Increasing Disparity: The Scanlan Effect

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www.StatLit.org/pdf/2018-Schield-CTC2-Slides.pdf

Disparate Outcomes: Call to Action

Disparate outcomes are typically relative.
Today, disparate group outcomes are viewed as:
- being bad.
- something to be eliminated.
- something requiring political action.

Disparities can be
1. Cross-sectional (at the same time)
2. Longitudinal (before-after time)

Hypothetical Case Study #1 Cross-sectional

99% of men would remarry their spouse
90% of women ……...

Men are 10% more likely to remarry their spouse.

1% of men would not remarry their spouse
10% of women ……..

Women are 10 times as likely to not remarry their spouse as are men.

Hypothetical Case Study #1 Cross-sectional

A ratio of two large percentages always creates a larger ratio of their small complements.

This is true for complementary ratios taken at the same moment in time (cross-sectional).

Hypothetical Case Study #2 Longitudinal

Initially (for success)
- Advantaged (90%); Disadvantaged (80%).

Relative to the disadvantaged, the advantaged have:
- a 10 point (13%) higher success rate.

Suppose these disparities are seen as a problem!

Management
- Institutes training program
- Redefines criteria for failure and success.
- Monitors progress.

Hypothetical Case Study #2 Success Rates Improved

A year later (for success outcome):
- Advantaged success 99%; disadvantaged 94%.
- Advantaged rate: up 10% (90% to 99%).
- Disadvantaged rate: up by 18% (80% to 94%)
- **Disparity difference cut** from 10 points to 5.
- **Disparity ratio decreased** from 1.13 to 1.05.

Looks good. Mission accomplished???

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Hypothetical Case Study #2 Failure Disparity Increased

A year later:
- Advantaged failure rate is 1%.
- Disadvantaged failure rate is 6%.

- **Disparity difference** cut by 5 points.
- **Disparity ratio increases** from two to 6.

This three-fold increase is a BIG problem!!
This increase is "journalistically-significant"!

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School Suspension Disparity: Good Intention; Good Result

Disparity ratio before: 2 to 1 (20%/10%)

	Minor	Major	
	15%	5%	Dis
	5%	5%	Adv

Action: Eliminate suspension for 'small stuff.'
Result 1: Disparity difference eliminated: Zero
Result 2: Disparity ratio eliminated. One.

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School Suspension Disparity: Good Intention; Neutral Result

Disparity ratio before: 2 to 1 (20%/10%)

	Minor	Major	
	10%	10%	Dis
	5%	5%	Advantaged

Action: Eliminate suspension for 'small stuff.'
Result 1: Disparity difference halved: 10 pts to 5.
Result 2: Disparity ratio (2 to 1) unchanged.

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School Suspension Disparity: Good Intention; Bad Result

Disparity ratio before: 2 to 1 (20%/10%)

	Minor	Major	
	10	10%	Dis
	7%	3%	Advantaged

Action: Eliminate suspension for 'small stuff.'
Result 1: Disparity difference decreases by 3 pts.
Result 2: Disparity ratio increases from 2 to 3.3.

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Summary: Longitudinal Change

Unlikely outcomes: If percentage reductions are identical for advantaged and disadvantaged, then the disparity ratio remains the same.

Unlikely outcomes; If percentage decrease is bigger for advantaged than for disadvantaged, **then disparity ratio will increase.**

Bottom line: It all depends on the "mix"!

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The Scanlan Rule

Scanlan rule: "the rarer an outcome, the greater tends to be the relative difference in experiencing it and the smaller tends to be the relative difference in avoiding it."

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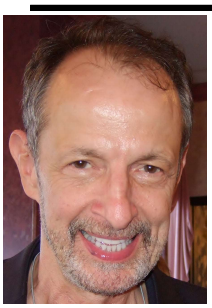
James P. Scanlan, Attorney: Identified the Scanlan Effect



Washington DC. Harvard Law
His website: ***JPScanlan.com***
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Calling attention to the Scanlan effect for 31 years.

Scanlan Effect Examples

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As health-care receipt rates increase, disparities in *receipt* tend to decrease but relative differences in *non-receipt* tend to increase.

Lowering credit score requirements tends to reduce disparities in *acceptance* while increasing relative differences in *rejection*.

As immunization and cancer screening become more common, relative differences in *receipt* tend to decrease while relative differences in *failing to receive* them tend to increase.

As *hiring and promotion* percentages increase, the disparity ratios for those *not hired or not promoted* tend to increase.

Example: Minnesota School Data: 2013-2018

Black students are expelled or suspended eight times as often as white students; American Indians are punished 10 times as often.

Students with disabilities make up 14% of all K-12 students; 43% of suspensions and expulsions.

A third of all school exclusions are for minor incidents: talking back, eye rolling or swearing.

