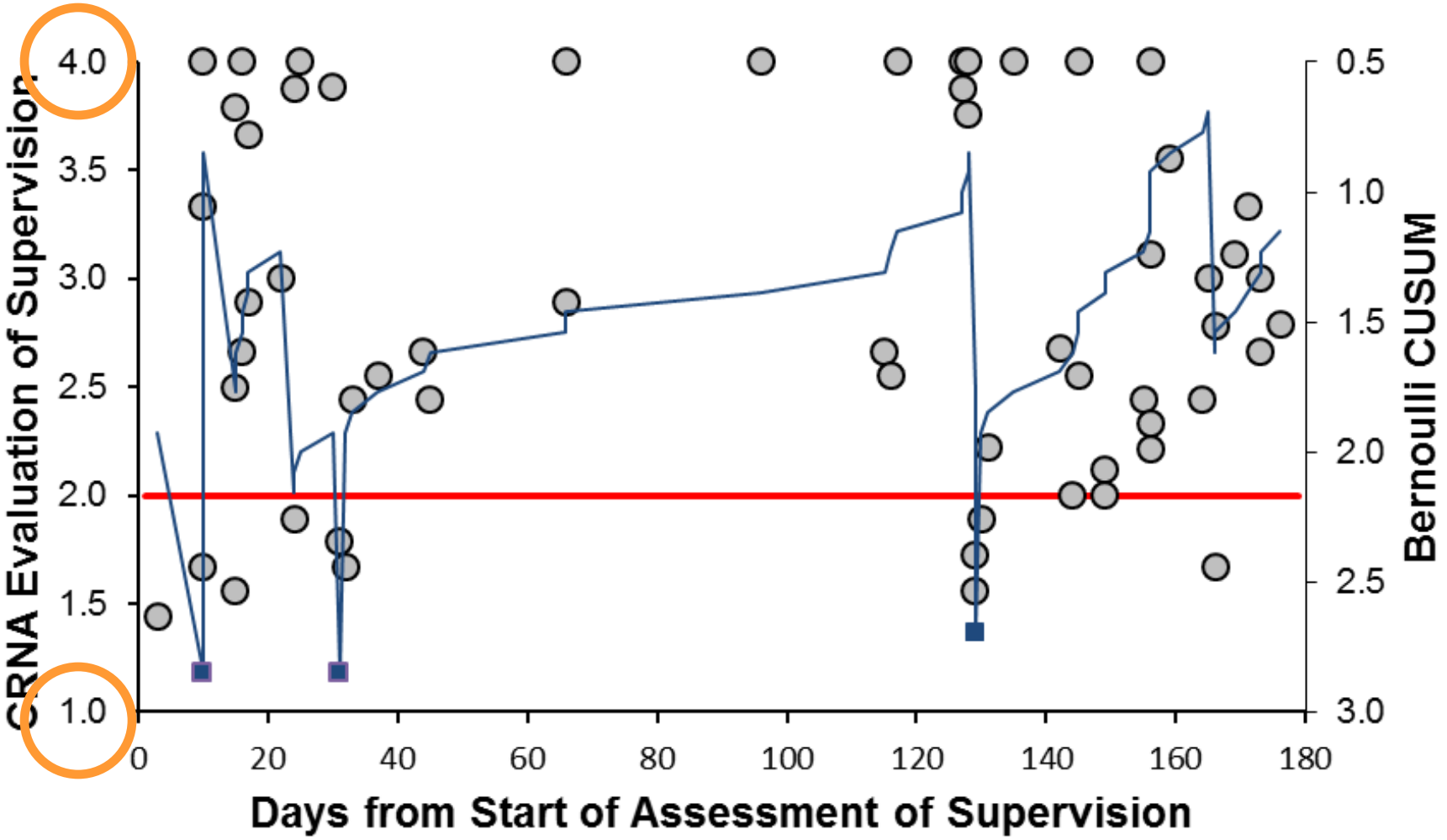
- Example for nurse anesthetists
  - Bernoulli CUSUM starting value = 1 – 1/13
  - Add (1 – 1/13) if score < 2.00 (“rarely”) or subtract (1/13) otherwise
  - Bernoulli CUSUM alert when > 2.32 and restart

Dexter F et al. Anesth Analg 2014

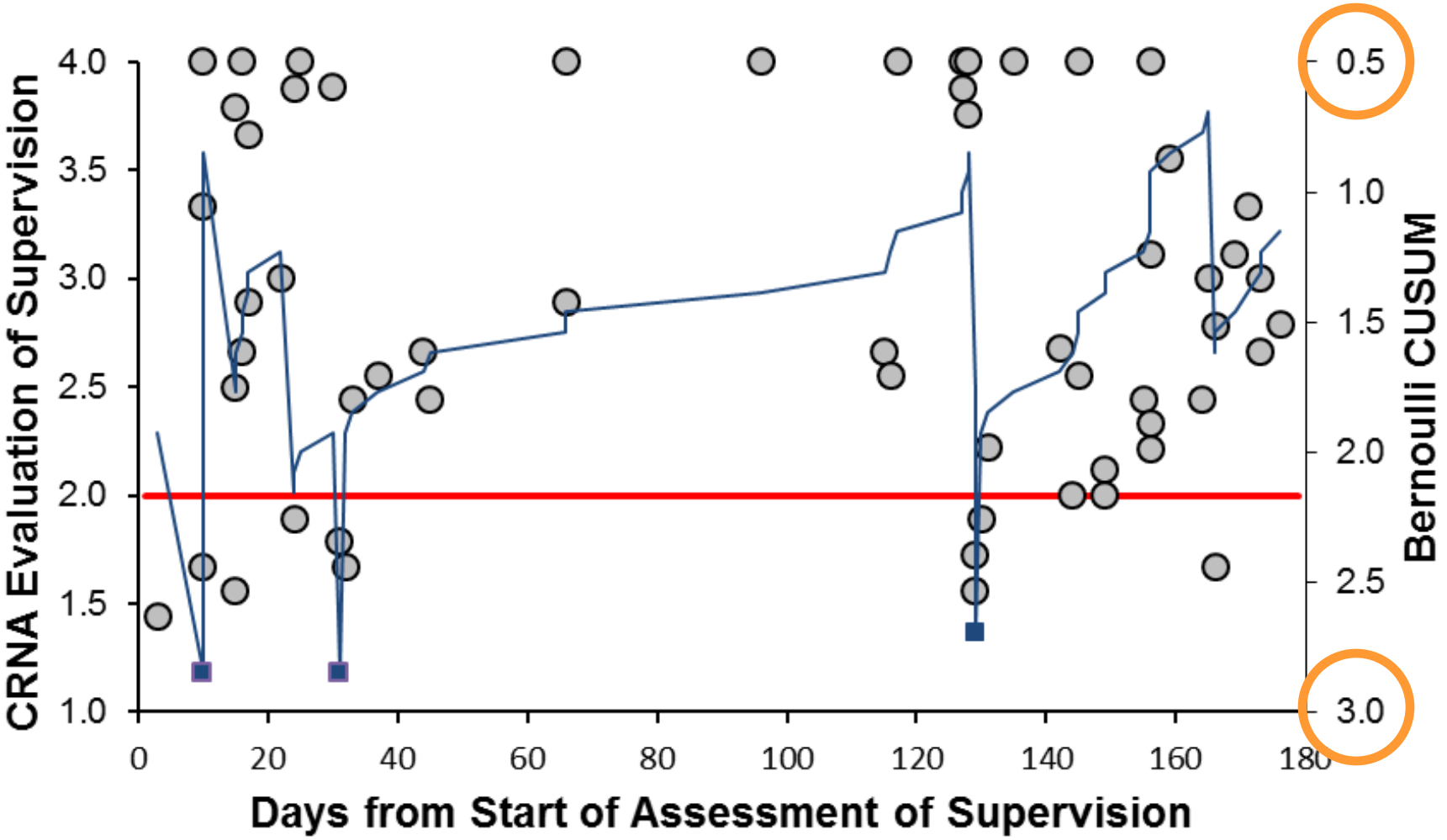
Bernoulli CUSUM Monitoring for Prompt Recognition Low Scores



Bernoulli CUSUM Monitoring for Prompt Recognition Low Scores



Bernoulli CUSUM Monitoring for Prompt Recognition Low Scores



Bernoulli CUSUM Monitoring for Prompt Recognition Low Scores

- Evaluation by anesthesia residents
  - Among upper half of anesthesiologists (27/55), based on their average scores, zero of 27 was detected (flagged) during the 6 months by the Bernoulli CUSUM
  - Among the lower quartile of anesthesiologists (13/55), 12 of 13 were detected

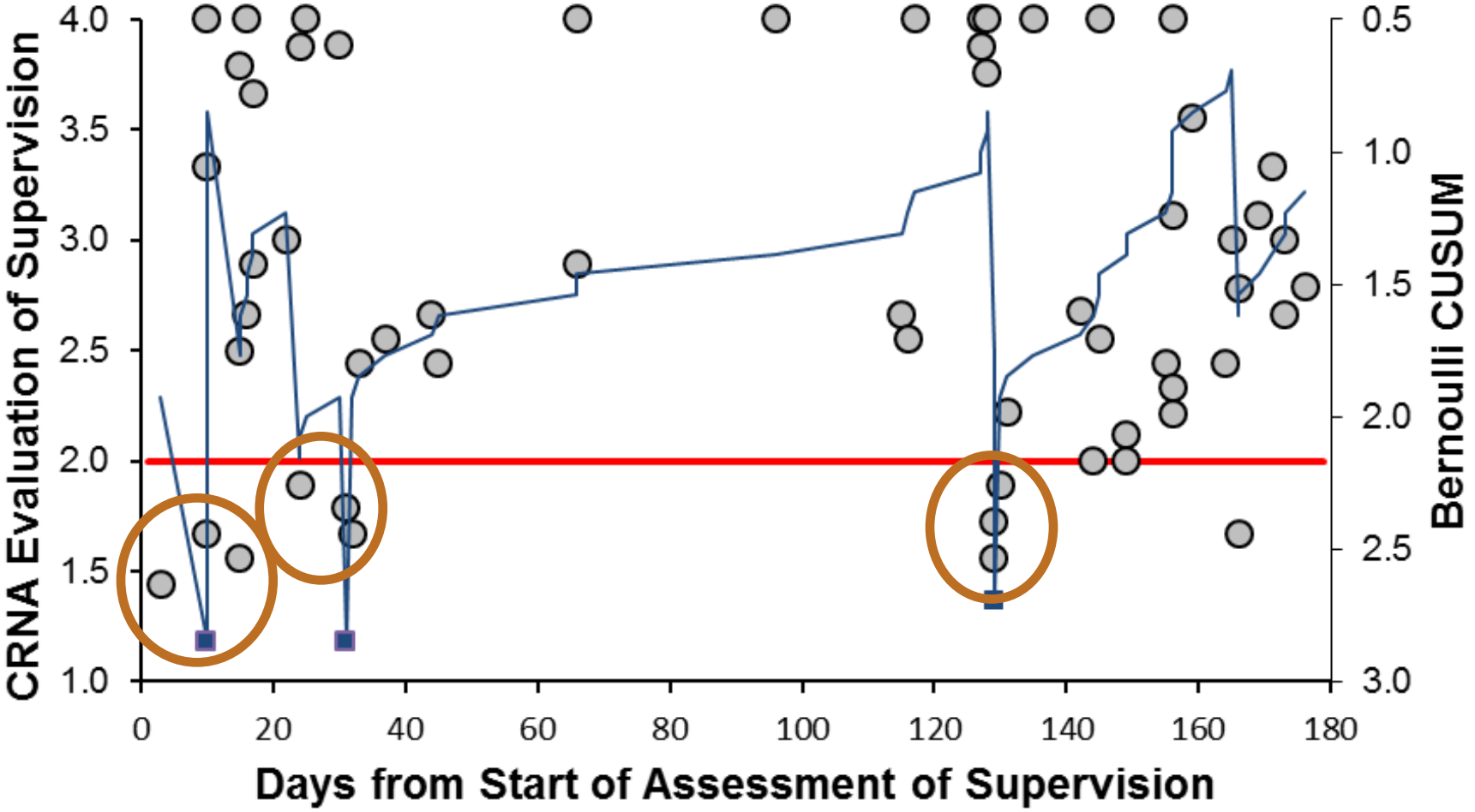
Dexter F et al. Anesth Analg 2014

Bernoulli CUSUM Monitoring for Prompt Recognition Low Scores

- Evaluation by nurse anesthetists
  - Among upper half of anesthesiologists (29/58) based on their average scores, only 1 of 29 was detected (flagged) during the 6 months by the Bernoulli CUSUM
  - Among the lower quartile of anesthesiologists (14/58), 13 of 14 were detected

Dexter F et al. Anesth Analg 2014

Do Need to Use Mathematics



Do Need to Use Mathematics

- Assumption of statistical independence
  - If no correlation among evaluations, and with p representing pooled estimate for low score, then among days with 2 evaluations, p^2 would be probability both scores are low
  - Among the nurse anesthetists' 1182 evaluations on days with 2 evaluations by nurse anesthetists, p = 5.92%
  - There were 4.34-fold more days with 2 low scores than expected at random (P < 0.0001)

Do Not Spend Substantial Time Maintaining Process: 1/Month

Date	Count of Scores	Mean of all Scores	% Scores < 3.00	Count CUSUM alerts
2014 Jan-Jun	4108	3.79	2.35%	13
2014 Jul-Dec	3777	3.82	1.53%	17
2015 Jan-Jun	4003	3.85	1.45%	10
2015 Jul-Dec	4492	3.86	0.70%	7
2016 Jan-Jun	3975	3.90	0.68%	3
2016 Jul-Dec	4356	3.91	0.89%	6
2017 Jan-Jun	4078	3.93	0.37%	1
2017 Jul-Dec	4334	3.94	0.84%	6

Bernoulli CUSUM Workflow for Who Receives the E-mail

Bernoulli CUSUM Workflow for Who Receives the E-mail

- If anesthesiologist works today with a resident, and this evening Bernoulli CUSUM alerts, likely the resident's evaluation indicated less than desirable supervision
- E-mail directly to the rated anesthesiologist would result in loss of confidentiality of the resident's evaluation

Dexter F et al. Anesth Analg 2014

Bernoulli CUSUM Workflow for Who Receives the E-mail

- Bernoulli CUSUM is process for detection
- Detection prompts e-mail notification of the relevant human resources professional, not the rated anesthesiologist
- Vice Chair for Faculty Development receives e-mail with hyperlink but without identifiers
  - Logs in
  - Sees name of anesthesiologist and evaluations from past 9 different raters

