Progress in HEI’s Scientific Activities

Rashid Shaikh
Director of Science
Health Effects Institute
2014-2015

• A Year of Transition

• Completion of Strategic Plan 2010-2015

• Formulation of Strategic Plan 2015-2020
  • with important scientific developments and policy challenges in mind
  • With extensive input and consultations with sponsors, HEI committees and board, and other scientists
Building for the Future: HEI’s Strategic Plan

- Guides HEI’s research and review activities;
- Responds to the needs of HEI industry & government sponsors, and other interested parties;
- Anticipates future policy and technology events; and,
- Evolves over time to adapt to changing knowledge and events.
### Status of the Last Plan

**Fiscal Year:**

<table>
<thead>
<tr>
<th>Year</th>
<th>FY 2010</th>
<th>FY 2011</th>
<th>FY 2012</th>
<th>FY 2013</th>
<th>FY 2014</th>
<th>FY 2015</th>
<th>FY 2016 and beyond</th>
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<tr>
<td>Major Upcoming Standard-Setting and Other Regulatory Events</td>
<td>- NO\textsubscript{x}, NAAQS</td>
<td>- PM, O\textsubscript{3}, NAAQS</td>
<td>- Renewable fuel</td>
<td>- EPA Tier-3 auto emissions?</td>
<td>- New round of GHG emissions standards beyond 2016?</td>
<td>- Euro 6</td>
<td>PM, NO\textsubscript{x}, NAAQS</td>
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<td>- CAFÉ, GHG emissions</td>
<td>- CALLEV 3</td>
<td>- Renewable fuel</td>
<td>- O\textsubscript{3}, NAAQS?</td>
<td>- Renewable fuel</td>
<td>NO\textsubscript{x}, NAAQS</td>
<td>CAFÉ/GHG emissions standards take effect/next phase?</td>
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<td>- Euro 5</td>
<td>- LCFS</td>
<td>- Asia, Latin America, Euro, U.S. emissions</td>
<td></td>
<td>- Euro 5</td>
<td>- Asia, Latin America, Euro, U.S. emissions</td>
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</table>

**HEI Strategic Plan 2010-2015**

- Systematic investigation of toxicity of PM components and sources (NPACT)
- Manage studies
- Report reviews
- Publish

**Multipollutant Exposure and Health**

- Conduct new methods and RIOPA exposure research
- Publish; disseminate
- Issue ozone/PM RFA
- Select studies
- Conduct research
- Publish; disseminate
- Workshop: Climate–air quality nexus
- Implement research/evaluation of climate–air quality health effects/co-benefits
- Publish air toxics “hot spot” studies
- Workshop: Traffic and other high-exposure settings research (e.g., PM, gases, air toxics)

**Emerging Technologies for Air Quality and Climate**

- Complete Advanced Collaborative Emissions Study (ACES)
- Short-term and chronic testing
- 2010 engines: emissions characterization
- Review, publish, and disseminate
- Special Committee on Emerging Technologies: sets priorities for rapid workshop/review of fuels/technologies, potential new research

**Assessing Health Impact of Air Quality Actions (Accountability)**

- Complete initial studies on shorter-term interventions
- Accountability workshop
- Initiate new studies on long- and short-term interventions, continue new methods development
- Continue building of networks and alliances with CDC and state public health tracking programs

**International Perspective**

- Publish APHENA and initial PAPA studies
- Publish review of Asian Studies
- Update PAPA-SAN database
- Update PAPA-SAN database
- Initiate additional developed and developing world studies

**Cross-Cutting Issues**

- Identification and integration of sensitive populations (e.g., elderly, lower SES) into HEI studies
- Continuous innovation, validation, and data access for state-of-the-art biologic methods, statistics
## Major Accomplishments

### Number of HEI Studies and Publications

**April 2010 - March 2015**

<table>
<thead>
<tr>
<th>Category</th>
<th>Studies Initiated</th>
<th>Reports in Review</th>
<th>Published(^a)</th>
<th>Other(^b)</th>
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<td><strong>Air Pollution Mixture</strong></td>
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<td>PM, Ozone, and Other Gases</td>
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<td>Air Toxics</td>
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<td>7</td>
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<td>Innovative Statistics</td>
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<td><strong>Emerging Technologies and Fuels</strong></td>
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<td>ACES</td>
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<td>International</td>
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<td>1</td>
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<td><strong>TOTAL</strong></td>
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<td><strong>10</strong></td>
<td><strong>37</strong></td>
<td><strong>6</strong></td>
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</tbody>
</table>