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St. Paul schools scrutinize student suspensions

St. Paul staff "took racial equity training, the district narrowed the types of behaviors that were to result in suspension, and principals were instructed to keep kids in class when possible."

Suspensions dropped significantly, ***but racial disparities … actually increased****.*

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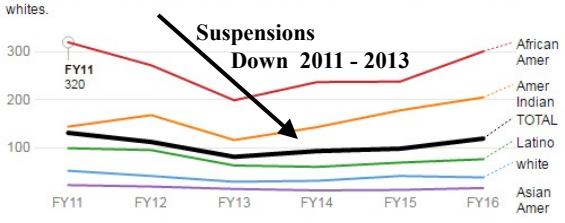
SPPS suspensions per 1,000 students

Out-of-school suspensions in St. Paul Public Schools have risen three consecutive years. In 2015-16, there were 119 suspensions for every 1,000 students. African-American and American Indian students had far higher suspension rates than Asian-Americans and whites.



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Disparity (Ratios) Up

SUSPENSION RATE RATIOS (vs white)			
Year	Latino	Am Ind	Afro-Am
FY11	1.9	2.8	6.2
FY12	2.3	4.1	**6.6**
FY13	2.2	4.0	**6.9**
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Suspension Disparity Ratio: Up

2012-2014: Suspension rates drop

- 44% drop for Whites, 37% drop for Afro-Am.

Afro-American vs. white disparity ratio increased

- From 6.2 to 7.6 (23% increase)

Why? White rate dropped more than Afro-Amer.

Source: Josh Vergas, St. Paul Pioneer Press.

Four Conclusions

1. A small ratio of two large percentages always creates a larger ratio of their complements.
2. If the percentage reduction in the less-likely outcomes is bigger for the advantaged than for the disadvantaged, then the disparity ratio will increase.
3. Less-Likely outcome: If the percentage reduction in the advantaged rate is greater than that in the disparity difference, then disparity ratio will increase.
4. As prevalence of rare outcomes decrease, the easier (more likely) it is for the disparity ratio to increase.

The Scanlan Effect

Scanlan Effect: "As the chance of an unlikely outcome decreases, the disparity ratios tend to increase.

Why?

1. Percentage decreases in rate of adverse outcomes tends to be larger for advantaged than for disadvantaged.
2. Relative decreases in differences tend to be outweighed by larger relative decreases in the smaller prevalence so the disparity ratio increases.

Key Scanlan References: Statistics-Related (31 years)

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Prevalence-Difference Proof: Prevalences: small adverse outcomes

P(Adv,1): Prevalence for advantaged before the change
P(Dis, 2): prevalence for disadvantaged after the change.
D(1) = Initial difference = P(Dis,1)-P(Adv,1) > 0.
R(2) = Final ratio = P(Ddis,2)/P(Adv,2) > 1.

R(k) = P(Dis,k)/P(Adv,k) = 1 + D(k)/P(Adv,k). k = 1, 2.

R(2) – R(1) = D(2)/P(Adv,2) – D(1)/P(Adv,1)

R(2) – R(1) > 0 if D(2)/D(1) > P(Adv,2)/P(Adv,1)
R(2) – R(1) > 0 if P(Adv,1)/**P(Adv,2)** > D(1)/D(2)

Adverse disparity ratio must increase if relative reduction in prevalence exceeds the relative reduction in difference.

Percentage Reduction Proof Assume unlikely outcomes

P(Adv,1) = Prevalence among Advantaged before.
P(Dis,2) = Prevalence among Disadvantaged after.

1-P(Adv,2)/P(Adv,1): Reduction ratio Adv [Radv]
1-P(Dis,2) / P(Dis,1): Reduction ratio Dis [Rdis]

Rk = Disparity ratio = P(Dis,k)/P(Adv,k) for k =1,2

R2 – R1 = P(Dis,2)/P(Adv,2) - P(Dis,1)/P(Adv,1)
R2-R1 > 0 if P(Dis,2)/P(Adv,2)>P(Dis,1)/P(Adv,1)
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R2-R1 > 0 if -Rdis > -Radv or Radv > Rdis.

