Partnership between NIOSH and an indium-tin oxide (ITO) company to prevent indium lung disease

R. Reid Harvey
NIOSH Respiratory Health Division
Morgantown, WV
ITO

• Sintered tile: 90% indium oxide, 10% tin oxide

• Transparent conductive oxide

• Many high-tech uses
Production and reclamation of ITO

- Indium metal
- In$_2$O$_3$ powder
- + SnO$_2$ powder, mixed
- Green bodies formed
- Green bodies sanded, fired
- Tiles & cylinders ground, cut
- Tiles & cylinders used by customers
- Used tiles & cylinders waste recycled

Tiles & cylinders used by customers

Used tiles & cylinders waste recycled
Japanese case reports — 2003–2005

- Workers making ITO targets

- Wet surface grinder for 3 years
  - Interstitial pneumonia
  - Died of collapsed lungs

- Wet surface grinder for 4 years
  - Pulmonary fibrosis
  - Some improvement after transfer
US case reports — 2009–2010

- Pulmonary Alveolar Proteinosis (PAP)
- Reclaim operator
  - Symptoms 9 months after hire in 1999
  - Died of respiratory failure in 2006 despite therapy
- ITO operator
  - Symptoms 6-9 months after hire in 2004
  - Some response to therapy
Health Hazard Evaluation (HHE) — 2009

• ITO production company requested HHE

• Management request
• Evaluation of workplace changes
  • Industrial hygiene reports
  • Medical surveillance records
  • Personnel records
NIOSH Recommended Exposure Limit for indium = 100 ug/m³
HHE medical surveillance — 2002–2010

- 50% had blood indium >5 μg/L after hire

- 31% had spirometric restriction after hire
  - 4 times higher than expected

- 29% had excessive decline in forced expiratory volume in 1 second (FEV₁) during employment

- 14% had abnormal chest radiographs after hire
HHE findings

- Indium air levels exceeded NIOSH REL, highest in IO Production and Reclaim

- Excess burden of lung function abnormalities
International workshop — 2010

• Same or different diseases in Japan and United States?

• Physicians, epidemiologists, industrial hygienists

• United States, Japan, China, Korea represented

• Reviewed clinical and epidemiologic data from reported cases and workplaces
  • 10 cases, 1–12 years exposure at ITO, \( \text{In}_2\text{O}_3 \) or LCD facilities
  • 8 cases worsened (2 died), mean blood indium 113 \( \mu\text{g/L} \);
    2 cases stabilized or improved, mean blood indium 40 \( \mu\text{g/L} \)
International workshop — 2010

• Shared histopathological features
  • Alveolar filling (n=9)
  • Cholesterol clefts, granulomas (n=10)
  • Fibrosis (n=9)
• Radiographic progression
  • From PAP to fibrosis, emphysema
• Appears to be one disease that progresses over time
NORA project — 2012–2015

• What is the respiratory health status of the workforce?

• What is the level of exposure to indium compounds?
  • Plasma indium (μg/L)
  • Respirable indium (μg/m3)

• Is there a relationship between these exposure metrics?

• Are there relationships between exposure metrics and health?
  • If so, do these progress overtime?

• What are the toxicity profiles of ITO and other indium compounds?
Industrial hygiene evaluations in 2012 & 2014

- Personal sampling
  - For time-integrated respirable indium, dust
  - For real-time respirable dust

- Area size-selective sampling
  - For indium, dust

- Observational data on tasks, tools, controls and materials used (real-time & hourly intervals)
<table>
<thead>
<tr>
<th>Facility</th>
<th>Respirable Indium (µg/m$^3$)</th>
<th>2012</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reclaim</td>
<td>38.8</td>
<td>62.2</td>
<td></td>
</tr>
<tr>
<td>ITO</td>
<td>45.0</td>
<td>19.6</td>
<td></td>
</tr>
<tr>
<td>Rotary Grind</td>
<td>36.4</td>
<td>25.9</td>
<td></td>
</tr>
<tr>
<td>Refinery</td>
<td>23.2</td>
<td>12.1</td>
<td></td>
</tr>
<tr>
<td>Planar Grind</td>
<td>16.1</td>
<td>9.9</td>
<td></td>
</tr>
<tr>
<td>Planar Bond</td>
<td>7.4</td>
<td>11.4</td>
<td></td>
</tr>
<tr>
<td>Rotary Bond</td>
<td>3.0</td>
<td>3.1</td>
<td></td>
</tr>
</tbody>
</table>
Medical evaluations in 2012 & 2014

