



# The Impact of Playing a High School Sport on Later Life Outcomes

By: Nitika Gupta  
Mentored By: Dr. Dylan Small

# Overview

- Mini Discussion
- NFL Concussion Settlement
- Background
- Significance
- Aim
- Hypothesis
- Methods
- Findings
- Roles
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# Discussion

- Playing a sport has several pros and cons



Concussions in High School Sports: Are They Worth the Risk? Should School Football Be Banned?

[Bran L. Mahaffey, MD](#)

[Author information](#) [Copyright and License information](#)

## ***Massachusetts Bill Would Ban Tackle Football Until After Seventh Grade***

### Should High School Football Be Banned?

*Is high school football so dangerous that it needs to be banned?*

**Debate over youth tackle football an extension of country's polarized politics**

Sports • Perspective

### High school football's existential crisis

## **Doctors Debate If High School Football Should Be Banned Due to Concussion Risks**

BASED ON A TRUE STORY

CONCUSSION  
CHRISTMAS



Dr. Bennet Omalu



Mike Webster

# NFL Concussion Settlement

| AGE AT DIAGNOSIS | ALS         | DEATH w/CTE | PARKINSON'S | ALZHEIMER'S | LEVEL 2     | LEVEL 1.5   |
|------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Under 45         | \$5,000,000 | \$4,000,000 | \$3,500,000 | \$3,500,000 | \$3,000,000 | \$1,500,000 |
| 45-49            | \$4,500,000 | \$3,200,000 | \$2,470,000 | \$2,300,000 | \$1,900,000 | \$950,000   |
| 50-54            | \$4,000,000 | \$2,300,000 | \$1,900,000 | \$1,600,000 | \$1,200,000 | \$600,000   |
| 55-59            | \$3,500,000 | \$1,400,000 | \$1,300,000 | \$1,150,000 | \$950,000   | \$475,000   |
| 60-64            | \$3,000,000 | \$1,200,000 | \$1,000,000 | \$950,000   | \$580,000   | \$290,000   |
| 65-69            | \$2,500,000 | \$980,000   | \$760,000   | \$620,000   | \$380,000   | \$190,000   |
| 70-74            | \$1,750,000 | \$600,000   | \$475,000   | \$380,000   | \$210,000   | \$105,000   |
| 75-79            | \$1,000,000 | \$160,000   | \$145,000   | \$130,000   | \$80,000    | \$40,000    |
| 80+              | \$300,000   | \$50,000    | \$50,000    | \$50,000    | \$50,000    | \$25,000    |

**\$681,928,955**





# CONCUSSION SETTLEMENT

IN RE: NATIONAL FOOTBALL LEAGUE PLAYERS' CONCUSSION INJURY LITIGATION

No. 2:12-md-02323 (E.D. Pa.)