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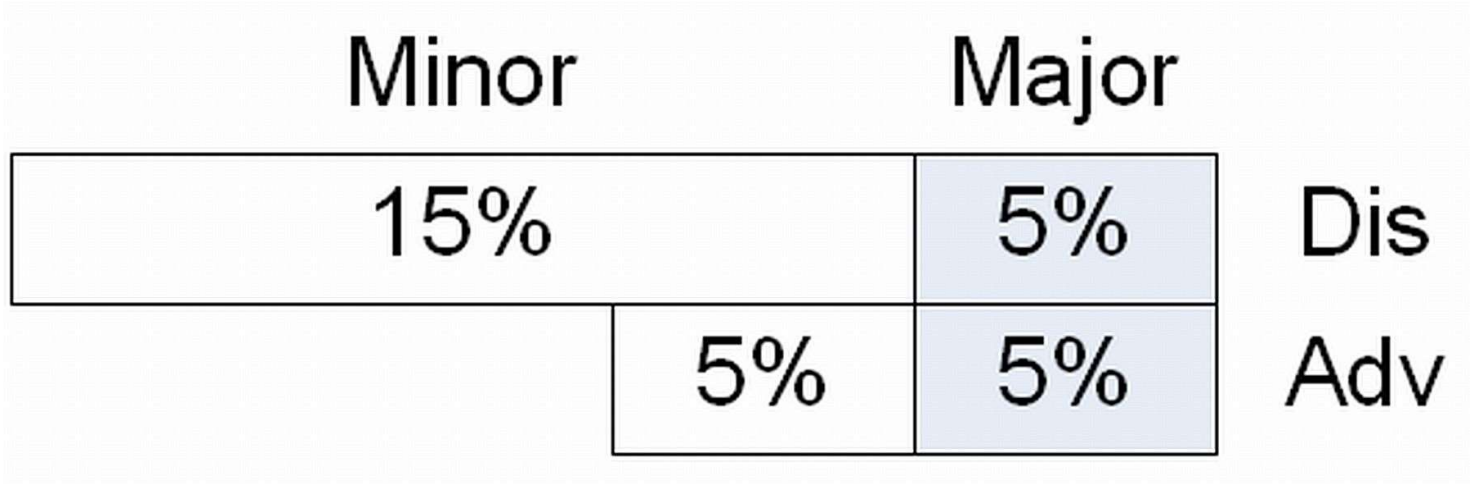

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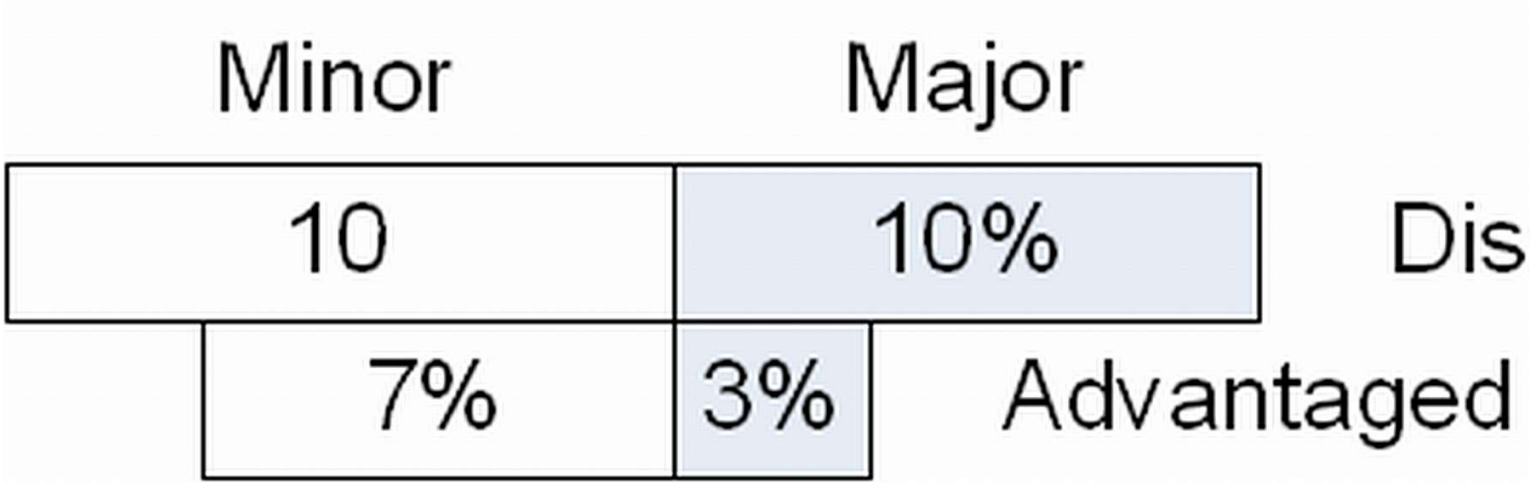