- All current workers eligible to participate at each evaluation
- Interviewer-administered questionnaire
  - Respiratory symptoms & diagnoses
  - Work history including job & department information
- Spirometry and diffusing capacity
- High-resolution computed tomography (HRCT) scan of chest
- Serum biomarkers of interstitial lung disease, namely Krebs von den Lungen (KL)-6 and surfactant protein (SP)-D
- Plasma indium concentration
%FEV₁ and plasma indium
KL-6 and plasma indium
Plasma indium and respirable indium

$r_s = 0.54$

$r_s = 0.78$
%FEV₁ and cumulative respirable indium
KL-6 and cumulative respirable indium
Longitudinal evaluation of respiratory health and exposure indices

<table>
<thead>
<tr>
<th>2014 Health Outcome</th>
<th>$\Delta \ln_p \geq 0.2 \mu g/L$</th>
<th>Log interval $\ln_{\text{resp}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
<td></td>
</tr>
<tr>
<td>New chest symptom</td>
<td><strong>4.2 (1.2; 17)</strong></td>
<td><strong>1.6 (1.0; 2.5)</strong></td>
</tr>
<tr>
<td>KL-6 &gt; 500 U/mL</td>
<td>3.9 (0.7; 29)</td>
<td><strong>2.6 (1.4; 6.0)</strong></td>
</tr>
<tr>
<td>% predicted DLCO</td>
<td>$\beta$ coefficient</td>
<td>$\beta$ coefficient</td>
</tr>
<tr>
<td></td>
<td><strong>-4.5 (-8.2; -0.1)</strong></td>
<td>-1.3 (-3.8; 1.2)</td>
</tr>
<tr>
<td>% predicted $V_A$</td>
<td><strong>-3.4 (-6.3; -0.4)</strong></td>
<td>-0.3 (-2.3; 1.8)</td>
</tr>
<tr>
<td>% predicted FEV$_1$</td>
<td>-2.7 (-6.6; 1.2)</td>
<td>-1.9 (-4.4; 0.7)</td>
</tr>
<tr>
<td>% predicted FVC</td>
<td>-3.1 (-6.3; 0.2)</td>
<td>-0.9 (-3.1; 1.3)</td>
</tr>
<tr>
<td>FEV$_1$/FVC ratio</td>
<td>0.1 (-1.9; 2.0)</td>
<td>-0.3 (-1.6; 1.0)</td>
</tr>
<tr>
<td>KL-6 (U/mL)</td>
<td>83 (-40; 205)</td>
<td>65 (-18; 148)</td>
</tr>
<tr>
<td>SP-D (ng/mL)</td>
<td>18 (-22; 57)</td>
<td>-2.7 (-30; 24)</td>
</tr>
</tbody>
</table>

*Adjusted for age, smoking status and 2012 plasma indium
2012–2014 change in plasma and respirable indium

Department | \( \Delta \text{InP} \) (µg/L) | \( \Delta \text{Inresp} \) (µg/m³)
--- | --- | ---
Administrative | | |
Engineering | | |
Forming Preparation | | |
Maintenance & Facilities | | |
ITO | | |
Planar Bond | | |
Planar Grinding | | |
QC Lab | | |
R&D | | |
Reclaim | | |
Refinery | | |
Rotary Bond | | |
Rotary Grinding | | |
Department

\( \Delta \text{InP} \) (µg/L)
\( \Delta \text{Inresp} \) (µg/m³)
Cellular uptake of indium-containing particles

A

SnO$_2$

UITO

SITO

VD
Macrophage Dysfunction

Cells (untreated) + E. coli → Bacterial Uptake

Maximum

Cells + ITO Particles

Impaired
Impact to date

- HHE findings can influence workplace improvements in a timely fashion, and stimulate further multidisciplinary research

- ITO production company utilized NIOSH findings to advance efforts to reduce worker exposure and prevent clinical indium lung disease

- Company recently finalized strict internal standards to further protect workers and incorporating NIOSH findings into development of a new facility in China

- Substantial contribution to knowledge of indium lung disease, including establishing risk of the emerging occupational respiratory disease
Works in progress — 2017

• Dose modeling to estimate alveolar dose resulting from different forms and patterns of indium exposure

• Cluster analyses to determine if grouped health outcomes are associated with exposure

• Exposure analyses
  • Compare respirable and inhalable indium and dust exposure taking into account particle size distribution
  • Investigate the determinants of full-shift indium exposure such as tasks, materials used and controls
  • Model the determinants of real-time dust exposure and evaluate its use to identify peaks and high exposure tasks
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ITO Production and Reclamation Company

The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the National Institute for Occupational Safety and Health.
Implementation Science: What is it and what do we know about successfully translating OSH solutions into worker practice?