## SECTION 11

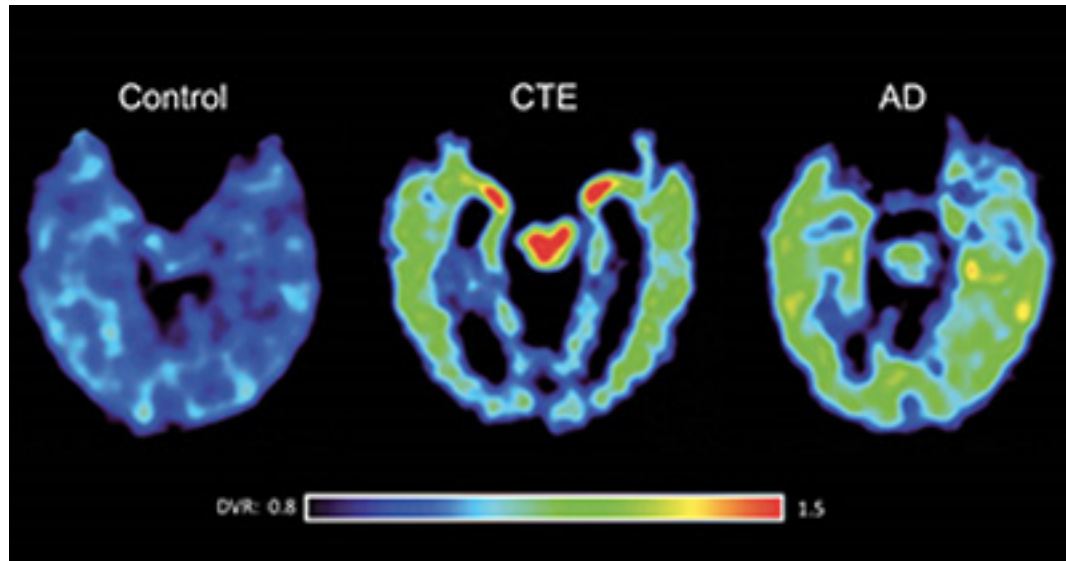
## MONETARY AWARD PAYMENTS

|    | Status by Confirmed Qualifying Diagnosis                       | Number | Amount        |
|----|--|--------|---------------|
| 1. | Notices of Monetary Award (Dollars Shown are Before Holdbacks) | 944    | \$681,928,955 |
|    | (a) Death with CTE   | 78     | \$92,919,026  |
|    | (b) ALS  | 37     | \$98,187,130  |
|    | (c) Alzheimer's Disease  | 292    | \$135,160,307 |
|    | (d) Parkinson's Disease  | 130    | \$79,742,205  |
|    | (e) Level 2.0 Neurocognitive Impairment                        | 144    | \$134,265,367 |
|    | (f) Level 1.5 Neurocognitive Impairment                        | 263    | \$141,654,920 |

<https://www.nflconcussionsettlement.com/>

# Background

- American Tackle Football is known for head injuries specifically **Chronic Traumatic Encephalopathy (CTE)**



Source: Adapted with permission from Dr. Jorge Barrio et al., PNAS



# Background

- As of July 2017, **110 out of 111** brains showed chronic traumatic encephalopathy



# Background

- A systematic review of potential long-term effects of sport-related concussion (Manley et al, 2017)
  - Showed association between NFL Players and Long-Term Effects but **not** amongst High School Players



# Background

- Association of Playing High School Football With Cognition and Mental Health Later in Life (Desphande et al, 2017)
- Among men who graduated from Wisconsin high schools in 1957, **playing high school football was not adversely associated with cognitive impairment or depression later in life.**



# Aim

- Repetitive head injury is observed in other sports such as boxing, wrestling, rugby, hockey, lacrosse, soccer, skiing and more.
- Analyze the effects of **playing a sport in high school** on later life outcomes amongst students who **graduated high school in the 90/2000s**.



# Significance

- Certain individuals demand banning American Tackle Football in School
- Determine if other sports share a similar risk
- Facts about CTE (frequency, hits to the head, onset)



# Hypothesis

- Playing any high school sport that involves head contact does have a risk of leading to cognitive impairment or depression





# Methods

- None
- American Flag Football
- American Tackle Football
- Baseball
- Basketball
- Cheerleading
- Cross Country
- Field Hockey
- Golf
- Gymnastics
- Ice Hockey
- Lacrosse
- Rugby
- Soccer
- Softball
- Swimming
- Tennis
- Track & Field
- Volleyball
- Water Polo
- Wrestling
- Other Sport 1
- Other Sport 2
- Other Sport 3

- Survey sent:  
[https://upenn.co1.qualtrics.com/jfe/form/SV\\_5zgmy3jgYsvDtcN](https://upenn.co1.qualtrics.com/jfe/form/SV_5zgmy3jgYsvDtcN)



# Methods

- Confirm with yearbook



## Sports Participation Survey: Yearbook Confirmation

Participant Name \_\_\_\_\_

School \_\_\_\_\_ Years attended \_\_\_\_\_

Year 2 (year): \_\_\_\_\_ : **Year Book Available Y/N**

Sports with info (list all sports with participant lists, group photos, etc.)