Residents & Fellows Evaluate Pain Medicine Clinical Faculty

- Same principles to evaluate the quality of supervision of resident physicians and pain medicine fellows by pain medicine faculty

Dexter F et al. Anesth Analg 2020

Residents & Fellows Evaluate Pain Medicine Clinical Faculty

- Same principles to evaluate the quality of supervision of resident physicians and pain medicine fellows by pain medicine faculty
  - Cronbach α very large, 0.975 (SE 0.001)

Dexter F et al. Anesth Analg 2020

Residents & Fellows Evaluate Pain Medicine Clinical Faculty

- Same principles to evaluate the quality of supervision of resident physicians and pain medicine fellows by pain medicine faculty
- Cronbach α very large, 0.975 (SE 0.001)
- ➢ G coefficient ≅0.90 with 18 raters, practical because mean 19 raters per 6-months

Dexter F et al. Anesth Analg 2020

Residents & Fellows Evaluate Pain Medicine Clinical Faculty

- Same principles to evaluate the quality of supervision of resident physicians and pain medicine fellows by pain medicine faculty
- Cronbach α very large, 0.975 (SE 0.001)
- G coefficient $\cong$0.90 with 18 raters, practical because mean 19 raters per 6-months
- ➢ Concurrent validity based on lesser scores on weeks with more pain procedures performed (i.e., more supervision expected)

Dexter F et al. Anesth Analg 2020

Residents & Fellows Evaluate Pain Medicine Clinical Faculty

- Concurrent validity based on correlation with fellows' evaluations using a 21-item graduate medical education scale, Kendall's $\tau_b = 0.45$, $P < 0.0001$

Dexter F et al. Anesth Analg 2020

Residents & Fellows Evaluate Pain Medicine Clinical Faculty

- Concurrent validity based on correlation with fellows' evaluations using a 21-item graduate medical education scale, Kendall's $\tau_b = 0.45$, $P < 0.0001$
- Concurrent validity based on correlation with anesthesia residents' evaluations when faculty supervising OR cases, $\tau_b = 0.38$, $P = 0.0002$

Dexter F et al. Anesth Analg 2020

Residents & Fellows Evaluate Pain Medicine Clinical Faculty

- Just like for supervision in ORs, important to adjust for rater leniency

Dexter F et al. Health Care Manag Sci 2020

Dexter F et al. Anesth Analg 2020

Residents & Fellows Evaluate Pain Medicine Clinical Faculty

- Just like for supervision in ORs, important to adjust for rater leniency
  - Large systematic heterogeneity of scores among raters, $\eta^2 = 0.48$, $P < 0.0001$

Dexter F et al. Anesth Analg 2020

Residents & Fellows Evaluate Pain Medicine Clinical Faculty

- Just like for supervision in ORs, important to adjust for rater leniency
  - Large systematic heterogeneity of scores among raters, $\eta^2 = 0.48$, $P < 0.0001$
  - ➢ Pairings of ratee and rater decidedly non-random, Cramér's $V = 0.349$, $P < 0.0001$

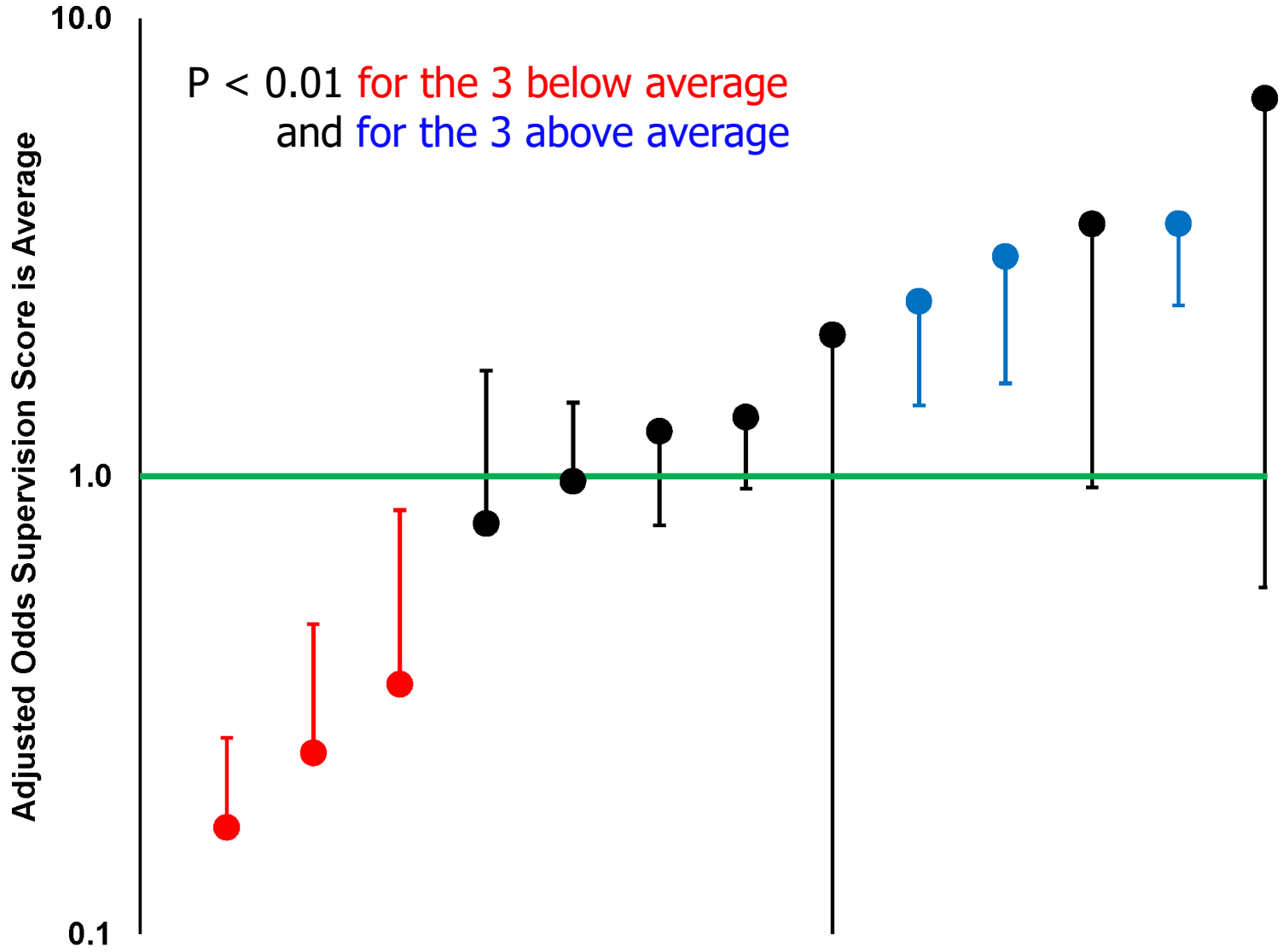
Dexter F et al. Anesth Analg 2020

Residents & Fellows Evaluate Pain Medicine Clinical Faculty

- Just like for supervision in ORs, important to adjust for rater leniency
  - Large systematic heterogeneity of scores among raters, $\eta^2 = 0.48$, $P < 0.0001$
  - Pairings of ratee and rater decidedly non-random, Cramér's $V = 0.349$, $P < 0.0001$
  - ➢ Raters' means nested by ratee not normally distributed, 10 $P < 0.0001$ and 11th $P = 0.0098$

Dexter F et al. Anesth Analg 2020

Residents & Fellows Evaluate Pain Medicine Clinical Faculty



Combine Individual Evaluations for Overall Department Quality

- Metric for internal and external use
  - Annual reporting to College of Medicine
  - Departmental reviews of training program
- Data used for development of methodology
  - Resident evaluations July 2013 to June 2022
  - 48,788 evaluations by 202 distinct raters

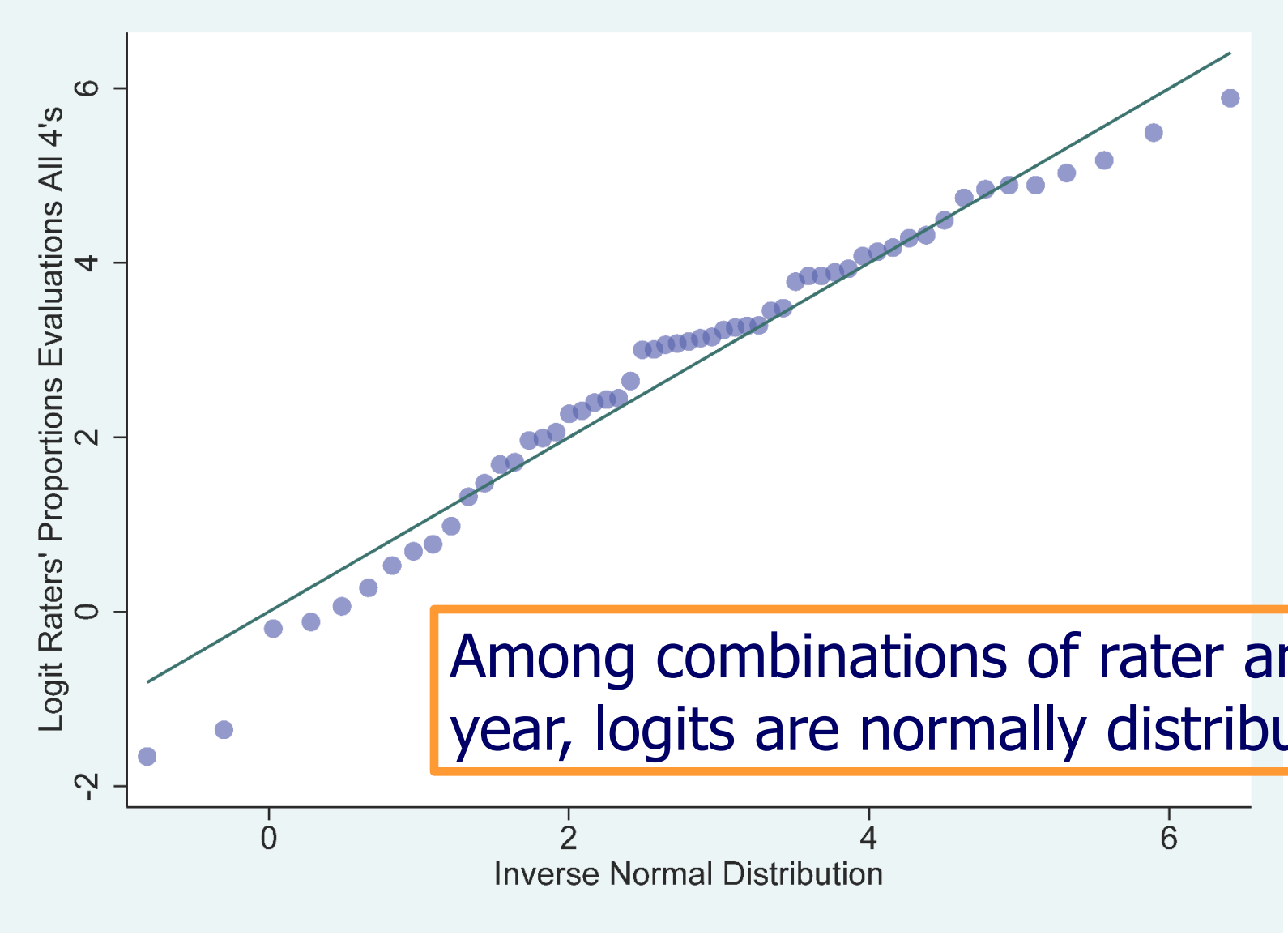
Dexter F et al. J Clin Anesth 2023

Combine Individual Evaluations for Overall Department Quality

- Mean scores equally weighting each rater?
  - For each of the 9 years, raters' mean scores negatively skewed, median G1 = 3.0
    - Lilliefors' tests all nine $P \leq 0.00001$
  - Confidence intervals calculated using Chen's method vastly too wide (unreliable) for use

Dexter F et al. J Clin Anesth 2023

Combine Individual Evaluations for Overall Department Quality



Combine Individual Evaluations for Overall Department Quality

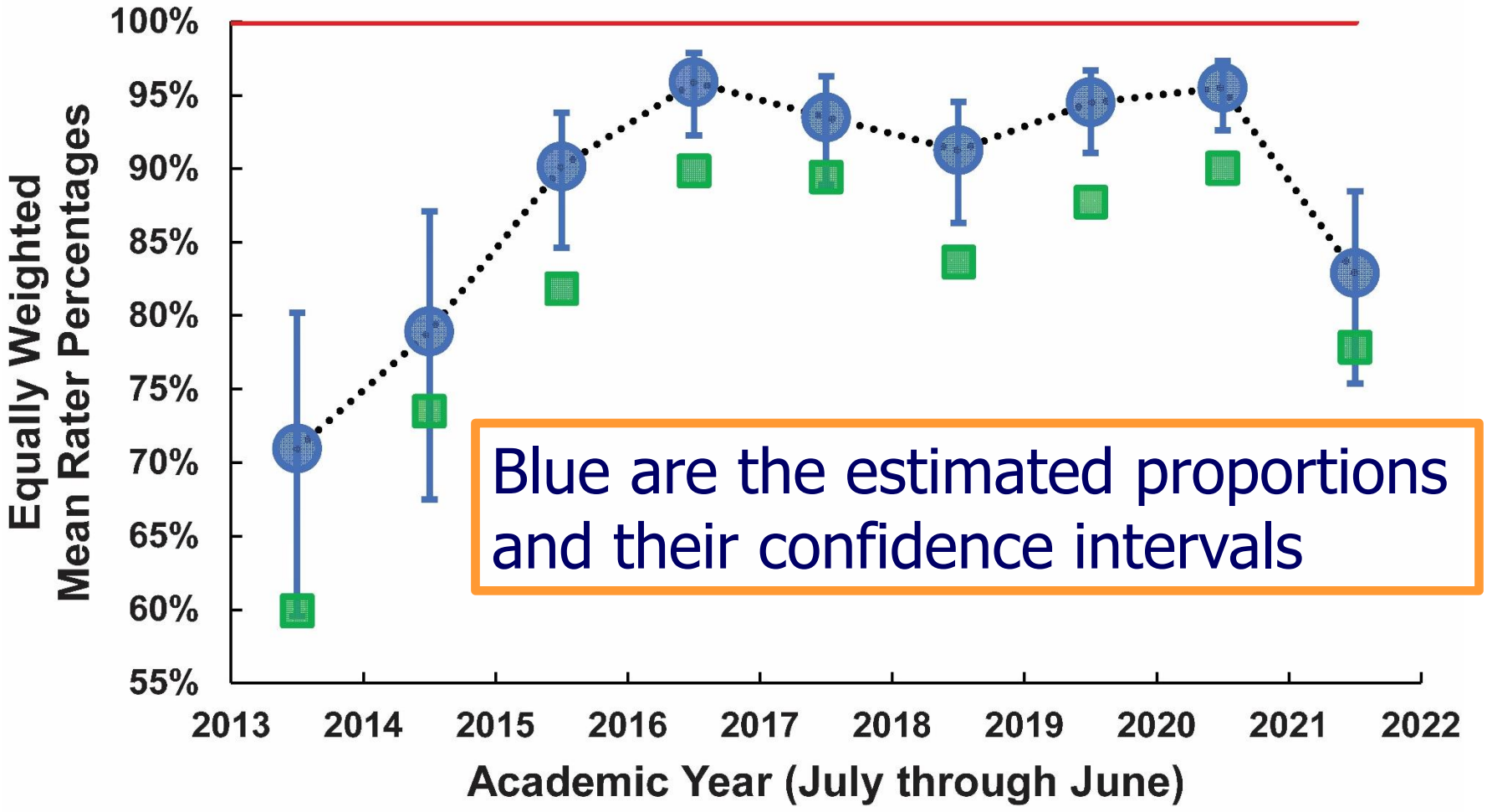
- Mixed effects logistic regression model for each academic year treating raters as random effect, because raters differ in leniency
  - Intercept only model
  - From estimated intercept and its 95% confidence interval, take inverse logit to obtain overall departmental quality as proportion