Paul Schulte, PhD: NIOSH
Jennifer Lincoln, PhD, CSP: NIOSH
Eileen Betit, BA: The Center for Construction Research
Julie Sorensen, PhD: The Northeast Center for OSH
Anna Gadomski, MD, MPH: The Northeast Center for OSH
Presentational Overview

1. Define translational science and phases (Dr. Schulte)
2. Fishing safety translational success story (Dr. Lincoln)
3. Construction translational success story (Ms. Betit)
4. Farming translational success story (Dr. Sorensen)
5. Translating evidence-based research (Dr. Gadomski)
6. Summary – Demonstrating impact in OSH research
Translation Research in OSH

Paul Schulte, Ph.D. and Tom Cunningham, Ph.D.

Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
“Much remains to be learned about how to improve the likelihood that research translation efforts will positively impact worksites.”

“Continued contribution by NIOSH to research on improving the effectiveness of translation efforts will ensure consideration of the dynamics that characterize occupational safety and health.”
What is Translation Research?

- Study of the processes, drivers and barriers that affect the relationship between research outputs and downstream outcomes.
Translation Research is **Not:**

- r2p
- Translation

Rather **it is** the study of those activities
Basis of OSH Translation Research

- NIH model (2003):
  - “bench-to-bedside”
  - 4 phases: T1—T4
  - Characterized by moving findings to a larger scale

- Knowledge to Action (Graham et al 2006);
  Knowledge Transfer and Exchange (Lavis et al 2003)

- Determining how best to make those transitions
Overview of OSH Translation Research

Figure 1: Overview of Translation Research for OSH

Translation Cycle
(Action Knowledge Creation)

- PHASE 1: Development
  - Candidate Intervention or Product
  - Synthesis
  - Solution Selection

- PHASE 2: Testing
  - Efficacy of Candidate Intervention or Product
  - Feasibility
  - Best Practices
  - Communication Strategy
  - Barrier Assessment

- PHASE 3: Institutionalization
  - Effectiveness of Candidate Intervention or Product
  - Dissemination
  - Diffusion
  - Adaptation
  - Fidelity
  - Implementation
  - Adoption
  - Use

- PHASE 4: Evaluation
  - Impact of Candidate Intervention or Product
  - Follow-up data
  - Outcomes
  - Sustainability

Feedback to Stimulate Basic and Applied Research
# The 4 Phases of Translation Research

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
<th>Role of OSH Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Development</td>
<td>Generating solutions and limited testing to select best candidates</td>
<td>Research and development; discovery studies</td>
</tr>
<tr>
<td>2 Testing</td>
<td>Observational and experimental studies</td>
<td>Efficacy and internal validity</td>
</tr>
<tr>
<td>3 Institutionalization</td>
<td>Assess facilitators and barriers to widespread implementation</td>
<td>External validity; Adoption and implementation, sustainability</td>
</tr>
<tr>
<td>4 Evaluation</td>
<td>Population level outcomes</td>
<td>Impact on health, safety, economics, and well-being</td>
</tr>
</tbody>
</table>
Translational Success Stories – Commercial Fishing

Jennifer Lincoln, PhD

30 years of NIOSH Research


- Developed to reduce high fatality rate
- Implemented 1990-1995
- No licensing or vessel requirements
- Focus placed on secondary prevention
  - Surviving a vessel disaster
  - Survival gear
Articles Identified as T4 Research

