Exposure Reconstruction for the Epidemiologic Study

Progress Report
October 2005
Research Team

Full Time
- **Nurtan Esmen** (Professor)
- **Steven Lacey** (Asst. Professor)
- **Kathleen Kennedy** (Project Manager)
- **Roger Hancock** (Sr. Research Specialist)

Co-investigators
- **Peter Scheff** (Professor)
- **Sabri Cetinkunt** (Professor)
- **Irina Dardynskaia** (Assoc. Professor)
- **John Franke** (Asst. Professor)
Research Team

Research Assistants

- Maria Gutierrez (Doctoral RA)
- Raul Espinosa (Doctoral RA)
- Tara Alcazar (Masters RA)
- Maya Barr (Masters RA)
- Sam Bigger (Masters RA)
- Julia Lippert (Masters RA)
- Jennifer Palmer (Masters RA)
Outline

• General Study Approach
• Study Components
• Study Progress
• Projected Study Timeline
General Study Approach

- Exposure reconstruction: Characterization of occupational exposures in space and time to inform the epidemiology study
General Study Approach

- Exposure Reconstruction
  - By Specific Agent
  - By Part and Process
    - Combined Analysis
      - Job Dictionary / Specific Exposure
        - Merge with UPitt Database
Study Components: Exposure by Part

• Part Dictionary
  – Includes all “part families” from P&W manufacturing and refurbishment, 1952-2001
  – Examples: hollow fan blades, vanes, shafts
  – Part families determined along with P&W engineers (“part family owners”) and employees
Study Components: Exposure by Process

• Process Dictionary
  – Includes all processes at P&W facilities, 1952-2001
  – Examples: milling, grinding, welding, coatings, NDT
  – Data sources: Summary of Operations, Time Series Studies
Study Components:
Exposure by Specific Agent

- 7 primary agents selected based upon extensive toxicological considerations

Ionizing radiation related
  1) Direct
  2) Thoriated Nickel / Thoriated Tungsten
  3) Radioactive Particles

Metalworking fluid
  4) Water soluble
  5) Oil based

Other
  6) Hexavalent Chromium
  7) Nickel
Study Components: Job Dictionary

- Job Dictionary
  - Contains all possible job titles recorded for workers during the study period
  - Examples: Plater, Aircraft Powerplant Mechanic, Toolmaker, Jig Borer Operator, Foundry Process Operator
  - Data sources: UPitt job history database, P&W hourly job descriptions, union contracts
Study Components:
Geographic Information System (GIS) Spatial Database

• Created to determine location of parts, processes, and agents in time and space

• Provides central integration of all data

• Data sources: blueprints, layouts on microfilm and data tape, company space allocation records
Study Components: GIS Spatial Database

• Provides the ability to manage spatially referenced information

• A means to communicate plant-wide properties

Aerial view of East Hartford
Study Components: GIS Spatial Database

Data sources:
- hand drawn schematics
- CAD drawing files
- company space allocation records

CAD drawing file
Hand drawn schematic
Study Components:
GIS Spatial Database

• Allows spatial distribution analysis of parameters of interest such as:
  - departments
  - parts
  - manufacturing processes

East Hartford: department layout
Study Components: GIS Spatial Database

- Ability to compare spatial distributions of parameters of interest at different points in time
<table>
<thead>
<tr>
<th>Study Component</th>
<th>Percent Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part Dictionary</td>
<td>75</td>
</tr>
<tr>
<td>Process Dictionary</td>
<td>20</td>
</tr>
<tr>
<td>Job Dictionary</td>
<td>2</td>
</tr>
<tr>
<td>GIS Spatial Database</td>
<td>25</td>
</tr>
<tr>
<td>Primary Agents:</td>
<td></td>
</tr>
<tr>
<td>Hexavalent Chromium</td>
<td>25</td>
</tr>
<tr>
<td>Ionizing Radiation (3)</td>
<td>20</td>
</tr>
<tr>
<td>MWF (2)</td>
<td>30</td>
</tr>
<tr>
<td>Nickel</td>
<td>0</td>
</tr>
<tr>
<td>Secondary Agents:</td>
<td></td>
</tr>
<tr>
<td>MPI</td>
<td>30</td>
</tr>
<tr>
<td>Exposure Analysis</td>
<td>5</td>
</tr>
</tbody>
</table>
### UIC Projected Time Line – Exposure Reconstruction

<table>
<thead>
<tr>
<th>Task*</th>
<th>Record Discovery &amp; Location</th>
<th>Part / Process Meetings (part owners)</th>
<th>Data Collection &amp; Entry</th>
<th>Integrated GIS Database Construction</th>
<th>Job Dictionary Reduction</th>
<th>Exposure Determination</th>
<th>Statistical Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2 [UIC] (2003-2004)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 3 (2004-2005)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4 (2005-2006)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 5 (2006-2007)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 6 (2007-2008)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 7 (2008-2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*One-on-one worker interviews: start contingent upon completion of extended funding agreement.
Acknowledgement

• Study progress has been possible due to the support and assistance of P&W union members, employees, and management.

• We would like to thank all who have assisted us by providing information, data, and documents and greatly appreciate their efforts.