Dexter F et al. J Clin Anesth 2023

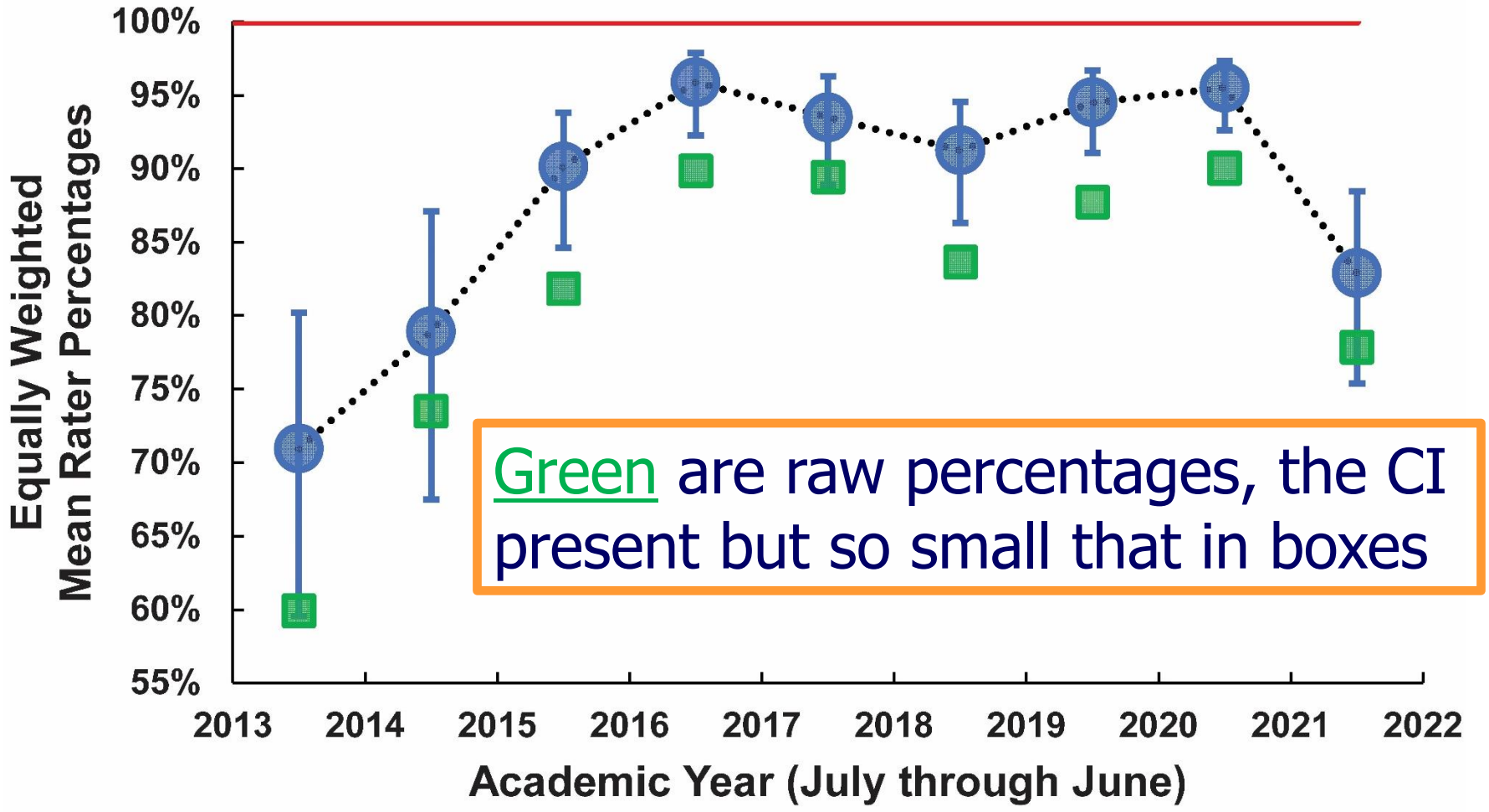
Combine Individual Evaluations for Overall Department Quality

- Mixed effects logistic regression model for each academic year treating raters as random effect, because raters differ in leniency
  - Intercept only model
  - From estimated intercept and its 95% confidence interval, take inverse logit to obtain overall departmental quality as proportion
  - ➢ Same as meta-analysis of proportions using generalized linear mixed model
    - Each study (i.e., rater) gives different estimate of the suboptimal quality of supervision

Combine Individual Evaluations for Overall Department Quality



Combine Individual Evaluations for Overall Department Quality



Combine Individual Evaluations for Overall Department Quality

- Mixed effects logistic regression model for each academic year treating raters as random effect, because raters differ in leniency
  - Intercept only model
  - From estimated intercept and its 95% confidence interval, take inverse logit to obtain overall departmental quality as proportion
  - ➢ Departments skipping random effects modeling will give incorrect impression that overall performance is worse than that being provided by average ratee

Anesthesiologists' Contribution to Collaborative Practice

- Anesthesiologists' contribution to collaborative practice with nurse anesthetist raters has attributes of supervision and work habits
  - Consequences add insight into the evaluation of supervision

O'Brien MK et al. J Clin Anesth 2019

Dexter F et al. J Clin Anesth 2019

Debney C et al. AANA J 2025

Anesthesiologists' Contribution to Collaborative Practice

- Large negative association between leniency-adjusted anesthesiologist scores and their years of post-graduate practice
  - Analyzed with 24 different covariates, all with the same negative association, P <0.0001
- University of Iowa does not use the instrument
  - If did, anesthesiologist employees ≥40 years would receive lower evaluation scores

O'Brien MK et al. J Clin Anesth 2019

Anesthesiologists' Contribution to Collaborative Practice

- Nurse anesthetists may not want "4=always"

Dexter F et al. J Clin Anesth 2019

Anesthesiologists' Contribution to Collaborative Practice

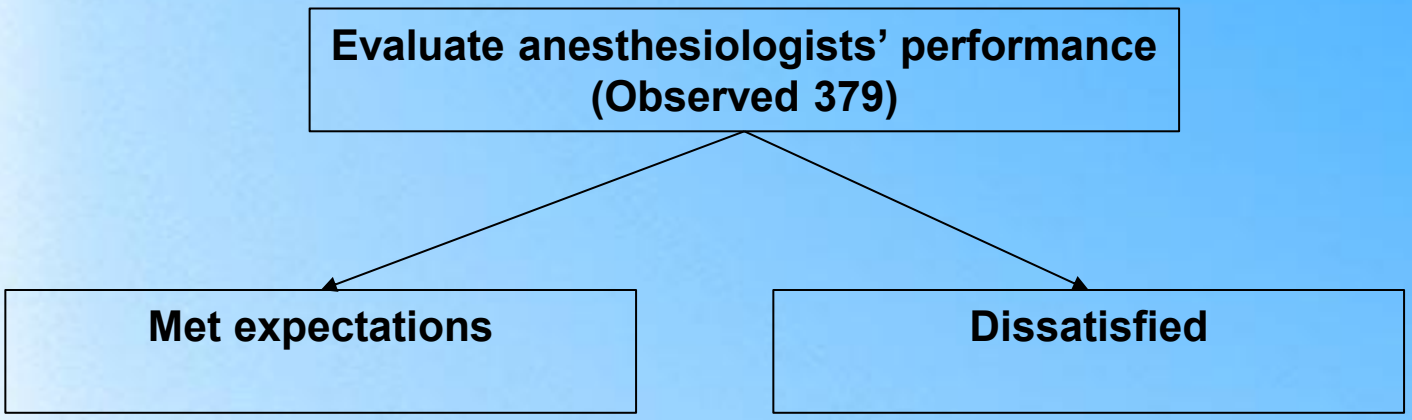
- Nurse anesthetists may not want "4=always"

Evaluate anesthesiologists' performance (Observed 379)

Dexter F et al. J Clin Anesth 2019

Anesthesiologists' Contribution to Collaborative Practice

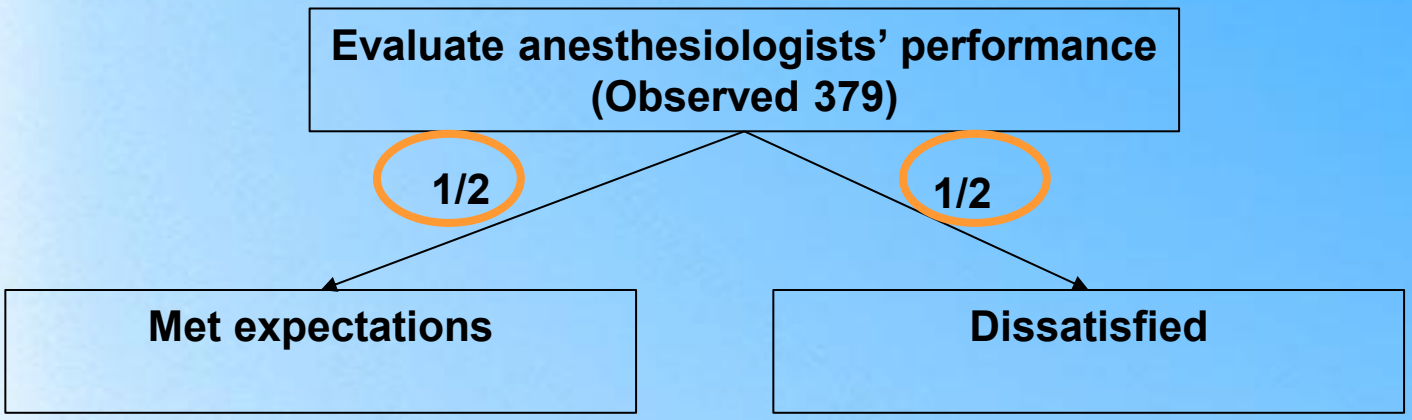
- Nurse anesthetists may not want "4=always"



Dexter F et al. J Clin Anesth 2019

Anesthesiologists' Contribution to Collaborative Practice

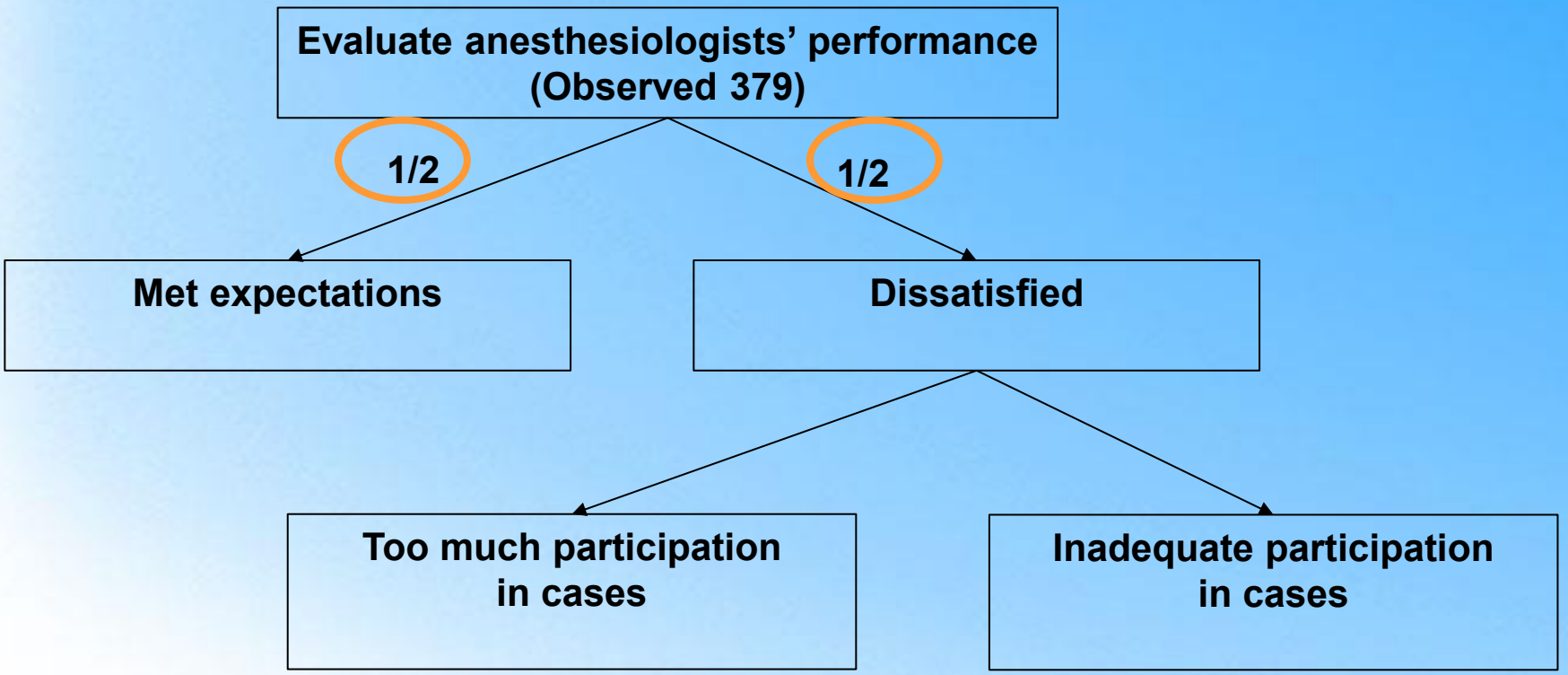
- Nurse anesthetists may not want "4=always"