Series of articles studying CFIVSA

## T4: Population Measures

<table>
<thead>
<tr>
<th>Year</th>
<th>Vessels Lost</th>
<th>Persons on Board</th>
<th>Fatalities</th>
<th>Survivor Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>39</td>
<td>93</td>
<td>25</td>
<td>73%</td>
</tr>
<tr>
<td>1992</td>
<td>44</td>
<td>113</td>
<td>26</td>
<td>77%</td>
</tr>
<tr>
<td>1993</td>
<td>24</td>
<td>83</td>
<td>14</td>
<td>83%</td>
</tr>
<tr>
<td>1994</td>
<td>36</td>
<td>131</td>
<td>4</td>
<td>97%</td>
</tr>
<tr>
<td>1995</td>
<td>26</td>
<td>106</td>
<td>11</td>
<td>90%</td>
</tr>
<tr>
<td>1996</td>
<td>39</td>
<td>114</td>
<td>13</td>
<td>89%</td>
</tr>
<tr>
<td>1997</td>
<td>31</td>
<td>84</td>
<td>1</td>
<td>99%</td>
</tr>
<tr>
<td>1998</td>
<td>37</td>
<td>124</td>
<td>9</td>
<td>93%</td>
</tr>
<tr>
<td>1999</td>
<td>28</td>
<td>104</td>
<td>11</td>
<td>89%</td>
</tr>
</tbody>
</table>

Fatal Falls Overboard by Region: 2000-2014

No PFDs!
Fisherman:

“Why doesn’t somebody buy a bunch of PFDs and see which ones guys like to wear?”
Application of a translational research model to assess the progress of occupational safety research in the international commercial fishing industry

Devin L. Lucas\textsuperscript{a,2,4}, Laurel D. Kincl\textsuperscript{a}, Viktor E. Bovbjerg\textsuperscript{a}, Jennifer M. Lincoln\textsuperscript{b}

\textsuperscript{a}College of Public Health and Human Sciences, Oregon State University, 122 Women’s Building, Corvallis, OR 97331, USA
\textsuperscript{b}Alaska Pacific Office, National Institute for Occupational Safety and Health, 4200 University Drive Suite 310, Anchorage, AK 99508, USA

ABSTRACT

Translating basic science research into population-level health benefits is a challenge in all areas of public health, including occupational safety in the fishing industry. Translational research is a process for developing evidence-based interventions and implementing them in practice. The purpose of this study was to organize the literature on occupational safety in the fishing industry within the T0–T4 phases of translational research to identify areas of strength and consensus, as well as gaps for future translational research to address. A comprehensive search of the English language literature on the topic of occupational safety in the fishing industry first appeared in the literature during the 1950s. The bulk of research has focused on descriptive epidemiology in the T0 phase of translational research. A positive trend in recent studies is the growing emphasis on translational research (i.e., the T1–T4 phases). These types of studies aim to move research-to-practice by investigating potential solutions to safety problems and by developing, implementing, and evaluating interventions. Recommendations for future translational research include using consistent methods of injury classification and analysis, developing interventions targeted at specific problems in the highest-risk fisheries, and addressing the barriers and facilitators to widespread implementation of interventions. Workplace safety in the fishing industry will improve if future research concentrates on identifying and testing promising safety measures that are effective, practical and scalable. Translational research is the key to making progress toward the prevention of work-related injuries in the fishing industry.
Translational Success Stories – Construction

Eileen Betit, BA

CPWR - The Center for Construction Research and Training
Reducing Silica Exposure

Using Technology to Promote Best Practices…

- Research-based solutions to silica exposure:
  - Water
  - LEV

- Adoption challenges:
  - Unaware of seriousness of hazard
  - Unaware of the research
  - Perception solutions are not available/not feasible

- What we learned from workers/contractors
  - Difficult to find information
  - Available information is too general/complicated
  - Make it easy
  - Generate a ‘take-away’

- What we proposed
  - A one-stop website/resource and planning tool
Reducing Silica Exposure

Create-A-Plan to Control the Dust

Step 1. Will you generate dust containing silica on the job?
The materials listed below contain silica. Select all of the materials you plan to use. As you select a material a list of dust generating tasks will appear. Please select the task(s) that you will perform with the material.

- Asphalt
- Brick
- Abrasive blasting
- Bushhammering
- Cutting/sawing
- Demolishing/disturbance
- Drilling/coring
- Earthmoving
- Grinding
- Jackhammering
- Milling
- Other

Step 2. How do you plan to control the dust?
Select the type of equipment and dust control you plan to use for each material and task you selected in Step 1. Not sure - Perform Air Monitoring.
To find the exposure control methods in OSHA, use of controls click here. To give users the flexibility, for uncommon combinations or those not tested, you can use your own exposure control method.