\(^a\) Excluding 3 pilot reports and 3 unpublished reports

\(^b\) Special Reports, Perspectives and Communications
Impact of HEI’s Research

- 37 HEI Research Reports published
- 127 peer-reviewed papers published based on these 37 reports (3.4 papers per report)
- 356 citations of the 37 reports (9.6 citations per report)
- 2942 secondary citations (79.5 citations per report)

Total: 3298 citations from 37 reports (89.1 citations per report)
Major Accomplishments -- cont

- **Most recent publications:**
  - Health effects testing of new technology diesel engines (ACES Phase 3)
  - National Particle Component Toxicity (NPACT)
  - Global Burden of Disease (GBD) – from outdoor air pollution\(^a\)
  - Reports on accountability, traffic related pollutants, statistical methods, and others

- **Forthcoming:**
  - Report from the HEI Diesel Epidemiology Panel
  - Executive Summary of the HEI ACES Program
  - Multicenter Ozone Study in Elderly Subjects (MOSES)
  - Reports from second wave accountability studies, traffic studies, methods and many others
  - GBD: Source specific contributions to air pollution in select countries\(^a\)
  - Report from the HEI Panel on Unconventional Oil and Gas\(^a\)

\(^a\) Supported from separate sources
Choosing the Future: the HEI Planning Process

**POTENTIAL TOPICS**

**Major Opportunities**
- Informing Tough Upcoming NAAQS/Limit-Values Decisions
  - Effects of long-term exposure to low levels of air pollution
  - Further analyses in the NPACT and ESCAPE studies
  - Cardiovascular effects of ozone
- Examining Exposure and Health Related to Traffic and Ports
  - Enhanced and innovative exposure assessment
  - New health studies of road and port exposures
  - Evaluation of sensitive populations
  - Exposure components of special interest
  - A possible updated HEI Traffic Special Review
- Improving Science for Decisions: Accountability and Transparency
  - New methods
  - At-risk communities
  - Improving transparency and data access
- Climate, Air Quality, and Health
  - Evaluation of fuel-efficient vehicles
  - Global decisions on air quality and climate

**STRATEGIC PLANNING PROCESS**

**Input from**
- Sponsors
  - U.S. EPA
  - Motor vehicle industry
  - Oil and other industries
- HEI scientific committees and board
- The scientific community
- The environmental community
- International agencies
- Others

**Selection criteria:**
- Importance to
  - Public health
  - Regulation and technology (short- and long-term)
  - Science
  - Research activities by others

**THE HEI STRATEGIC PLAN 2015–2020**
... and beyond

**Informing Decisions on Air Quality and on Climate-Driven Technology**
- Multipollutant Science (low dose, statistics, traffic)
- Accountability and Transparency
- Emerging Fuels and Technologies
- Global Health Science

**Cross-Cutting Issues**
- Statistical models
- At-risk populations
- Enhanced exposure
- Climate change
- New biologic techniques
- New health outcomes

**Lower-Priority Items** *(which will not be a focus)*
- Single-pollutant research programs
- Life-cycle analysis
- Broader climate change issues and effects
The Four Core Program Areas

The HEI Strategic Plan 2015–2020... and beyond

Informing Decisions on Air Quality and on Climate-Driven Technology

Cross-cutting Issues

- Multipollutant Science (Low Dose, Traffic Statistics)
- Accountability, Transparency
- Fuels and Technologies
- Global Science (E.U., Asia)

Better Decisions

Statistical Models, At-Risk Populations, Enhanced Exposure Assessment, Climate Change, New Biologic Techniques, and New Health Outcomes
Multipollutant Science

- Estimating the effects of low exposure levels
  - RFA on this topic – already published
  - MOSES (nearing completion)
- Emissions, exposures and health effects of the air pollution mix
  - Exposures and health effects from traffic and port sources
    - Complete current traffic and tunnel studies
    - Major update of the HEI Special Report on traffic
    - New research on traffic health studies, near traffic and port facilities – especially potential effects in susceptible communities
- The changing nature of diesel sources and emissions
  - The Diesel Epidemiology project
  - Non-tail pipe emissions
  - Also, to be included as important issues in traffic and other studies
Accountability and Transparency

- Accountability (Health Outcomes)
  - Completion and publication of four studies
  - Planning for the next phase of accountability program
  - Implementation of the new studies

- Transparency
  - Enhancing HEI’s ability to build data access from inception into all our work
Emerging Fuels and Technologies

• Executive Summary of the ACES Program
• Toxicity testing for emissions from emerging technologies and fuels
  • A suite of in vitro and short term assays, with particular focus on airborne pollutants
• Workshops and other activities on:
  • Aromatics in gasoline and PM formation
  • Gasoline direct injection and UFP emissions
• Continue to work with the HEI Special Committee on Emerging Technologies (SCET)
Cross-Cutting Issues