Dexter F et al. J Clin Anesth 2019

Anesthesiologists' Contribution to Collaborative Practice

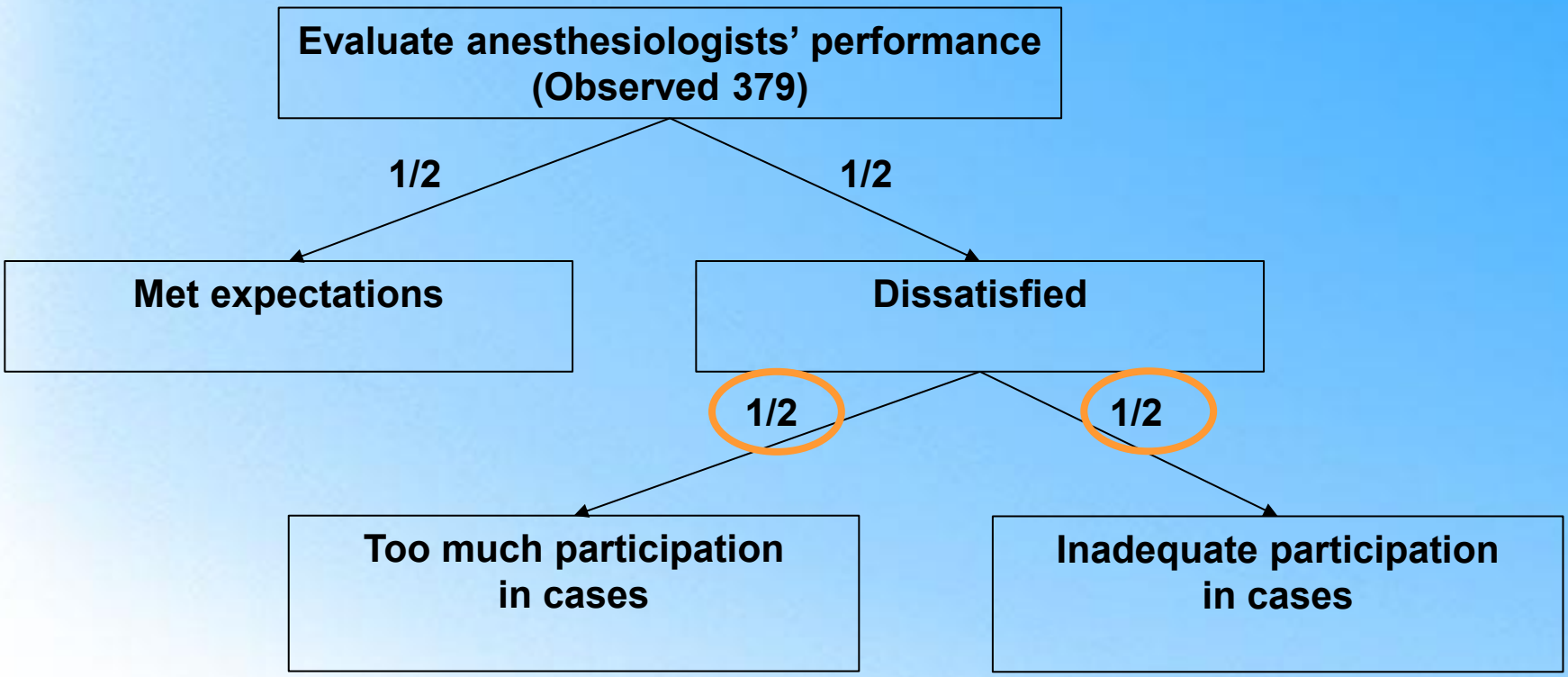
- Nurse anesthetists may not want "4=always"



Dexter F et al. J Clin Anesth 2019

Anesthesiologists' Contribution to Collaborative Practice

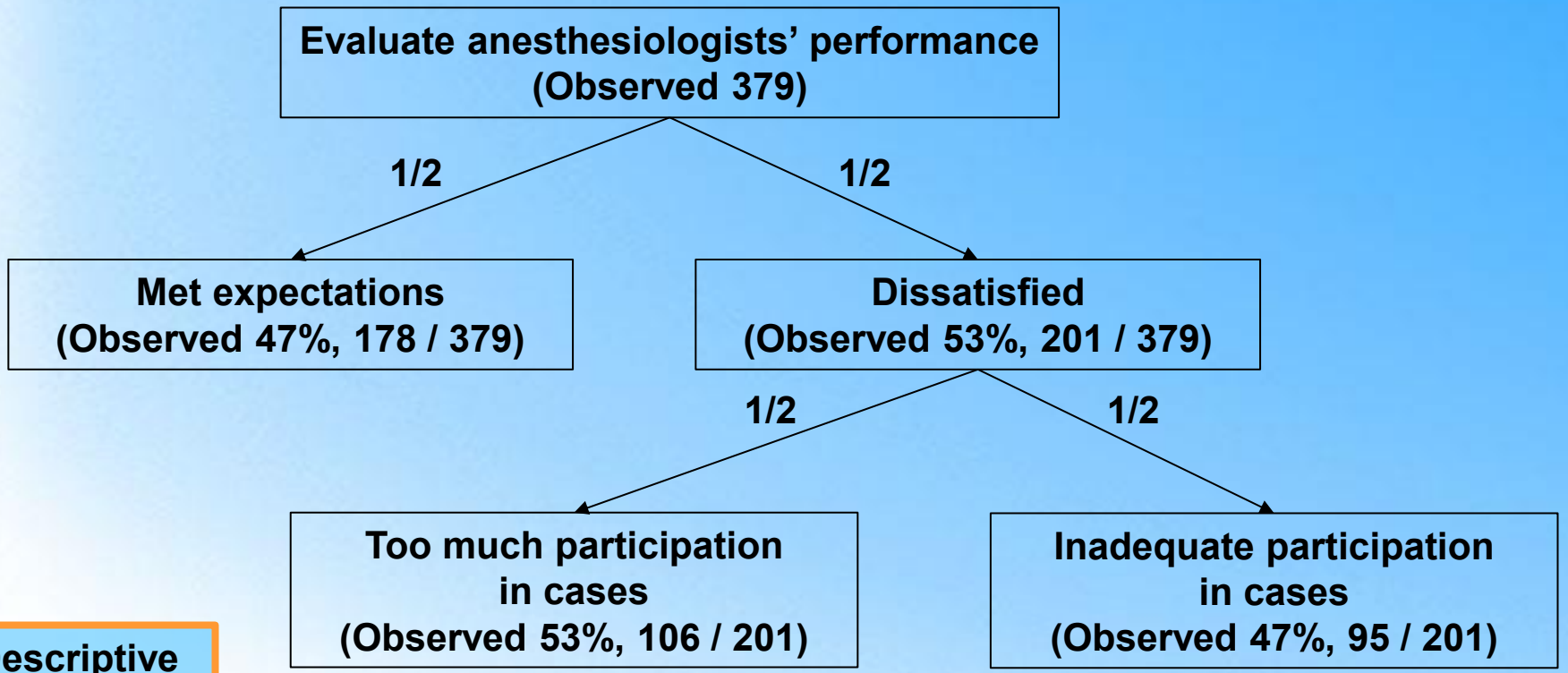
- Nurse anesthetists may not want "4=always"



Dexter F et al. J Clin Anesth 2019

Anesthesiologists' Contribution to Collaborative Practice

- Nurse anesthetists may not want "4=always"



Descriptive model fit
P = 0.36

Dexter F et al. J Clin Anesth 2019

Anesthesiologists' Contribution to Collaborative Practice

- Nurse anesthetists may not want "4=always"
- When evaluating clinical supervision with adjustment for rater leniency, not assessing "good" or "bad," rather quantifying the dose of supervision being provided

Anesthesiologists' Evaluation of Nurse Anesthetists' Work Habits

- Remainder of talk follows same sequence of preceding slides, but for anesthesiologists' evaluation of nurse anesthetists' work habits

Bayman EO et al. Periop Care Oper Room Manag 2017

Logvinov IL et al. J Clin Anesth 2017

Dexter F et al. Health Care Manag Sci 2020

Dexter F et al. Periop Care Oper Room Manag 2022

Dexter F et al. Cureus 2023

Dexter F et al. Cureus 2024

Dexter F et al. Periop Care Oper Room Manag 2025

Dexter F et al. Anesth Analg 2025

Dexter F et al. Cureus 2025

University of Iowa Experience

- Anesthesiologists and nurse anesthetists paired daily in actual (*in situ*) clinical practice
- Over 9 years (Jul 2015 – Jun 2024)
  - 59,863 evaluations
  - 713 nurse anesthetist (ratee) years
  - 167 anesthesiologists (raters)

Dexter F et al. Periop Care Oper Room Manag 2025

Ongoing Professional Practice Evaluation (OPPE)

Ongoing Professional Practice Evaluation (OPPE)

- Example of hospital accreditation standards; these from The Joint Commission

Ongoing Professional Practice Evaluation (OPPE)

- Example of hospital accreditation standards; these from The Joint Commission
  - Information collected about every practitioner

Ongoing Professional Practice Evaluation (OPPE)

- Example of hospital accreditation standards; these from The Joint Commission
  - Information collected about every practitioner
  - ➢ OPPE used at least annually to decide whether to continue, limit, or revoke hospital privileges

Ongoing Professional Practice Evaluation (OPPE)

- Performance report sent to Chief Medical Officer in undesirable format

Ongoing Professional Practice Evaluation (OPPE)

- Performance report sent to Chief Medical Officer in undesirable format

Name	Score	Evaluations
BA	4.38	10
MW	4.45	53
DG	4.51	29
ST	4.57	37
…	…	…
AD	4.75	114
…	…	…
GU	5.00	6

Ongoing Professional Practice Evaluation (OPPE)

- Performance report sent to Chief Medical Officer in undesirable format

Name	Score	Evaluations
BA	4.38	10
MW	4.45	53
DG	4.51	29
ST	4.57	37
…	…	…
AD	4.75	114
…	…	…
GU	5.00	6

- Scores invalid and unreliable

Ongoing Professional Practice Evaluation (OPPE)

- Performance report sent to Chief Medical Officer in undesirable format

Name	Score	Evaluations	
BA	4.38	10	"Worst" in department?
MW	4.45	53	
DG	4.51	29	
ST	4.57	37	
…	…	…	
AD	4.75	114	
…	…	…	
GU	5.00	6	"Best" in department?

Ongoing Professional Practice Evaluation (OPPE)

- Performance report sent to Chief Medical Officer in undesirable format

Name	Score	Evaluations	
BA	4.38	10	"Worst" in department?
MW	4.45	53	
DG	4.51	29	
ST	4.57	37	
…	…	…	
AD	4.75	114	
…	…	…	
GU	5.00	6	"Best" in department?

➢ Ranks invalid and unreliable

Attributes of Work Habits

Attributes of Work Habits

- Six item instrument from Dannefer, modified slightly for nurse anesthetists
- Non-Likert scale

Dannefer EF et al. Med Educ 2005
Logvinov IL et al. Anesth Analg 2017
Dexter F et al. J Clin Anesth 2017

Attributes of Work Habits

1) Consistently seemed unprepared for case(s)

2)

3)

4)

5) Consistently well prepared for case(s)

Attributes of Work Habits

1) Did not communicate clearly his or her reasoning process with regard to solving problem(s)

2)

3)

4)

5) Clearly communicated his or her reasoning process with regard to solving problem(s)

Attributes of Work Habits

1) Lacked initiative or leadership qualities

2)

3)

4)

5) Took initiative and provided leadership

Attributes of Work Habits

1) Dependent upon others for direction with regard to his or her care

2)

3)

4)

5) Thought and worked independently

Anesthesiologists Evaluate Anesthetists' Work Habits

Anesthesiologists Evaluate Anesthetists' Work Habits

- Takes ≤1 min for 89% and ≤2 min for 96%

O'Brien MK et al. J Clin Anesth 2019

Anesthesiologists Evaluate Anesthetists' Work Habits

- Takes ≤1 min for 89% and ≤2 min for 96%
  - ➢ No changing scores once evaluation submitted

Dexter F et al. Cureus 2024

Anesthesiologists Evaluate Anesthetists' Work Habits

- Takes ≤1 min for 89% and ≤2 min for 96%
- No changing scores once evaluation submitted
- ➢ Mean 2.44 evaluations per day on days with ≥1 such evaluation (standard deviation 1.26)

Dexter F et al. Cureus 2024

Anesthesiologists Evaluate Anesthetists' Work Habits

- Email request for evaluation sent early next day after ≥1 hour anesthesia time together
  - Completed 2 days later (50th), 1 day (25th), and 5 days later (75th percentile)

Dexter F et al. Periop Care Oper Room Manag 2025

Anesthesiologists Evaluate Anesthetists' Work Habits

- If evaluations were completed on same day that requested, evaluations could be done once per week, reducing evaluation requests by 7.1% (4794/67,274)

Dexter F et al. Cureus 2023

Anesthesiologists Evaluate Anesthetists' Work Habits

- If evaluations were completed on same day that requested, evaluations could be done once per week, reducing evaluation requests by 7.1% (4794/67,274)
  - ➢ Because median 2 days to complete, in reality could reduce requests by at most 1.7%, so our department uses daily requests

Dexter F et al. Cureus 2023

High Internal Consistency Among the 6 Items

High Internal Consistency Among the 6 Items

- Cronbach α in routine use 0.96 (SE 0.001)
  - (89.2% items scored "5")^6 = 50.3% would be percentage all 6 items "5" if statistically independent, but actual percentage 82.3%

Dexter F et al. Periop Care Oper Room Manag 2025

High Internal Consistency Among the 6 Items

- Cronbach α in routine use 0.96 (SE 0.001)
  - (89.2% items scored "5")^6 = 50.3% would be percentage all 6 items "5" if statistically independent, but actual percentage 82.3%
- ➢ Instrument functionally acts as binary evaluation, all 5's versus one or more $\leq$4

Dexter F et al. Periop Care Oper Room Manag 2025

Content Validity of Work Habits Important for Anesthesia

Dexter F et al. Anesth Analg 2016

Dexter F et al. J Clin Anesth 2017

Content Validity of Work Habits Important for Anesthesia

- Among 6692 comments by anesthesiologists of anesthesia residents, 51% included the theme of work habits