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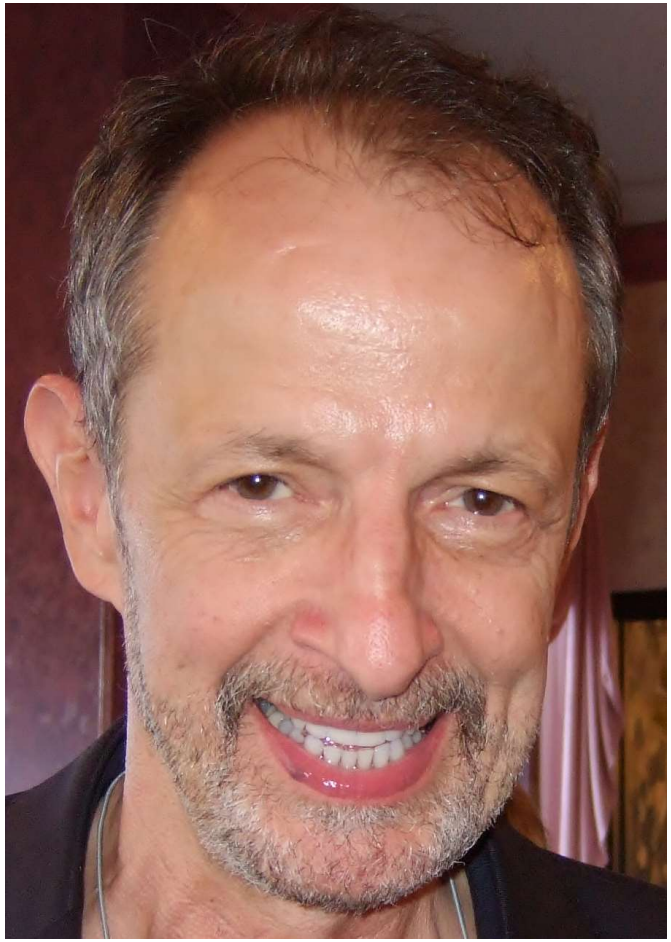

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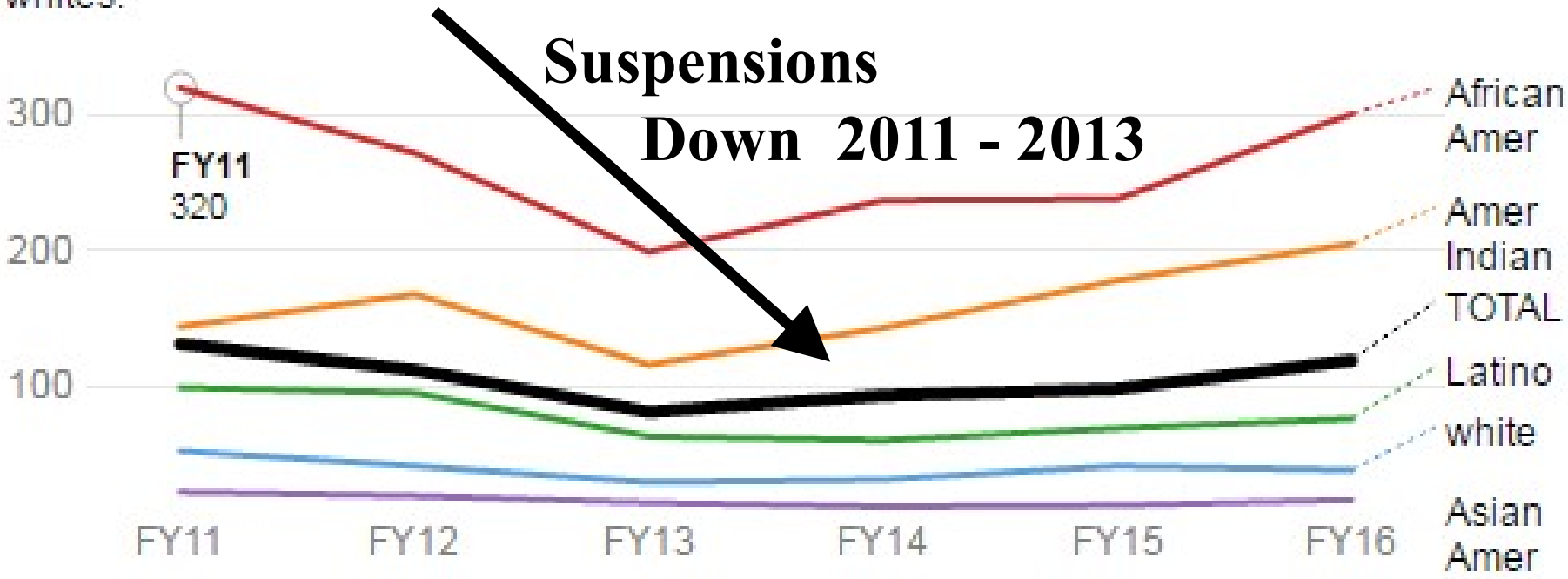

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$R(k) = P(Dis,k)/P(Adv,k) = 1 + D(k)/P(Adv,k). \quad k = 1, 2.$

$R(2) - R(1) = D(2)/P(Adv,2) - D(1)/P(Adv,1)$

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R2-R1 > 0 if -Rdis > -Radv or Radv > Rdis.