Brick - Cutting/sawing
Select the Equipment/Control:
Click here for examples of commercially available controls.
- Hand-Held Masonry Saw with Vacuum
- Hand-Held Masonry Saw with Water
- Splitter
- Stationary Masonry Saw with Vacuum
- Stationary Masonry Saw with Water
- Other

Step 3. Complete your Silica Control Plan

Company:

Person Completing the Plan/Title:

Jobsite/Project:

Description of Work:

Please fill in the name and title of the person assigned as the competent person for silica on the project. Required by 29 CFR 1926.1153 (g)(5).
Click here for an explanation of what a competent person is, why it is important to assign one for silica, and what this person should know and do on the job.

Exposure Assessment and Controls
Equipment and Controls(s):
1) Hand-Held Masonry Saw with Vacuum, 2) Hand-Held Masonry Saw with Water (Table 1 Entry)
Key Steps and Progress

- **2011-2012** developed and launched the website
  - Involved workers and contractors, manufacturers and researchers
  - Launched with target audience involvement

- **2013** OSHA announces proposed Silica standard
  - Website used in testimony
  - Worked with stakeholders to expand content
  - Promoted in social media, presentations, articles, trade pubs

- **2016** OSHA releases final standard
  - Website cited in preamble as evidence of feasibility
  - OSHA recommends website as tool to aid in compliance
  - Manufacturers and insurance companies promote website with clients
T4: Population Measures

Average sessions per month since launch...

After launch
- Planning Tool: 85
- Overall Site: 919

After proposal
- Planning Tool: 582
- Overall Site: 5,630

After final standard
- Planning Tool: 1,287
- Overall Site: 14,008
T4: Population Measures

Masonry Union Workers’ Use of Controls
Always or Most of the Time:

- **2017**: 79% Always or Most of the Time
  - 61% Always
  - 26% Only Some of the Time

- **2014**: 46% Always or Most of the Time
  - 26% Always
  - 20% Only Some of the Time

- **2011**: 42% Always or Most of the Time
  - 19% Always
  - 20% Only Some of the Time
Translational Success Stories – Agriculture

Julie Sorensen, PhD

The Northeast Center for Occupational Health and Safety
Tractor Overturns in the US

- Most common cause of death on US farms
- Preventable with the proper use of ROPS
- Several efforts in the US to encourage ROPS
  - Education
  - Tractor Safety Initiative
  - Rebate Programs
The ROPS Rebate Program: How it Works

Call the ROPS Hotline 1-877-ROPS-R4U or visit www.ropsr4u.com

Complete Intake Form

List of price estimates and ROPS sources are sent

Rebate check mailed within 30 days

Send proof of purchase and installation

Call ROPS Staff for pre-approval and to confirm ROPS placed on order
T0-T3 Implementation Progression

T1 and T2: Solution Development and Pilot Testing

T3: Assess and Address Barriers to Widespread Implementation
National Expansion

National Tractor Safety Coalition

National ROPS Rebate Program
T4: Population Measures

19 overturns and nearly 200 close calls reported by participants

99% of farmers would recommend the program to others
What Contextual Factors Ensure Successful Implementation of Worksite Solutions?

Anne Gadomski, MD, MPH

Northeast Center for OSH
Important Factors for Scaling Up

- Fixsen et al. (2005):
  - Attitudes about EBIs, motivational readiness, community resources, staff attributes, organizational climate, stages of community readiness

- Rabin and Brownson (2012):
  - Clear distinction between fixed intervention components (implementation fidelity) and flexible components (adaptation).

- Aarons et al. (2012):
  - A strong leader who encourages the use of evidence to guide practice and adherence to that vision.

- Spoth et al. (2013):
  - Cost tracking/analysis tools that facilitate accurate cost projections
  - Technical assistance that incorporates on-the-job coaching
The Consolidated Framework for Implementation Research (CFIR)

Models, Measures and Methods

Using the Consolidated Framework for Implementation Research (CFIR) to transition to T4 stage (National ROPS Rebate Program):

- CFIR model to a non-clinical setting
- Add two categories (client outcomes and implementation outcomes)
- Use *Think Aloud* to update concepts so individuals from a wide-variety of backgrounds can understand and comment
- Survey the NRRP coalition (n =65) to rate constructs on a 5-point Likert scale “will not impact implementation” “will strongly impact implementation”
- Use modified survey to assess implementation at 3 points during scale-up
- Relate strength of CFIR factors to program outcomes (ROPS shipments)
T₀ to T₄ Model Adaptations for OSH