Dexter F et al. Anesth Analg 2016

Dexter F et al. J Clin Anesth 2017

Content Validity of Work Habits Important for Anesthesia

- Among 6692 comments by anesthesiologists of anesthesia residents, 51% included the theme of work habits
- ➢ Among 153 comments of negative sentiment about nurse anesthetist, 60% included the theme of work habits

Dexter F et al. Anesth Analg 2016

Dexter F et al. J Clin Anesth 2017

Concurrent Validity

- Greater chief CRNA's qualitative annual evaluation scores, made without knowledge of the work habits scores, associated with greater odds of all 6 of the work habit items scored "5" (P = 0.0004)

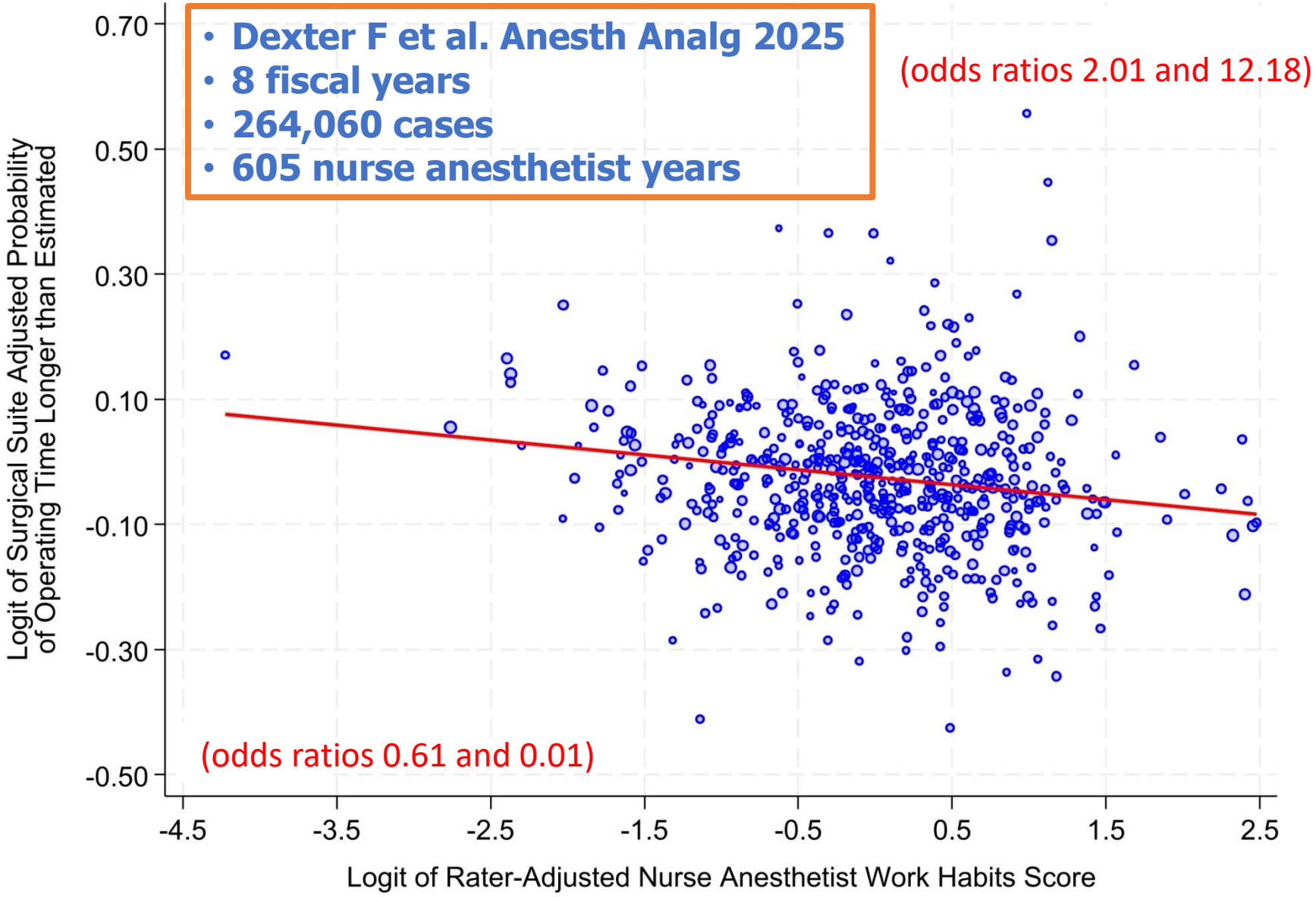
Dexter F et al. J Clin Anesth 2017

Concurrent Validity

- Anesthesiologist comments of negative sentiment included with evaluation were associated with greater odds of one or more of the 6 items scored < 5 (odds ratio 54.5, P <0.0001, 95% confidence limit ≥19.1)

Dexter F et al. J Clin Anesth 2017

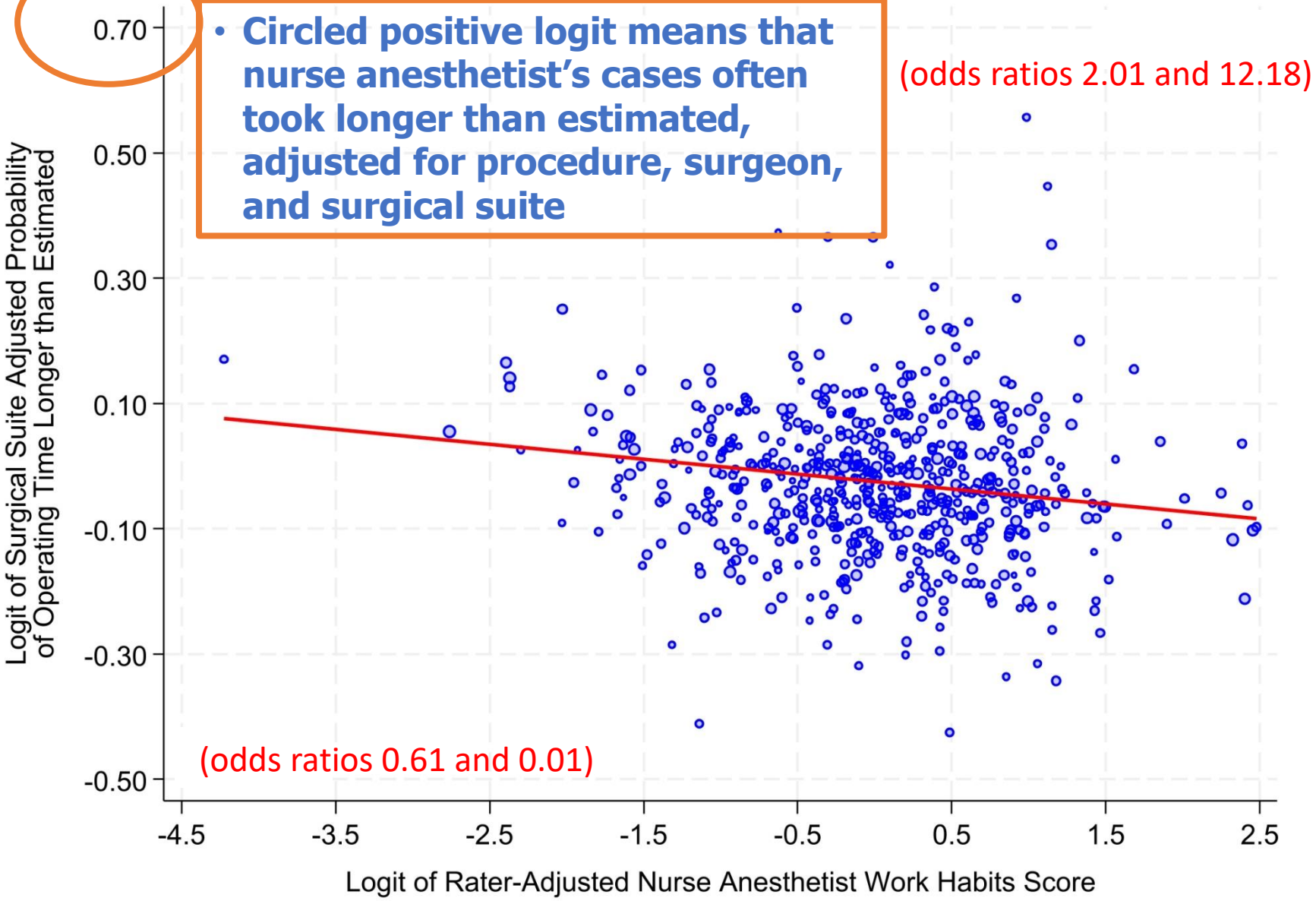
Predictive Validity



Predictive Validity

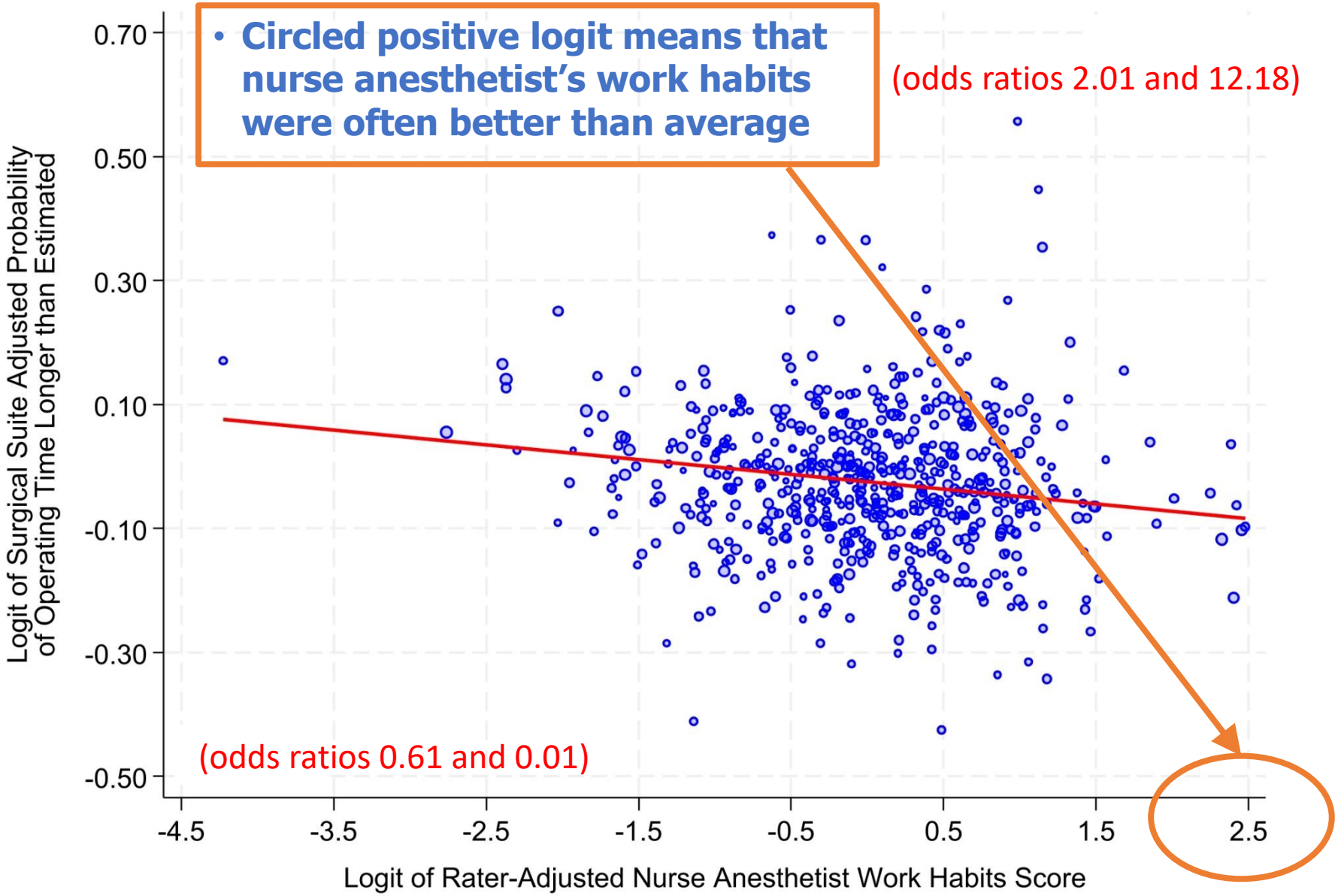
- **Circled positive logit means that nurse anesthetist's cases often took longer than estimated, adjusted for procedure, surgeon, and surgical suite**

(odds ratios 2.01 and 12.18)

