

# Exploring Risks of Repeated Head Impacts in Youth and Strategies to Minimize Exposure

## A Workshop

Virtual | April 15–16, 2025

### Workshop Objectives

A planning committee of the National Academies of Sciences, Engineering, and Medicine will organize a virtual public workshop that brings together researchers, medical professionals, sports personnel, parents and other key audiences to examine the evidence on the risks of repeated head impacts among youth (ages 17 and under) and explore effective strategies to minimize exposure to repeated head impacts. The focus of this workshop will be on repeated hits to the head that may lead to pathophysiological changes in the brain but do not result in the manifestation of clinical signs and symptoms indicative of concussion.

Sessions during the workshop will:

- Discuss the definition and characterization of repeated head impacts.
- Describe activities that increase the risk for exposure to repeated head impacts among youth.
- Consider what is known and unknown about the risks and health outcomes associated with repeated head impact exposure among youth, including health differences in exposure.
- Share perspectives of people and families with lived experience.
- Discuss available evidence on effective interventions to minimize exposure to repeated head impacts in youth.
- Discuss gaps, needs, and opportunities regarding youth repeated head impact prevention, care, and research.

### DAY 1: TUESDAY, APRIL 15<sup>th</sup>

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#### Session 1: Introduction to Repeated Head Impacts in Youth

##### Session Objectives:

- Introduce the goals and scope of the workshop, which will discuss available evidence on the risks of repeated head impacts among youth (ages 17 and under) and strategies to minimize exposure or negative health outcomes.
- Provide context on how repeated head impact (RHI) can be defined and measured, to inform subsequent discussions.

10:00-10:10AM	<b>Welcome and Introductory Remarks</b> Frederick Rivara, MD/MPH – University of Washington, <i>Planning Committee Chair</i>
10:10-10:25AM	<b>Introduction to the Potential Implications of Repeated Youth Head Impacts</b> Keith Yeates, PhD – University of Calgary, Alberta
10:25-10:40AM	<b>How RHI Can be Defined and Measured</b> Kristy Arbogast, PhD – Children's Hospital of Philadelphia
10:40-10:50 AM	<b>Initial Q&amp;A</b>

## Session 2: Who Experiences Repeated Head Impacts

### Session Objectives:

- Discuss the epidemiology of repeated head impacts in those age 17 and under, including what is known about the demographic characteristics of those at increased risk of exposure to RHI.
- Discuss which activities increase RHI exposure risk, and how participation in those activities intersects with both potential harms and potential benefits.
- Consider the strengths and limitations of current evidence and where additional evidence may be needed to support a fuller understanding of RHI exposure in youth.

<b>10:50-10:55AM</b>	<b>Session Introduction</b> Avinash Chandran, PhD/FACSM – Datalys Center/NCAA
<b>10:55-11:10AM</b>	<b>Demographic Characteristics of Those at Increased Risk of Exposure</b> Johna Register-Mihalik, PhD – University of North Carolina
<b>11:10-11:25AM</b>	<b>Sport and Non-Sport Activities that Increase Risk of RHI Exposure</b> Jingzhen (Ginger) Yang, PHD, MPH – Nationwide Children's Hospital
<b>11:25-11:40AM</b>	<b>Considering Risks and Benefits from Activities Exposing Youth to RHI</b> William Meehan, MD – Harvard Medical School/Boston's Children's Hospital
<b>11:40-12:10PM</b>	<b>Discussion</b>
<b>12:10-12:40PM</b>	<b>Lunch Break</b>

## Session 3: How Does RHI Exposure Affect Outcomes in the Shorter Term

### Session Objectives:

- Discuss links between exposure to RHI in youth and health outcomes. For the purposes of this session, "short term" generally reflects outcomes that manifest in the immediate period after exposure to months after exposure.
- Examine evidence from a range of sources, including brain pathology, biomarker levels, and clinical assessments.
- Describe where links have and have not been drawn between RHI exposure and health outcomes, and identify strengths and limitations of the current evidence base.

<b>12:40-12:45AM</b>	<b>Session Introduction</b> Jeffrey Bazarian, MD/MPH – University of Rochester Medical Center
<b>12:45-1:25PM</b>	<b>Speakers</b> Keisuke Kawata, PhD – Indiana University Sean Rose, MD – Nationwide Children's Hospital
<b>1:25-1:45PM</b>	<b>Discussion</b>

## Session 4: How Does RHI Exposure Affect Outcomes in the Longer Term

### Session Objectives:

- Discuss links between exposure to RHI in youth and health outcomes. For the purposes of this session, “long term” generally reflects outcomes that manifest multiple years after exposure.
- Examine evidence from a range of sources, including brain pathology, biomarker levels, and clinical assessments.
- Describe where links have and have not been drawn between RHI exposure and health outcomes, and identify strengths and limitations of the current evidence base.

<b>1:45-1:50PM</b>	<b>Session Introduction</b> Michael Alosco, PhD – Boston University
<b>1:50-2:30PM</b>	<b>Speakers</b> Jesse Mez, MD, MS – Boston University Michael McCrea, PhD, ABPP – Medical College of Wisconsin
<b>2:30-2:50PM</b>	<b>Discussion</b>
<b>2:50-3:05PM</b>	<b>Break</b>

## Session 5: What Factors Influence and Modify Outcomes After RHI

### Session Objectives:

- Discuss biological and sociodemographic factors that may modify the effects of exposure to RHI and resulting health outcomes.
- Consider factors that reduce and mitigate youth RHI exposure.
- Consider the implications for study designs that could address knowledge gaps.