- |    |     |     |
|----|-----|-----|
| 1. | 8.  | 15. |
| 2. | 9.  | 16. |
| 3. | 10. | 17. |
| 4. | 11. | 18. |
| 5. | 12. | 19. |
| 6. | 13. | 20. |
| 7. | 14. | 21. |

| Participant Reported Sport | Yearbook confirmed sports | Agree? (Y/N) |
|----------------------------|---------------------------|--------------|
|                            |                           |              |
|                            |                           |              |
|                            |                           |              |
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|                            |                           |              |
|                            |                           |              |

Other info (position, championships, etc.)  
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 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

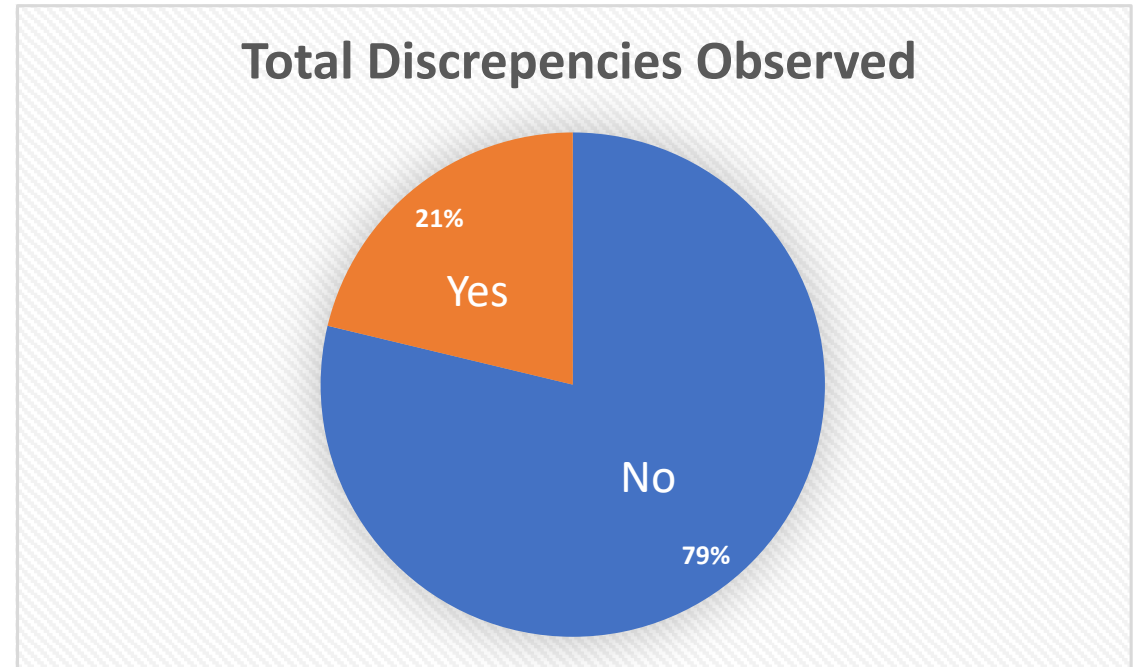
# Data

- 82 Participants
- Confirm participation for 80 participants
- Schools involved:
  - 67 from Rutgers Prep
  - 15 from Wyomissing High School
- Sex
  - 50 male
  - 32 female
- Sports Listed
  - American Tackle Football, Swimming, Track & Field, Cross Country, Soccer, Baseball, Lacrosse, Basketball, Cheerleading, Wrestling, Volleyball, Tennis, Golf, Bowling and Street Hockey



# Results

- After confirming with yearbook.



# Part 2

# Methods

- National Longitudinal Study of Adolescent to Adult Health (Add Health)
  - Combines longitudinal survey data on respondents' social, economic, psychological and physical well-being
  - Followed 10k participants since 1994
  - Links between adolescent experiences and adult health outcomes
  - Wave VI