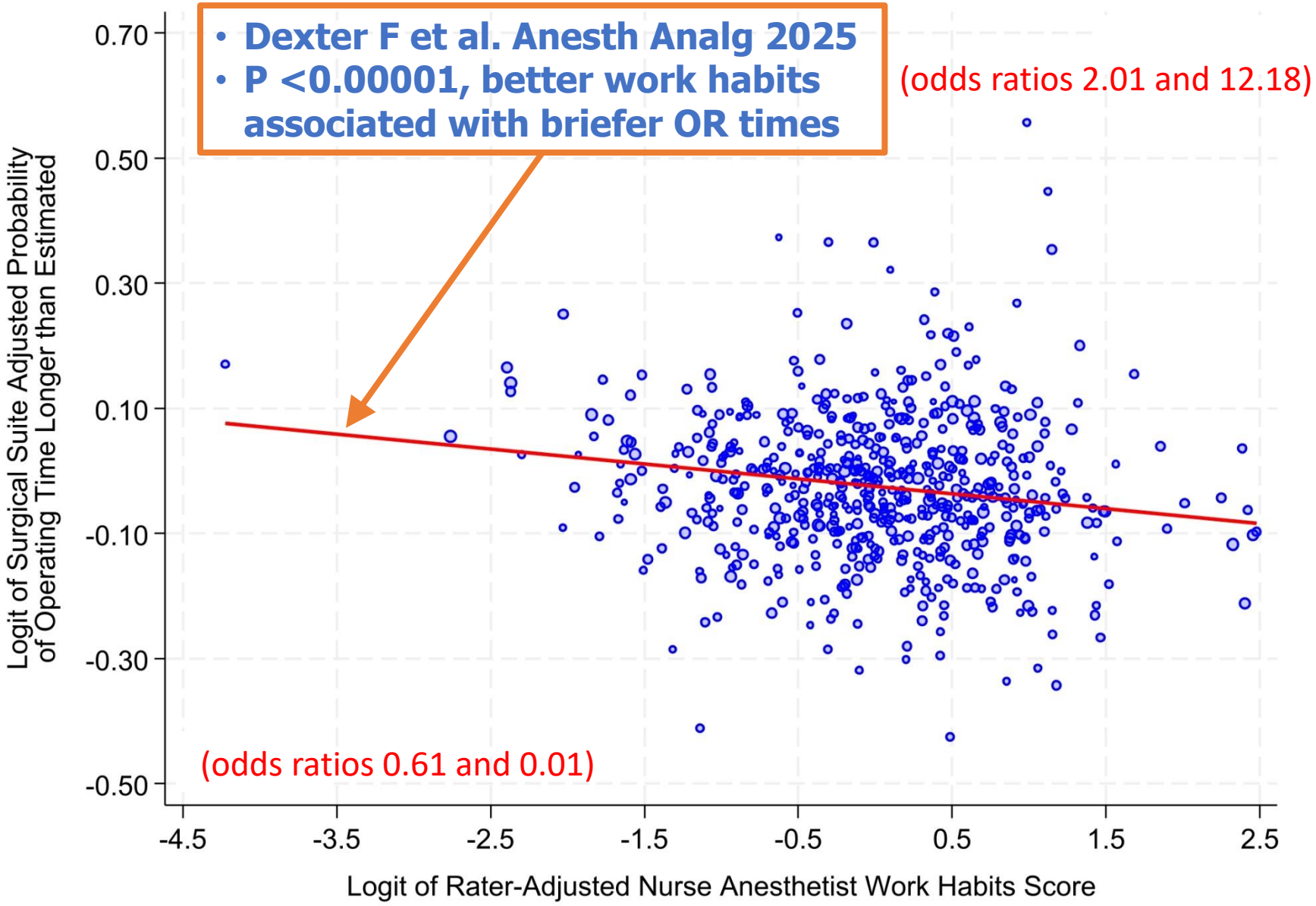


(odds ratios 0.61 and 0.01)

Predictive Validity



Predictive Validity



Covariates

Covariates Not Important

- Absence (P > 0.10) of correlation between estimated work habits and:
  - Cases performed at night,
  - Cases of high physiological complexity,
  - Cases with high physical status of patients,
  - Cases with infants or toddlers,
  - Cases with patients ≥80 years

Dexter F et al. Cureus 2024

Covariates Not Important

- Absence (P > 0.10) of correlation between estimated work habits and:
  - Hours with anesthesiologist that day,
  - Count of ratees of anesthesiologist that day,
  - Count of occasions previously worked with anesthesiologist,
  - Break(s) or handoff(s) during case(s)

Dexter F et al. Cureus 2024

Dexter F et al. J Clin Anesth 2017

Anesthesiologists as Covariates

- Leniency/ severity of the anesthesiologist
  - Scientific term for heterogeneity among raters

Bayman EO et al. Perioper Care Oper Room Manag 2017
Dexter F et al. Health Care Manag Sci 2020

Anesthesiologists as Covariates

- Leniency/ severity of the anesthesiologist
  - Scientific term for heterogeneity among raters
  - ➢ Unless adjust for rater leniency, evaluations of anesthetists' work habits will be biased, even if evaluations qualitative

Dexter F et al. Perioper Care Oper Room Manag 2022

Dexter F et al. J Clin Anesth 2020

Bayman EO et al. Perioper Care Oper Room Manag 2017

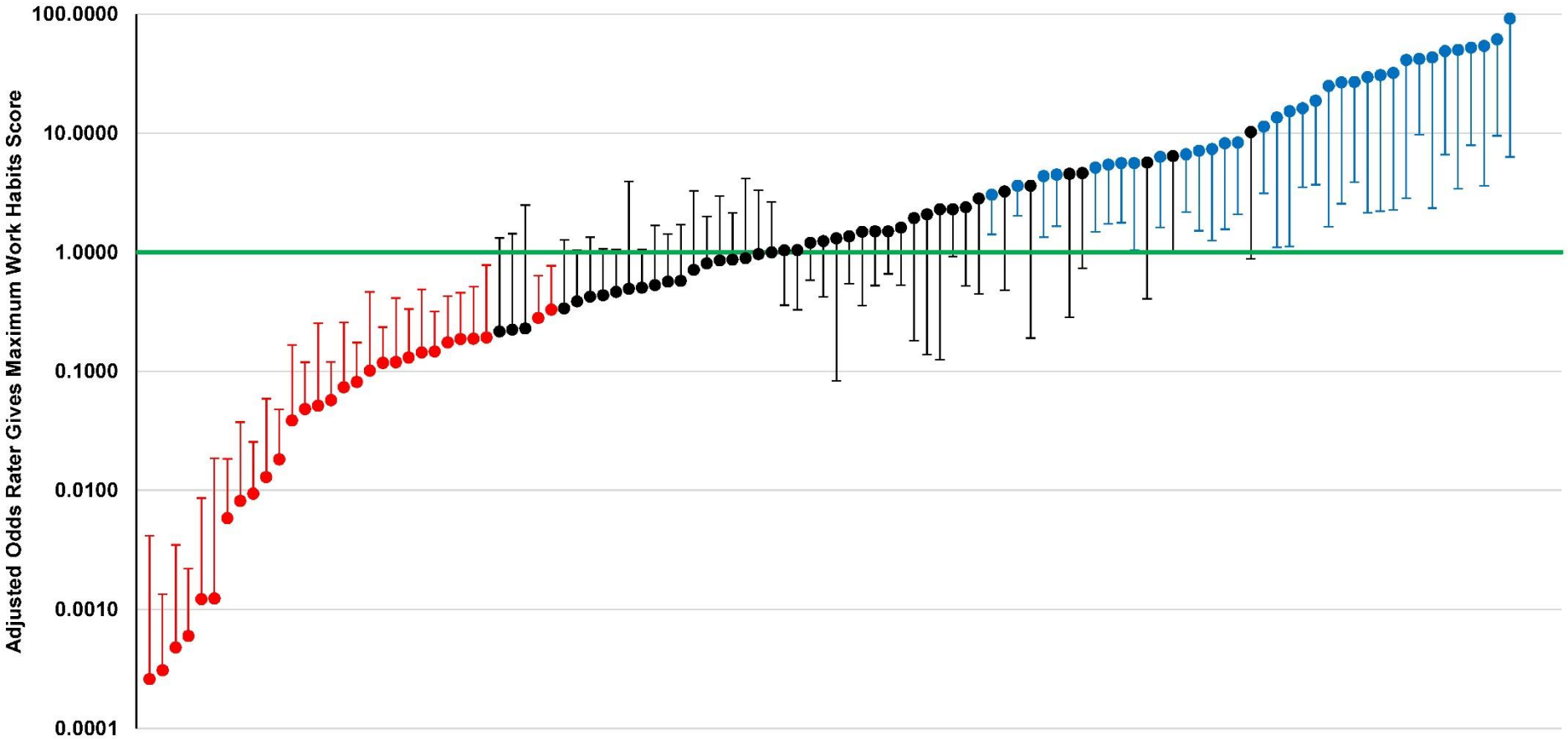
Dexter F et al. Health Care Manag Sci 2020

Dexter F et al. Cureus 2025

Anesthesiologists as Covariates

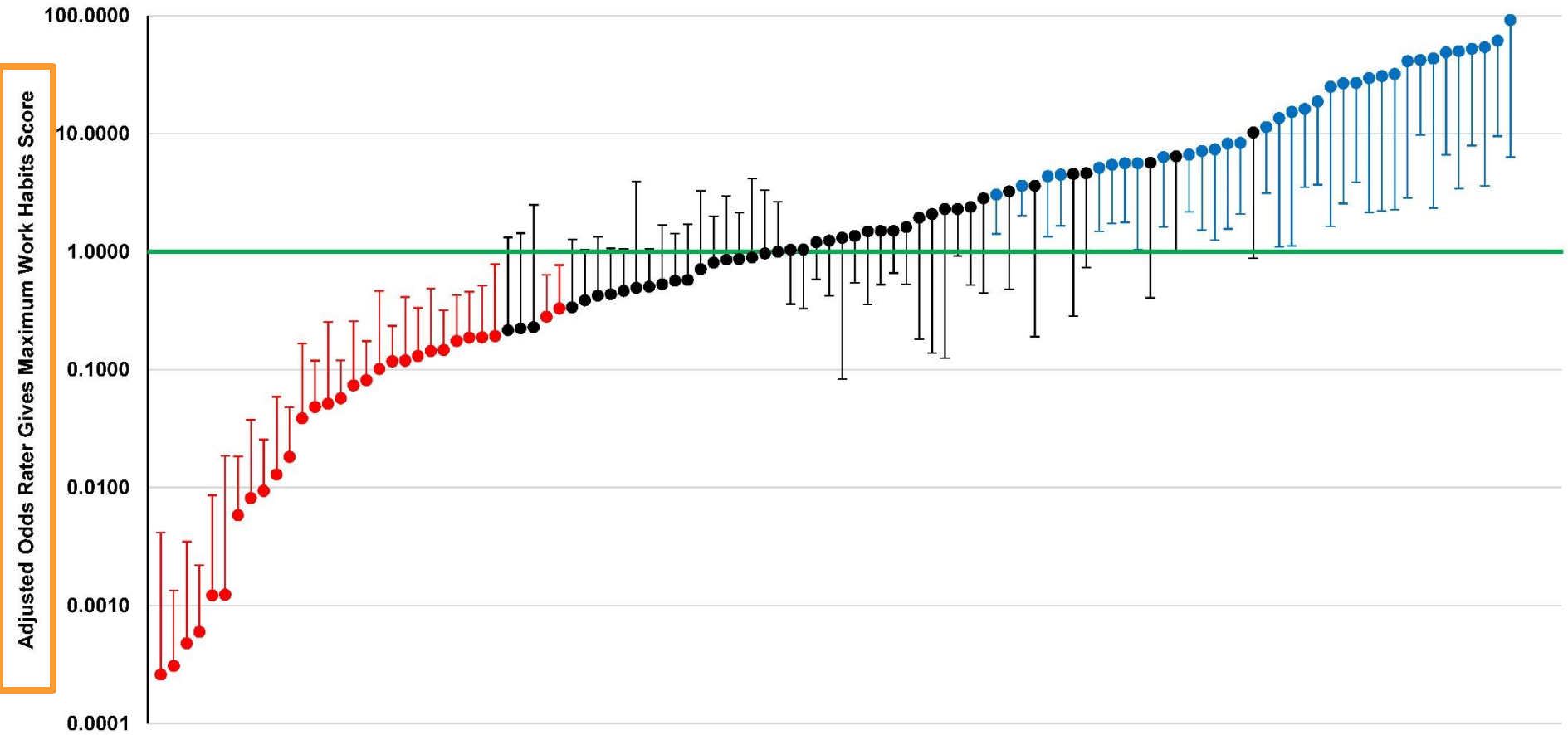
- Leniency/ severity of the anesthesiologist
  - Scientific term for heterogeneity among raters
  - Unless adjust for rater leniency, evaluations of anesthetists' work habits will be biased, even if evaluations qualitative
  - ➢ Raw scores are not just hypothetically influenced by implicit bias, subsequent results show that they are biased

Anesthesiologists as Covariates



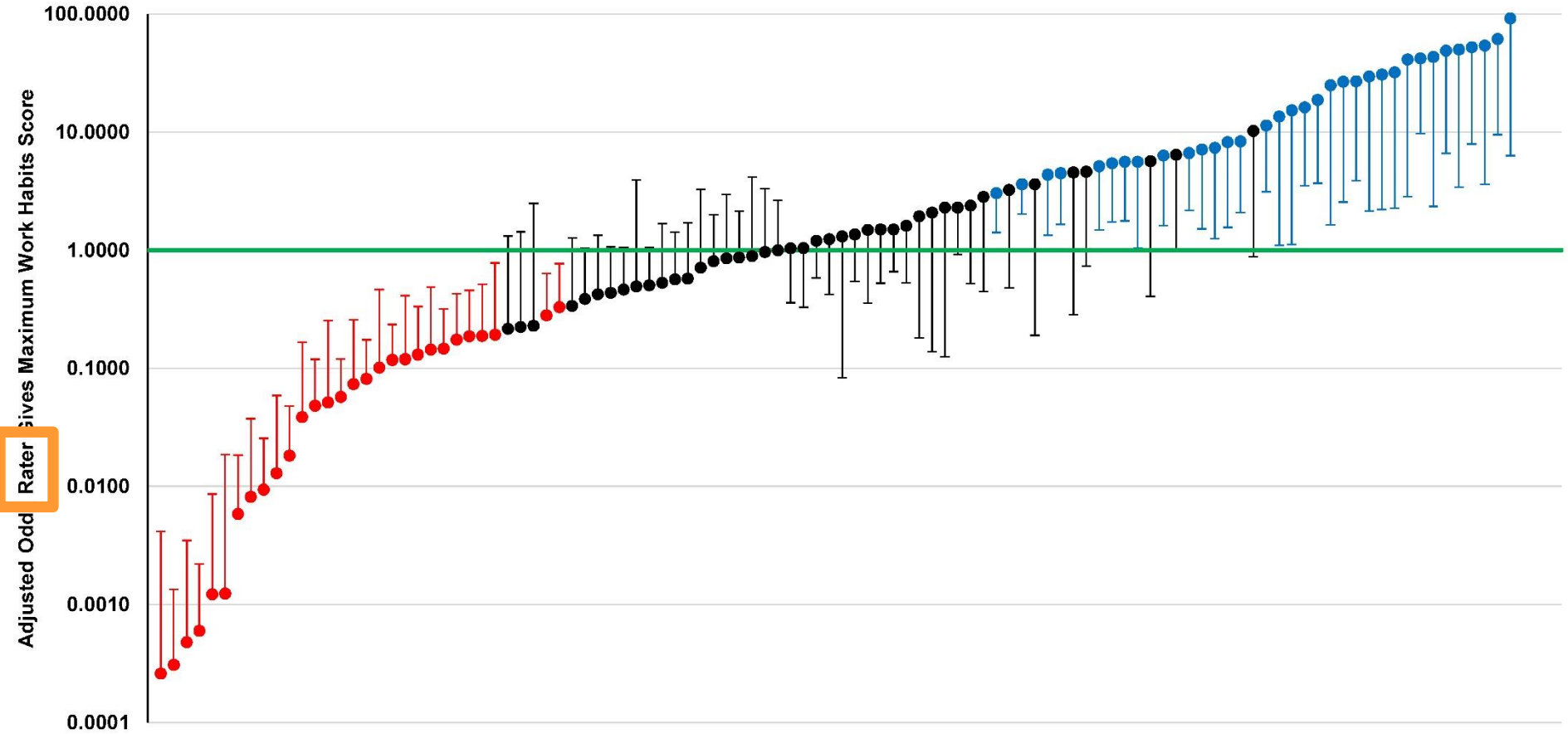
Dexter F et al. Health Care Manag Sci 2020