T₀: Identify Risk
- Surveillance
- Descriptive studies

T₁: Discovery to Candidate Innovation
- Formative research
- Innovation development
- Small-scale pilot testing
- Evaluation
- Revise innovation, as needed

Was the innovation successful?
No

T₂: Candidate Innovation to Evidence-Based Research
- Large-scale pilot testing
- Evaluation
- Revise innovation, as needed

Was the innovation successful?
Yes

T₃: Evidence-Based Research to Widespread Adoption
- Diffusion, dissemination, and implementation
- Evaluation
- Revise innovation, as needed

Are there insufficient resources to continue?
No

T₄: Practice to Population Health Impact
- Surveillance
- Outcomes Research

Did the effort lead to widespread adoption?
No

Efficacy or Effectiveness

Barriers and Facilitators

Sustainability

How will widespread adoption be initiated?

Passive diffusion of research findings or innovation

Implementation Studies
- Scaling up innovation
- Evaluation
- Revise innovation, as necessary

Will policies or standards be developed?
No

Policy or standard development

Dissemination of research findings or innovation to peers, workers

Implementation

Yes
In summary...

- Translational research-the study of the process of research translation

- Factors for ensuring successful translation of research to the worksite:
  - Tailoring solutions to our target populations
  - Multi-industry/stakeholder investment throughout the process
  - Multiple points of persuasion-make it easy/enforcement/benefits
  - Sustained funding agency investment
  - Promotion and advocacy (High Visibility)
Understanding Community Infrastructure and Capacity to Engage Community Agencies in Advancing Occupational Health Disparities Research

Jenny Hsin-Chun Tsai, PhD, ARNP, PMHCNS-BC, School of Nursing
Elaine Adams Thompson, PhD, RN, School of Nursing
Jerald Herting, PhD, Department of Sociology

NIOSH Expanding Research Partnerships: State of the Science
June 22, 2017
Presenter Disclosures

> No relationships to disclose

> Content is solely responsibility of the authors and does not necessarily represent the official views of NIOSH, the funding agency
Background and Issues

> Changing demographics of the US workforce and nature of work
> Immigrant workers disproportionately employed in low-wage, high health risk jobs
> Conventional worksite prevention approaches relatively ineffective in reaching low-wage immigrant workers
> Alternative approaches needed to address occupational health disparities
Background and Issues

> Community-based collaborative approaches have received increasing attention as a promising alternative.

> Little guidance, however, in the literature regarding:

  – How to engage community resources such as immigrant community institutions, nonprofits in the process to maximize “research to practice” effectiveness?

  – How to systematically identify community partners to disseminate worker health knowledge in the community?

  – How to translate research findings to non-worksites for immigrant worker health?
Purpose of this Presentation

> Illustrate an alternative approach to advance research for immigrant worker health, using two community based research projects (R21) with Chinese immigrant workers as an exemplar

Grants: NIOSH R21 OH009955 & OH010670
Overall Goal of the Studies

> To generate new knowledge to guide community partner selection and intervention design to increase worker health program diffusion and sustainability in communities:

– Who engages in the delivery of information and services to advance Chinese immigrant worker health

– What are ways to disseminate interventions that capitalize on community resources and at the same time put minimal demand on community resources
Study Description

> Interagency Network Study (N=36)
  – Characterized interagency connections and agency roles in community networks
  – Assessed organizational capacity (commitment, resources, flexibility) specific to Chinese immigrant worker health

> Integrating Worker Health Education Study (N=26)
  – Identified factors pertinent to agency programmatic decisions
  – Assessed the integration process for Basic Worker Health Education (WHEB) diffusion and sustainability at diverse community settings


Study Description

Study Samples

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Network Study</td>
<td>4</td>
<td>10</td>
<td>5</td>
<td>11</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>WHE Study</td>
<td>4</td>
<td>11</td>
<td>3</td>
<td>9</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Procedures

Network study: Joint interview with administrator & staff person from each agency

WHE Study: 2 Phases
1. Interview with middle or upper level administrator to identify factors for programmatic decisions;
2. Intervention implementation with 2 SER, 2 FBO, 2 PAN, and 2 NON agencies.
Knowledge We Gained...
Community Infrastructure & Capacity for Chinese Immigrant Worker Health
Sharing Information: Primary Reason for Interagency Connections

LEGEND
- Blue = Participating agency node; Red = Declined agency node
- Straight line = inter-agency link; Arrow = direction of link

Information sharing (density=0.16)  Joint political actions (density=0.06)
Strongest Ties Predominately Service, Nonprofit, and Public Sectors

- Chinese and Pan-Asian service sectors: strongest interconnectness
- Chinese faith-based and union sectors: relatively weakest links with other sectors

Legend:
Colored circle=sector node
Size of circle=sample size in sector
Line=inter-sector tie
Line width=strength of tie
Arrowhead=direction of tie

Directed cross-sector network for information and resource sharing

Undirected, cross-sector network for referrals, joint programs, joint political actions, & service contracts.