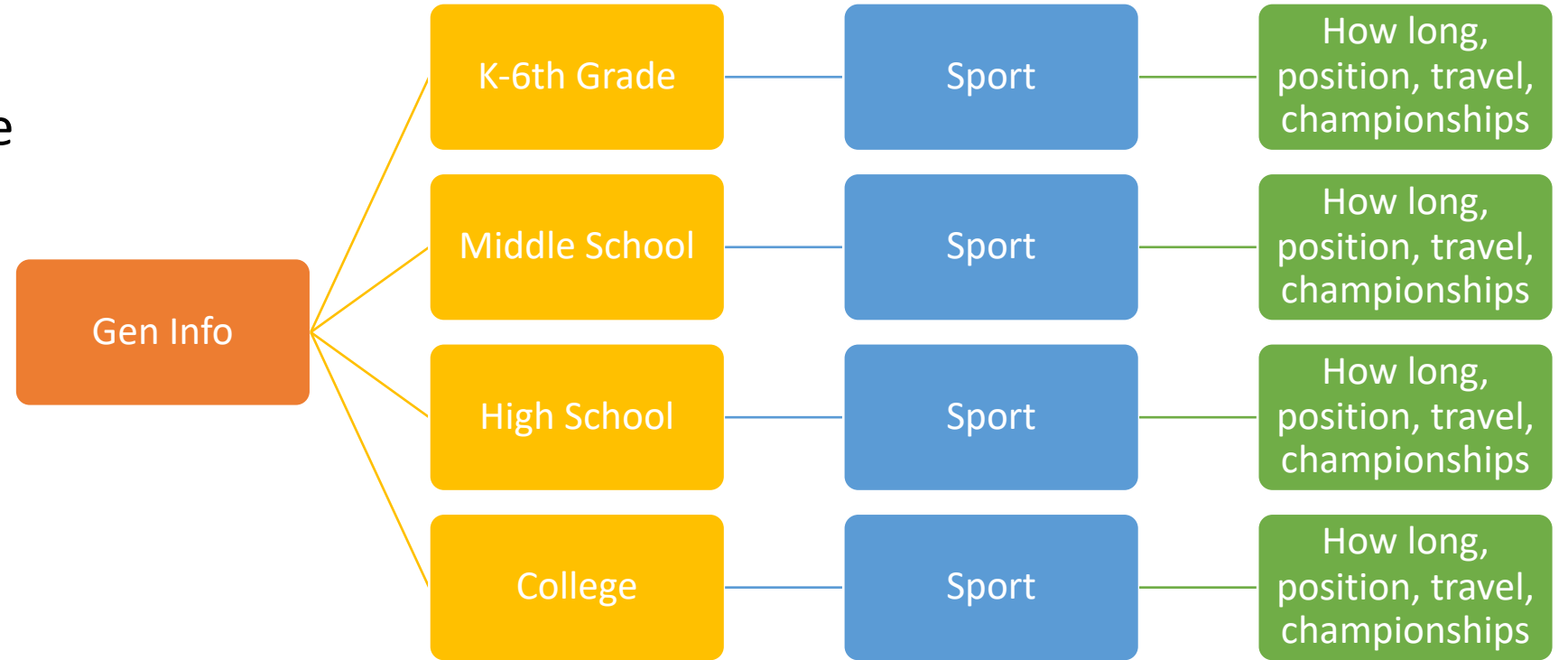
# Methods

- National Longitudinal Study of Adolescent to Adult Health (Add Health)
  - Complete Application 6 months in advance
  - Must be a PhD, MD or other terminal degree and work in an eligible institution
  - Meet funding requirements → subcontract
  - Must describe
    - Significance
    - Approach
    - Innovation
    - Investigators
    - Environment



# Methods

- Sample Questionnaire





# Methods

- Impact on Later Life Outcomes
  - Add Health Behavioral Health Study
  - ALS, Alzheimer's, Parkinsons, etc.



# Methods

- Analysis
  - Eliminate confounding factors
  - Demonstrate a correlation between sports and later life outcomes



# Limitations

- Part 1
  - 1997 yearbook missing
  - A lot of cross referencing
  - Cannot confirm certain sports (spring, outside of school)
  - Small Sample
- Part 2
  - Will not receive data for a long time
  - Hopefully there is a large sample of each sport played



# Role in the Project

- Confirm sports played with Yearbooks
- Future
  - Assist in writing the proposal to Add Health
  - Analyze the data from Add Health using R



# Lessons Learned

- Add Health
- CTE
- Creating a questionnaire
- R



# Lessons to be Learned

- Analysis using R
- Writing a proposal to Add Health
- Formal writing for paper submission



# Thank you!

- Dr. Dylan Small
- Jordan Weiss
- Sameer Deshpande
- Amanda Rabinowitz

- 
- Joanne Levy
  - Safa Browne
  - Ashley Anumba
  - Leonard Davis Institute
  - University of Pennsylvania



A collection of sports equipment is arranged on a patch of green grass. From left to right, there is a brown American football with white laces, a white and black soccer ball, a large orange basketball with black lines, a white baseball with red stitching, a tennis racket with a purple grip, and a white golf ball. The background is a plain, light gray wall.

Questions?





Thank you! |