Anesthesiologists as Covariates



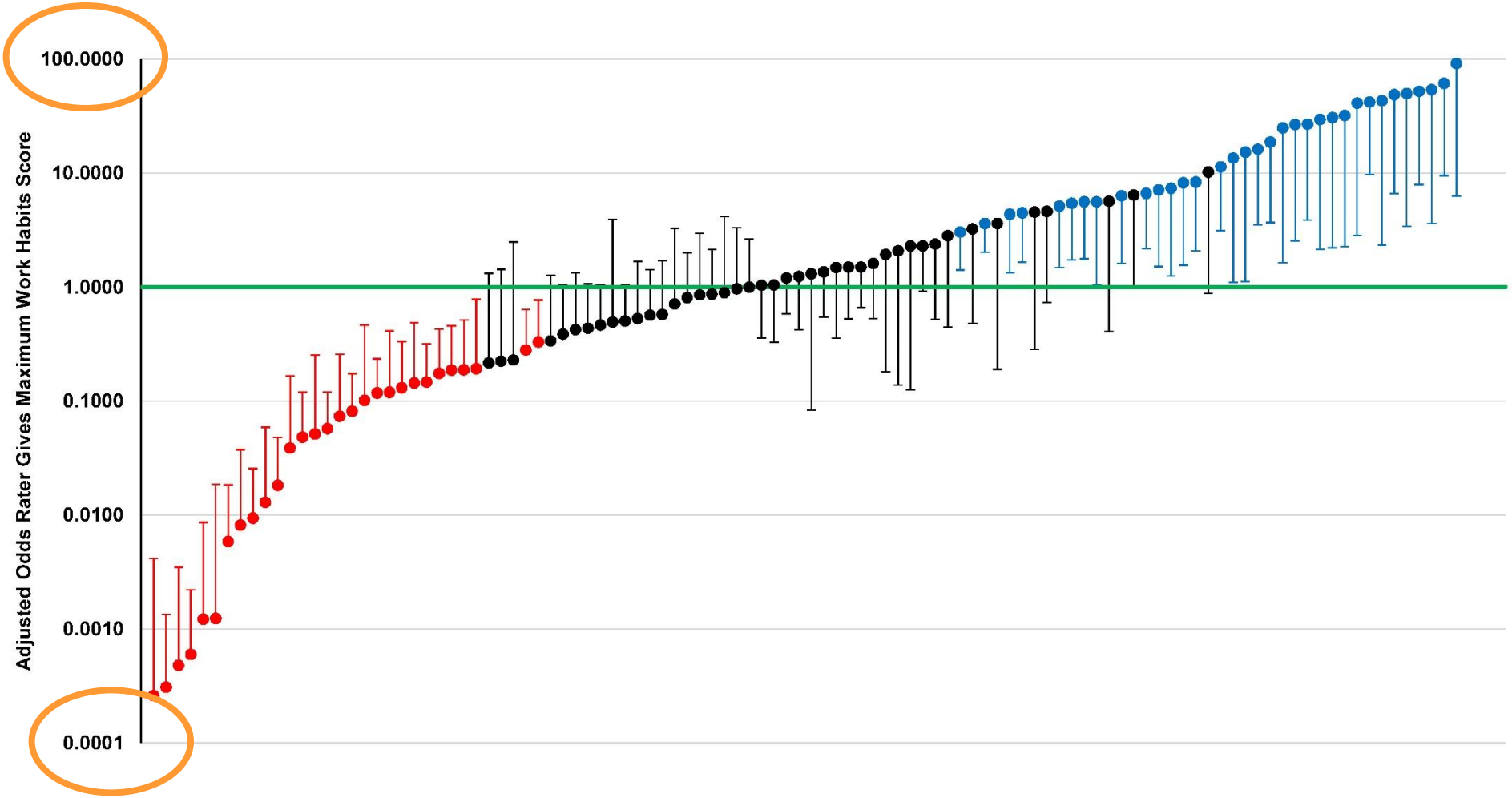
Dexter F et al. Health Care Manag Sci 2020

Anesthesiologists as Covariates



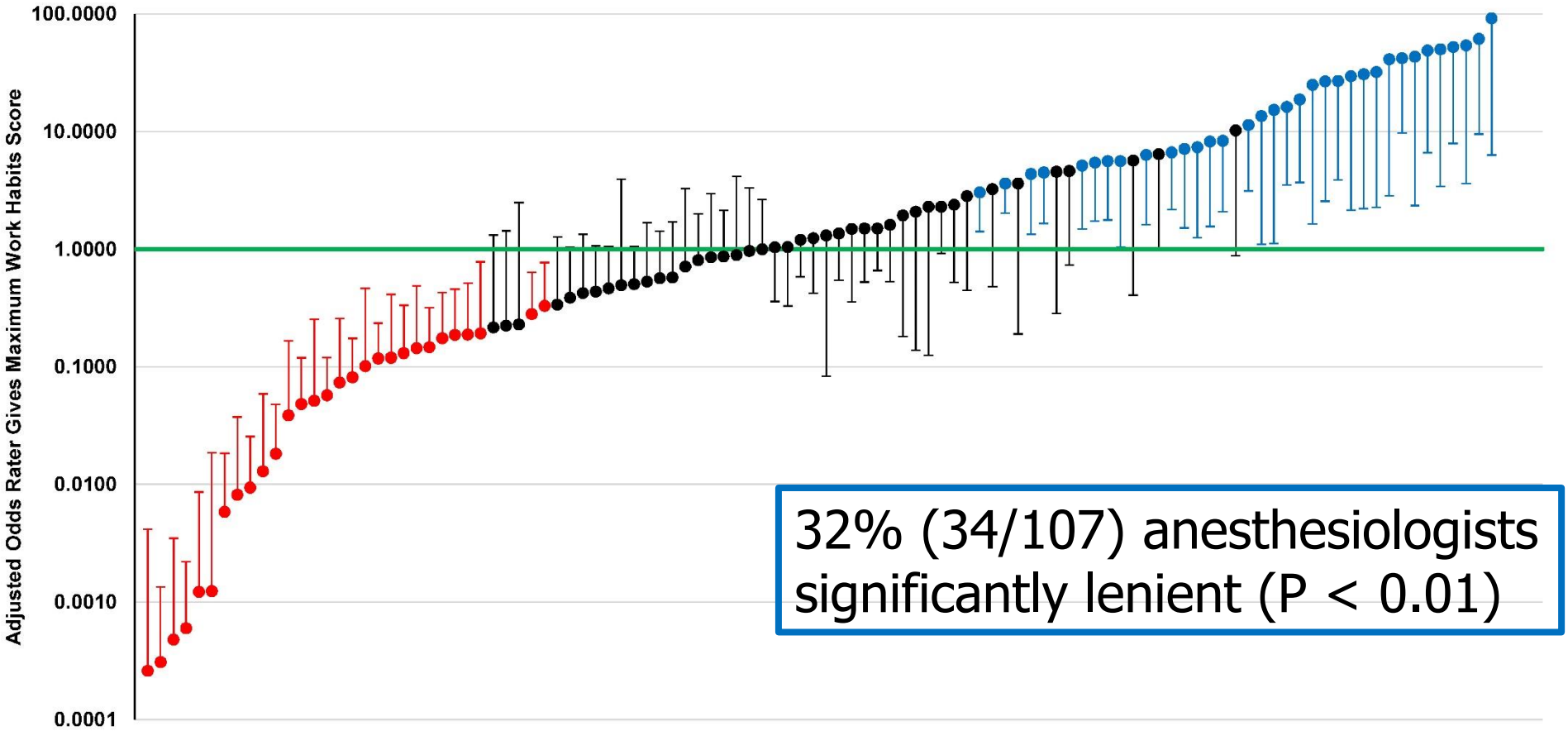
Dexter F et al. Health Care Manag Sci 2020

Anesthesiologists as Covariates



Dexter F et al. Health Care Manag Sci 2020

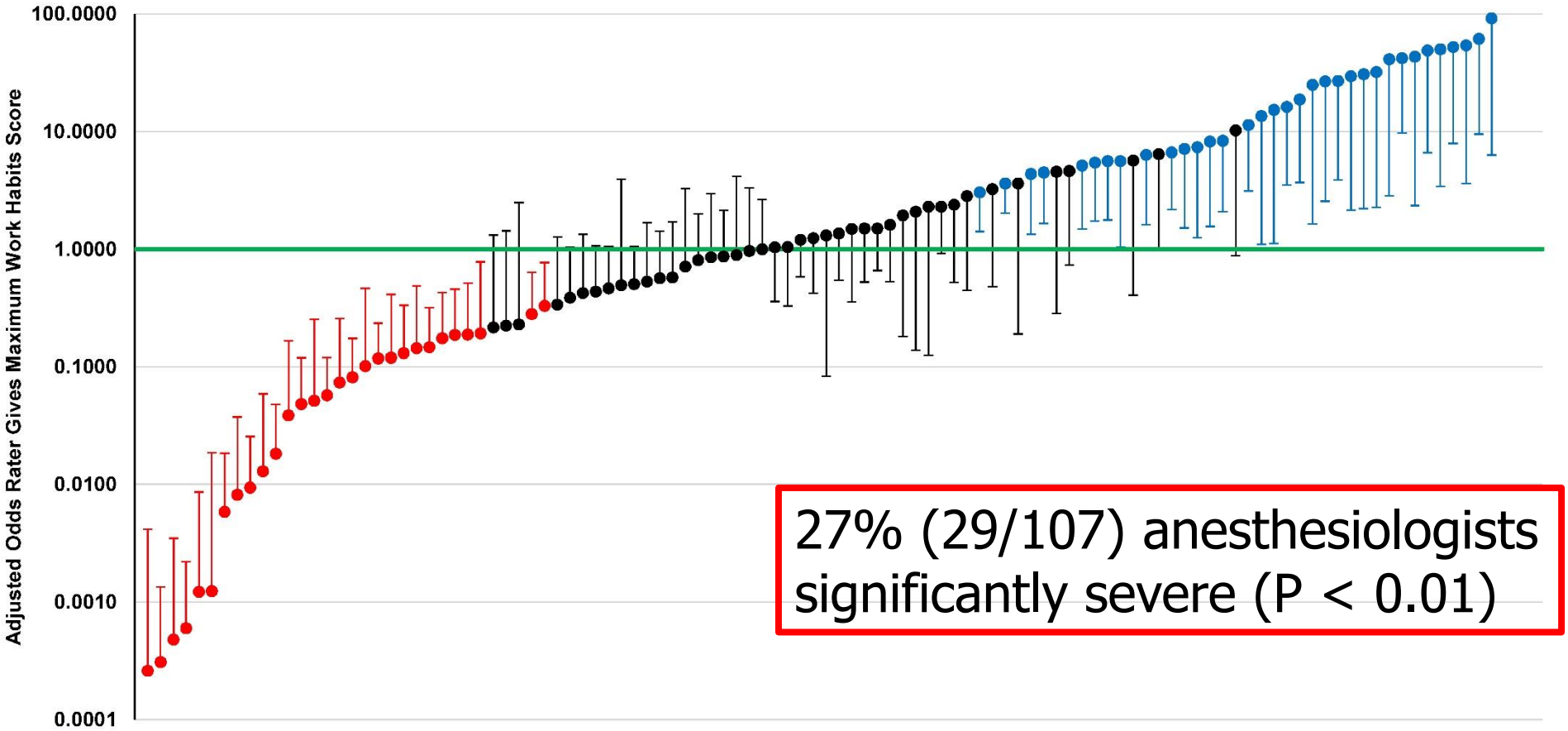
Anesthesiologists as Covariates



32% (34/107) anesthesiologists significantly lenient (P < 0.01)

Dexter F et al. Health Care Manag Sci 2020

Anesthesiologists as Covariates



27% (29/107) anesthesiologists significantly severe (P < 0.01)

Dexter F et al. Health Care Manag Sci 2020

Anesthesiologists as Covariates

- Leniency/ severity of the anesthesiologist
  - Scientific term for heterogeneity among raters
  - Unless adjust for rater leniency, evaluations of anesthetists' work habits will be biased, even if evaluations qualitative
  - Raw scores are not just hypothetically influenced by implicit bias, subsequent results show that they are biased
    - ➢ Effects do not average out because pairings of raters and ratees are non-random (P <0.00001)

Dexter F et al. Health Care Manag Sci 2020

Use Mixed Effects Logistic Regression

- Model the proportions of evaluations with all items scored "5"
  - Raters treated as fixed effects
  - Ratees treated as random effect
    - Empirical Bayes means and standard errors