<b>3:05-3:10PM</b>	<b>Session Introduction</b> Christopher Giza, MD – University of California, Los Angeles
<b>3:10-3:40PM</b>	<b>Speakers</b> Benjamin Brett, PhD – Medical College of Wisconsin Tamerah Hunt, PhD/FACSM – Georgia Southern University
<b>3:40-4:00PM</b>	<b>Discussion</b>

## Session 6: Perspectives from Those with Lived Experience

### Session Objectives:

- Share perspectives from individuals and families who have experienced youth RHI, and youth education and sports organizations that make decisions around youth RHI.
- Discuss questions that arise when navigating care and return to learning or to play in the context of RHI.
- Share views on how different stakeholders think about the relative risk and benefits of recreational activities that expose youth to RHI.

<b>4:00-4:05PM</b>	<b>Session Introduction</b> Tamerah Hunt, PhD/FACSM – Georgia Southern University
<b>4:05-4:15 PM</b>	<b>Family Experiences</b>
<b>4:15-4:55PM</b>	<b>Panel Discussion</b> Christina (Tina) Master, MD/FACSM – Children’s Hospital of Philadelphia Karlita L. Warren, PhD/LAT/ATC/ FNAP – The Kizo Effect, LLC Laura Keyes, LSW/CBIS – Children’s Hospital of Philadelphia
<b>4:55PM</b>	<b>Closing Remarks</b>
<b>5:00PM</b>	<b>Adjourn Day 1</b>

## **DAY 2: WEDNESDAY, APRIL 16<sup>th</sup>**

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<b>1:00–1:05</b>	<b>Welcome and Introductory Remarks</b> Frederick Rivara, MD/MPH – University of Washington, <i>Planning Committee Chair</i>
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### **Session 7: Interventions to Minimize Exposure to Repeated Head Impacts**

#### *Session Objectives:*

- Discuss available evidence on effective interventions to minimize exposure to repeated head impacts in youth, including changes to rules and techniques of play, protective equipment improvements, or other types of interventions.
- Consider successful examples where evidence-based interventions to minimize exposures were integrated into youth sports and recreational activities.

<b>1:10-1:15PM</b>	<b>Session Introduction</b> Gerard Gioia, PhD – Children’s National Hospital
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<b>1:15-2:10PM</b>	<b>Panel Discussion</b> Jaclyn Caccese, PhD – The Ohio State University Carolyn Emery, PhD – University of Calgary George Chiampas, DO – Northwestern University/US Soccer Erik Swartz, PhD – Adelphi University
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### **Session 8: Decision-Making on Return-to-Activity and Opportunities for Policy Change**

#### *Session Objectives:*

- Explore best practices for informed, collaborative decision-making regarding participation in activities that may involve RHI exposure
- Discuss policy and systemic changes that could better support safer participation in youth activities with RHI risks.

<b>2:10-2:15PM</b>	<b>Session Introduction</b> Christina Master, MD/FACSM – Children’s Hospital of Philadelphia
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<b>2:15-2:30PM</b>	<b>Mitigating Risk: Opportunities for Community Engagement to Develop Policy and Systemic Changes</b> Jillian Urban, PhD/MPH – Wake Forest University School of Medicine
<b>2:30-2:45PM</b>	<b>Best Practices in Shared Decision-Making on Return-to-Activity</b> Emily Kroshus, ScD/MPH – University of Washington
<b>2:45-3:05PM</b>	<b>Discussion</b>
<b>3:05-3:25PM</b>	<b>Break</b>

### **Session 9: Reflections on Research Gaps and Opportunities**

#### *Session Objectives:*

- Discuss key knowledge and science gaps. What do you wish you knew today?
- Reflect on promising approaches and tools to close these gaps in the next 5 years.
- Consider the road ahead for improved monitoring of exposure to RHI and for more effective mitigation of potential short and long term effects. Where could we be in the next 10 years?

<b>3:25-3:30PM</b>	<b>Session Introduction</b> Luca Marinelli, PhD – GE HealthCare Technology & Innovation Center
<b>3:30-3:40PM</b>	<b>Lessons from Other Types of Exposures</b> Jeffrey Bazarian, MD/MPH – University of Rochester Medical Center
<b>3:40-3:50PM</b>	<b>Methods of Quantifying Youth RHI Exposure</b> Lee Gabler, PhD – Biocore
<b>3:50-4:00PM</b>	<b>Understanding Structural and Functional Changes in the Brain after Youth RHI</b> Benjamin Brett, PhD – Medical College of Wisconsin
<b>4:00-4:10PM</b>	<b>Methods for Tracking Short- and Long-Term Cognitive and Clinical Outcomes</b> Rebekah Mannix, MD/MPH – Boston Children's Hospital
<b>4:10-4:50PM</b>	<b>Discussion</b>
<b>4:50-5:00PM</b>	<b>Concluding Remarks</b> Frederick Rivara, MD/MPH – University of Washington

### **WORKSHOP ADJOURNS**