- Multipollutant Statistical Models – development, application and testing
- At-risk populations
- Enhanced exposure assessment
- Climate change and health
- Capacity building: Support of early-career investigators
- Others
### Implementation of Strategic Planning 2015 – 2020

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<tr>
<td><strong>Selected Upcoming Ambient Air Quality, Emissions, and GHG Regulatory Events</strong></td>
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<td>Next PM ISA kickoff</td>
<td>O₃ final rule</td>
<td>PM/ISA</td>
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<td>PM NAADS</td>
<td>PM NAADS</td>
<td>O₃, NOₓ, SOₓ, and PM reviews</td>
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<td>U.S. LD GHG tech review</td>
<td>U.S. Tier 3 phase-in</td>
<td>E.U. &quot;real-world&quot; vehicle test</td>
<td>India standards, BS V</td>
<td>New E.U. emissions ceiling targets</td>
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<tr>
<td><strong>Multipollutant Science</strong></td>
<td>Complete MOSES—Review, publish, and disseminate</td>
<td>Effects at low-levels—Select studies—Conduct research—Publish and disseminate</td>
<td>Complete traffic exposure studies—Publish and disseminate</td>
<td>Plan for and issue RFA—Select and conduct traffic health studies—Publish and disseminate</td>
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<td></td>
<td>Communicate Diesel Epidemiology Review</td>
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<td><strong>Accountability and Transparency</strong></td>
<td>Complete Second-Wave Health Outcomes studies</td>
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<td>Accountability Workshop</td>
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<td>Communicate ACEs results</td>
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<td>Initialize new studies on long-term interventions and ports, continue new methods development—Publish and disseminate</td>
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<td>Synthesis of past decade of accountability research, lessons for future actions</td>
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<td><strong>Emerging Fuels and Technologies</strong></td>
<td>Communicate ACEs results</td>
<td>Special Committee on Emerging Technologies, monitor key fuel and technology developments</td>
<td>Experts review and identify best techniques for comparative toxicity screening—Initiate proof-of-concept testing—Disseminate</td>
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<td>Workshop/review Aromatics and PM</td>
<td>Workshop/review GDI and UFPs</td>
<td>Workshop/review Fuels/technology</td>
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<td><strong>Global Health Science</strong></td>
<td>Update and apply Global Burden of Disease to inform developing world source decisions</td>
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<td>Potential global cohort studies of full range of pollution exposure and/or port exposures and effects</td>
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<td><strong>Cross-Cutting Issues</strong></td>
<td>Identification and integration of at-risk populations into HEI studies</td>
<td></td>
<td>Testing and validation of statistical models; enhanced exposure assessment; climate change; new biologic techniques; new health endpoints and modifying factors</td>
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**MID-PLAN REVIEW: VISION 2020**
## Implementation of Strategic Planning 2015 – 2020

### HEI Fiscal Year

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<td>Revised WHO air quality guidelines?</td>
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<td>New E.U. emissions ceiling targets</td>
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<td>China low-sulfur fuel</td>
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<td>India, BS IV fuel</td>
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### The HEI Strategic Plan 2015–2020

#### Multipollutant Science

- Complete MOSES: Review, publish, and disseminate
- Effects at low-levels: Select studies → Conduct research → Publish and disseminate
- Complete traffic exposure studies → Publish and disseminate
- Plan for and issue RFA → select and conduct traffic health studies → Publish and disseminate
- Workshop on research potential in NPACT and ESCAPE: Consider follow-on research on NPACT and ESCAPE studies (apply multipollutant statistics)
- Communicate Diesel Epidemiology Review results

#### Accountability and Transparency

- Complete Second-Wave Health Outcomes studies
- Accountability Workshop: Initiate new studies on long-term interventions and ports, continue new methods development → Publish and disseminate
- Synthesis of past decade of accountability research: lessons for future actions
- Continue efforts to enhance data access and reproducibility of results

#### Emerging Fuels and Technologies

- Communicate ACES results
- Special Committee on Emerging Technologies: monitor key fuel and technology developments
- Experts review and identify best techniques for comparative toxicity screening → Initiate proof-of-concept testing → Disseminate
- Workshop/review Aromatics and PM
- Workshop/review GDIs and UFPs
- Workshop/review Fuels/technology

#### Global Health Science

- Update and apply Global Burden of Disease to inform developing world source decisions
- Potential global cohort studies of full range of pollution exposure and/or port exposures and effects

#### Cross-Cutting Issues

- Identification and integration of at-risk populations into HEI studies
- Testing and validation of statistical models; enhanced exposure assessment; climate change; new biologic techniques; new health endpoints and modifying factors

### MID-PLAN REVIEW: VISION 2020
Change:

- The only constant in life!
Thank you!!

Copies of Strategic Plan 2015-2020 available at the main desk