– NOTES –
Health and the Built Environment Workshop Series

Workshop #1: Moisture
September 24, 2021

Participants

NAME	EMAIL
Aara'L Yarber	auy57@psu.edu
Daniel Vecellio	djv5030@psu.edu
David Conroy	conroy@psu.edu
Emily Kuhns	eah193@psu.edu
Esther Obonyo	eao4@psu.edu
Greg Jenkins	gsj1@psu.edu
Ismaila Diallo	idiallo@psu.edu
Jennifer Moss	jmoss1@pennstatehealth.psu.edu
Jessica Pugel	jessica_pugel@research2policy.org
Katherine Chan	kvc5765@psu.edu
Ken Davis	kjd10@psu.edu
Kristin Sznajder	kek157@psu.edu
Lara Fowler	lbf10@psu.edu
Laurie Crawford	lcrawford4@pennstatehealth.psu.edu
Natasha Miles	nmiles@psu.edu
Norman Anderson	andersonenvironmentalhealth@gmail.com
Nuria Casquero	nuriacm@lbl.gov
Omrana Pasha	opasha@pennstatehealth.psu.edu
Pamela Borowski	pab48@psu.edu
Rebecca Bascom	rbascom@pennstatehealth.psu.edu
Sandra Allain	sjallain@psu.edu
Sarah Klinetob Lowe	sek175@psu.edu
Saurabh Basu	sxb514@psu.edu
Tom Richard	tlr20@psu.edu
Wen-Jan Tuan	wtuan@pennstatehealth.psu.edu

Moisture and the External Environment

Session Facilitator: Ken Davis
Session Notetaker: Ken Davis

What are the main research questions in **moisture and the external environment** at the intersection of health and the built environment?

- Heat stress and the complications of relative humidity and wet bulb temperature.
- Flooding and flood prediction / prevention.
- Drought and water availability.
- (extremes of low humidity?)
- Water quality / pollution.
- Impacts of extreme high water in rivers and streams.
- Sea level rise and coastal areas.
- Climate / environmental justice facet…economic and racial forces can place people in dangerous environments (e.g. low lying areas / flooding / flood insurance / vicious cycle).

- EJ/CJ relationship to flood risk and perhaps RH hazard.
- Need for high resolution and high fidelity predictions and re-analyses. Need to quantify, verify, test our skills and evaluate usefulness relative to health needs, in the urban environment in particular. (hydrological, meteorological)
- Communication of environmental risks.
- Connection of extreme moisture to molds, mosquitos and other environmental secondary pollutants?
- What is the impact of the built environment on the atmospheric environment? Evapotranspiration is limited by impervious surfaces, and so is runoff.

What expertise exists at Penn State in **moisture and the external environment**?

- Climate science expertise. Numerical modeling, prediction, dynamics, process understanding, observations. Ice, air, etc.
- Forecasting. Including precipitation. Short to medium to long term.
- Urban meteorology, air quality.
- Urban hydrology. Storm water experts.
- Water quality experts.
- Sea level rise forecasting and management.
- Flood forecasting.

Where do we typically find **funding** for this work?

- NSF
- DoE
- NASA
- NOAA
- (USDA)
- EPA

Moisture in the Built Environment

Session Facilitators: Esther Obonyo and Nuria Casquero-Modrego
Session Notetaker: Sarah Klinetob Lowe

What are the main research questions in **moisture and the built environment** at the intersection of health and the built environment?

- **Increased moisture** -- Extreme weather/climate change (floods, heavy rains) will affect moisture in homes (humidity problems) and will increase moisture & health problems
- **Building codes & energy performance** – moisture problems due to higher insulation / tighter air sealing
    - **New construction** (building codes)
    - **Existing construction** (deep energy retrofits)
- **IAQ/PM2.5 outdoors** – time of day/season of year, have found it's higher at night; therefore if cooling at night, bringing in more PM2.5
- **Mass timber / wood** – moisture vulnerability esp. with flooding/extreme weather, lack of mold surveillance systems; DIY remediation esp. with vulnerable populations
- **Houses w.r.t. mold/moisture**
- **Public health / indicators for mold** – legal issues, how to detect underlying moisture problems
- **Building as a system** – ventilation / air tightness / interrelated – how connected to health, meaningful metrics
- **Mold remediation services --** good treatment of mold over long periods, construction research needs to improve
- **Diagnoses** -- With our knowledge, we can help the medical professions to diagnose, we know what the particles are, with a more direct relationship we'll be able make better diagnoses

What expertise exists at Penn State in **moisture and the built environment**?