Dexter F et al. Perioper Care Oper Room Manag 2022

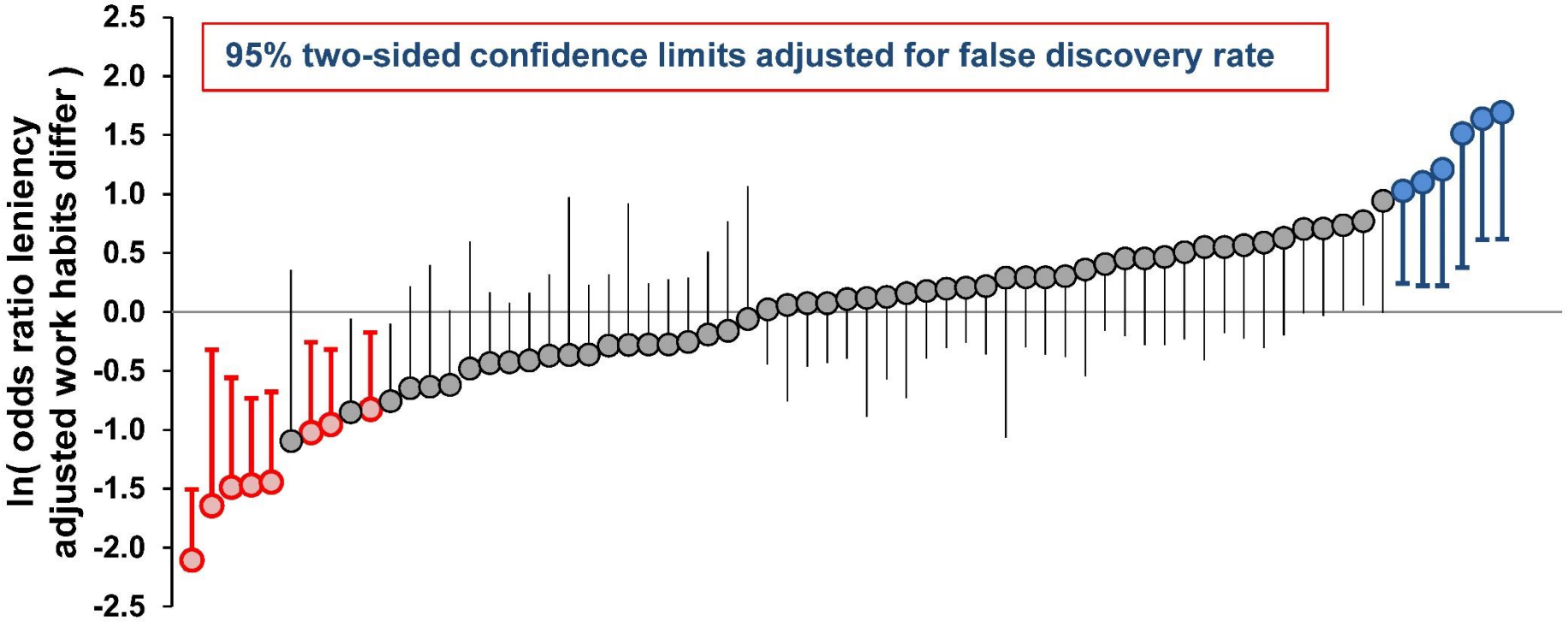
Dexter F et al. J Clin Anesth 2020

Bayman EO et al. Perioper Care Oper Room Manag 2017

Dexter F et al. Cureus 2025

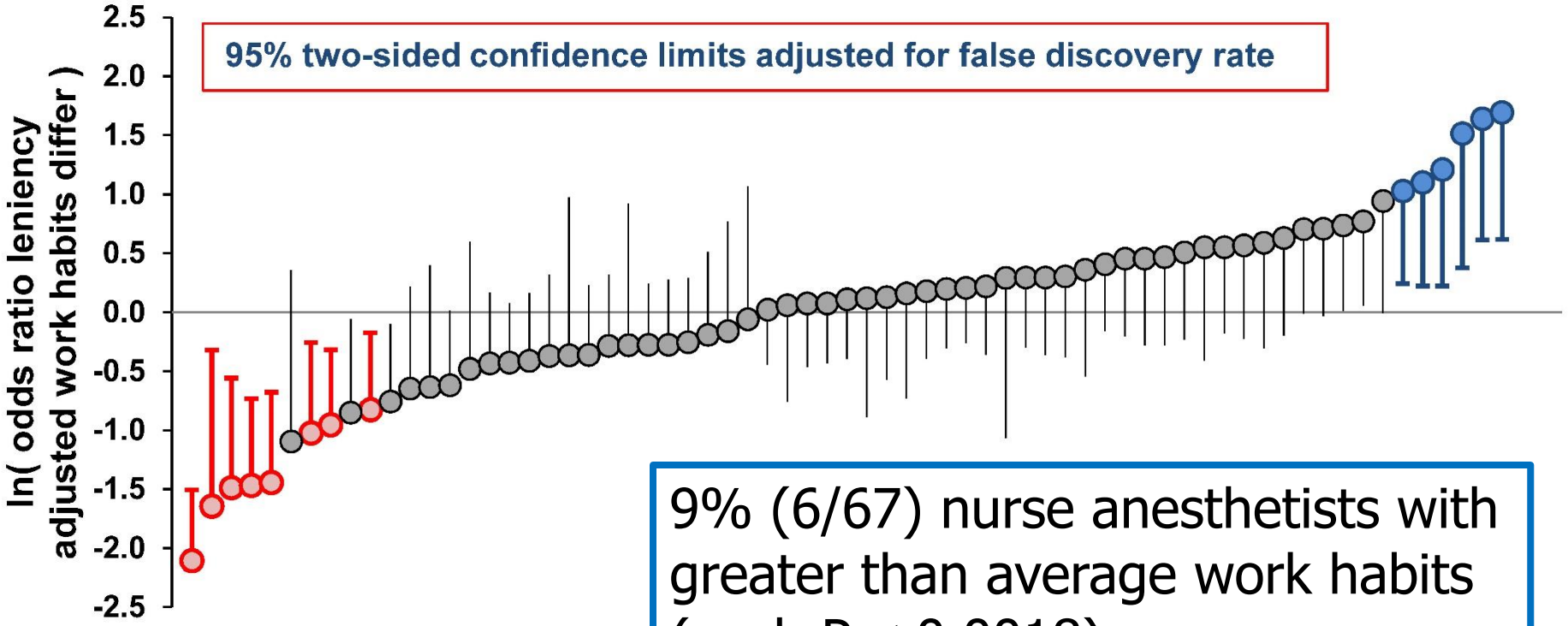
Dexter F et al. Health Care Manag Sci 2020

Use Mixed Effects Logistic Regression



Dexter F et al. J Clin Anesth 2017

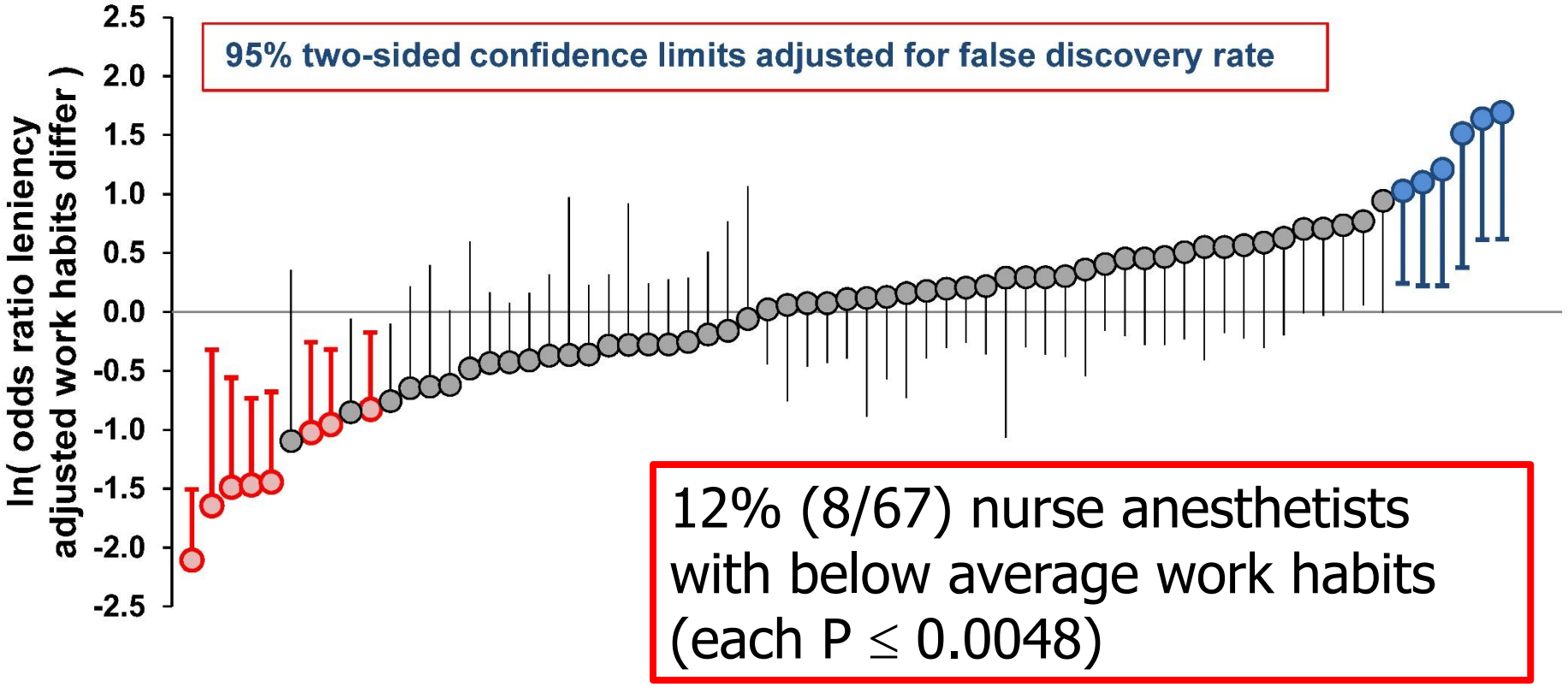
Use Mixed Effects Logistic Regression



9% (6/67) nurse anesthetists with greater than average work habits (each $P \leq 0.0018$)

Dexter F et al. J Clin Anesth 2017

Use Mixed Effects Logistic Regression



12% (8/67) nurse anesthetists with below average work habits (each $P \leq 0.0048$)

Dexter F et al. J Clin Anesth 2017

Example OPPE Report for the Chair and the Chief CRNA

Ratee	Odds ratio (99% interval) (max score / raw count)
20207057	0.08 (< 0.26) (15/31)
20202896	0.17 (< 0.38) (51/78)
20203404	0.24 (< 0.64) (54/70)
20205255	0.31(< 0.76) (45/65)
20200888	4.81 (> 1.26) (58/63)
20203008	4.93 (> 1.29) (52/60)
20203267	13.44 (> 1.93) (25/28)
20205510	0.17 (< 1.71) (6/11)
20207156	0.19 (< 1.03) (13/20)
20201272	1.15 (> 0.29) (35/41)

Example OPPE Report for the Chair and the Chief CRNA

Ratee	Odds ratio (99% interval) (max score / raw count)
20207057	0.08 (< 0.26) (15/31)
20202896	0.17 (< 0.38) (51/78)
20203404	0.24 (< 0.64) (54/70)
20205255	0.31(< 0.76) (45/65)
20200888	4.81 (> 1.26) (58/63)
20203008	4.93 (> 1.29) (52/60)
20203267	13.44 (> 1.93) (25/28)
20205510	0.17 (< 1.71) (6/11)
20207156	0.19 (< 1.03) (13/20)
20201272	1.15 (> 0.29) (35/41)

Type I and II Errors Neglecting Raters

Unadjusted logistic regression failed to detect that anesthetist significantly in lower half, but mixed effects model found odds ratio less than 1.00	6% (4/66)
Unadjusted logistic regression failed to detect that anesthetist significantly in upper half, but mixed effects model found odds ratio greater than 1.00	2% (1/66)
Unadjusted logistic regression falsely detected that anesthetist significantly in upper half, but mixed effects model found odds ratio not different than 1.00	8% (5/66)
Overall misclassification using unadjusted analysis, Type II (6%) + Type II (2%) + Type I (8%)	15% (10/73)

Dexter F et al. J Clin Anesth 2020

Type I and II Errors Neglecting Raters

- Reproducible with different University (Florida), evaluating anesthesiologists
- Misclassification 22% (24/108)
  - Adjustment for rater leniency needed because greater heterogeneity of scores among raters (eta-squared 0.40) than among ratees (0.22)

Dexter F et al. Cureus 2025

Feedback to Raters to Increase Information from Evaluations

Dexter F et al. Perioper Care Oper Room Manag 2022

Feedback to Raters to Increase Information from Evaluations

- None of the following raters has provided incremental information about ratees
  - 100 evaluation requests, all completed, all ratees given maximum score of 5.00
  - 100 evaluation requests, 50 completed, no ratee given maximum score of 5.00
  - 100 evaluation requests, 0 completed

Dexter F et al. Perioper Care Oper Room Manag 2022

Feedback to Raters to Increase Information from Evaluations

- None of the following raters has provided incremental information about ratees
  - 100 evaluation requests, all completed, all ratees given maximum score of 5.00
  - 100 evaluation requests, 50 completed, no ratee given maximum score of 5.00
  - 100 evaluation requests, 0 completed

➢ Completing evaluations shows raters' work habits and conscientiousness, but objective of evaluation is to learn about the ratees

Dexter F et al. Perioper Care Oper Room Manag 2022

Feedback to Raters to Increase Information from Evaluations

- None of the following raters has provided incremental information about ratees
  - 100 evaluation requests, all completed, all ratees given maximum score of 5.00
  - 100 evaluation requests, 50 completed, no ratee given maximum score of 5.00
  - 100 evaluation requests, 0 completed

Scores, but provide no information

Dexter F et al. Perioper Care Oper Room Manag 2022

Feedback to Raters to Increase Information from Evaluations

- Insight from anesthesiologists' 40,027 evaluations of nurse anesthetists' work habits
  - Few (12%) consecutive ratings by same rater included >10 ratings with all scores the same

Dexter F et al. Perioper Care Oper Room Manag 2022

Feedback to Raters to Increase Information from Evaluations

- Insight from anesthesiologists' 40,027 evaluations of nurse anesthetists' work habits
  - Few (12%) consecutive ratings by same rater included >10 ratings with all scores the same
    - ➢ Those runs continued, median 13 additional ratings with scores the same

Dexter F et al. Perioper Care Oper Room Manag 2022

Feedback to Raters to Increase Information from Evaluations

- Insight from anesthesiologists' 40,027 evaluations of nurse anesthetists' work habits
  - Few (12%) consecutive ratings by same rater included >10 ratings with all scores the same
    - Those runs continued, median 13 additional ratings with scores the same
    - ➢ We send automatic email notification (feedback) after run of 10 such ratings

Feedback to Ratees on their Work Habits Scores

Dexter F et al. J Clin Anesth 2017

Feedback to Ratees on their Work Habits Scores

- During the six months after the nurse anesthetists received their work habits scores and knew the scores were being used for ongoing professional practice evaluation, there were increases in the work habits scores compared with the preceding six months ($P < 0.0001$)

Dexter F et al. J Clin Anesth 2017

University of Iowa Department of Anesthesia

- Nearly every paper in this lecture was work with contribution of the University of Iowa
- Department's faculty, residents, and nurse anesthetists have contributed to scholarship in understanding the evaluation of anesthesia faculty in clinical practice

Evidence-Based Anesthesia Group Management

- www.FranklinDexter.net/education.htm
  - Example reports with calculations
  - Lectures on preoperative evaluation clinics, day of surgery decision making, PACU staffing, OR allocation and staffing, anesthesia staffing, financial analysis, comparing surgical services among hospitals, and strategic decision making
- www.FranklinDexter.net
  - Comprehensive bibliography of peer reviewed articles in operating room and anesthesia group management