(Tsai & Petrescu-Prahova, 2016)
Central or Gatekeeper Positions Limited to Service-Oriented Agencies

<table>
<thead>
<tr>
<th>Type of relation</th>
<th>First</th>
<th>Second</th>
<th>Third</th>
</tr>
</thead>
<tbody>
<tr>
<td>Info. Sharing</td>
<td>Pan Asian 05</td>
<td>Public/Gov 01</td>
<td>Chinese Srv. 04</td>
</tr>
<tr>
<td>Resource Sharing</td>
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<td>Nonprofit 06</td>
<td>Public/Gov 03</td>
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<td>Joint Programs</td>
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<td>Nonprofit 05</td>
<td>Nonprofit 10</td>
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<td>Joint Political Actions</td>
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<td>Nonprofit 05</td>
<td>Nonprofit 09</td>
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<td>Service Contracts</td>
<td>Nonprofit 03</td>
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<td>Joint Programs</td>
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(Tsai & Petrescu-Prahova, 2016)
## Ratings on Organizational Capacity for Agencies in Central or Gatekeeper Positions

<table>
<thead>
<tr>
<th>Agency in Central or Gatekeeper Positions</th>
<th>Commitment (4 indicators)</th>
<th>Resources (4 indicators)</th>
<th>Flexibility (3 indicators)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pan Asian 05</td>
<td>High</td>
<td>Low Medium</td>
<td>High Medium</td>
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<tr>
<td>Nonprofit 05</td>
<td>High</td>
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<tr>
<td>Chinese Service 04</td>
<td>High</td>
<td>High</td>
<td>High</td>
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<tr>
<td>Public/Gov. 03</td>
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<td>Low</td>
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</tr>
<tr>
<td>Public/Gov. 04</td>
<td>High Medium</td>
<td>High</td>
<td>Low Medium</td>
</tr>
</tbody>
</table>

*Note. High= in the top quartile; Low=in the bottom quartile; Low medium= between the 25th and 50th percentiles; High medium= between the 50th and 75th percentiles*

Agencies in central or gatekeeper positions showed various levels of organizational capacity.
Engage Non-Governmental, Community Agencies in Chinese Immigrant Worker Health Research and Education Delivery
Factors Influencing Agency Decisions on Program Adoption

> Intra-organizational factors:
  – Organizational mission
  – Staffing level
  – Organizational structure
  – Needs of their clients or service users
  – Funding

> Extra-organizational factors:
  – Needs of the communities or populations they serve
  – Services available at other agencies
  – Funder expectations
Challenges in Engagement

- Multiple phone “tags” required before actual connections
- Agency personnel changes
- Agency website contact information insufficient to initiate study invitation process
- Agency unfamiliar with research
Challenges in Engagement

> Inconvenient or poor timing for agency participation
> Agency unable to conceive the relevance of or fit with study goals
> Concerns about demands on staff
> Concerns about clients’ perceived relevance for their primary reason for visiting the agency
> Uncertain about feasible mechanisms to engage Chinese immigrants at the agency to deliver Basic Worker Health Education
Solutions for Successful Engagement

> Persistence
> Broad data collection windows
> Ongoing support to provide assistance to research staff in developing effective strategies to facilitate recruitment and reduce frustration
> Create study-specific FAQs and communication templates for effective recruitment guidance
> Tailor communication strategies to help agencies understand the research project
> Brainstorm with agency staff to find ways to integrate the interventions
Summary and Implications

Our research provides critical new information

> Community potential to
  – Build on current interagency or cross-sector connections
  – Disseminate immigrant worker health interventions
  – Strengthen community infrastructure and capacity to promote immigrant worker health
Summary and Implications

> Application of interagency network analysis and measures of organizational capacity for systematic assessment of community infrastructure and identification of potential partners

> Importance of working within agency organizational context to minimize demands on the agency, increase buy-in, and foster sustainability of immigrant worker health interventions
Thank you. Questions?