- **Pennsylvania Housing Research Center**
- **Architectural Engineering**
    - Building Science – heat, air, moisture
- **Industrial Engineering** – how to identify quality of materials within the house, factory; evaluation of materials using smart phone technology; app development around material qualities
- **Meteorology** -- Modeling tools with GHG, apply to air pollution, e.g., PM2.5;
- **Climate change research** -- dynamics of changing weather
- **Occupational health literature** – environmental conditions that can connect to clinical models
- **GIS / risk analysis**
- **Architecture**
    - Hamer Center for Community Design

Where do we typically find **funding** for this work?

- **EPA**
- **DOE**
- **NIH**
- **NSF**
- **Environmental Defense Fund (EDF)**
- **DOE – Weatherization (now starting to address moisture / health)**

Moisture and Human Health

Session Facilitator: Becky Bascom
Session Notetaker: Wen-Jan Tuan

What are the main research questions in **moisture and human health** at the intersection of health and the built environment?

- Can we utilize GIS and geospatial analysis for risk-stratification purposes for moisture and human health?
- How do we measure the moisture effect and benefit of the remediation factors?
- What are the incidence and severity, and disease burden (childhood asthma, COPD). There are data cores for asthma in public health sciences.
- Is there moisture assessment tool (<u>NIOSH dampness and Moisture Assessment tools</u>)? Can moisture tools be adopted by residential environment?
- How does the moisture affect geographic disparities in the care outcome and overall health status of the population?
- If we put a prescription for people with severe asthma, will it be an effective way to improve health outcomes or reduce disease incidents? <u>A prescription for environmental assessment and remediation</u>.
- Can we predict the impact of climate change (e.g. moisture) on the occurrence and severity of the disease (e.g., asthma, cardiovascular events, depression, or drug use)?
- Are there differences in biomarkers between people living in damp areas and people not?
- What are the characteristics of the populations over time?

What expertise exists at Penn State in **moisture and human health**?

- Electronic health records and big data analytics
- TriNetX portal and raw data
- PaTH network, including EHRs at PSU, led by Wenke Hwang (analytics) and Cynthia Chung (clinician)
- PaTH is part of PCORNet that can be connected to other regional and national data sources.
- The division of allergy and immunology has a portfolio for the asthma population and disease conditions.
- There is a strong research core in family medicine, and other primary care specialties (e.g., GIM and general pediatrics).
- HHD knows a lot about working with people in their experience. There is a huge development from HHD.

Where do we typically find **funding** for this work?

- NIEHS
- NHLBI
- AHRQ (health services and quality improvement)?
- HRSA (training program for clinicians and medical students)?
- RWJ
- CMS or Insurance companies

Moisture and Policy

Session Facilitators: Kristin Sznajder and Omrana Pasha
Session Notetaker: Kristin Sznajder

What are the main research questions in moisture and policy at the intersection of health and the built environment?

- **Acute**: How to clean up, access utilities, facilities, healthcare, water/vector borne disease
- **Chronic**: Illness, quality of life, underemployment, impact on learning if schools are delayed to mold
- **Vulnerable Populations**: incarcerated populations, long-term care facilities
- **Infrastructure problems**: road infrastructure, building infrastructure, backyard wells
- **What populations are vulnerable to poor health outcomes associated with flooding in PA?**
- **Standards related to backyard wells do not exist – how to we work to develop appropriate regulations to improve human health?**
- **What is the correlation between hot spots with disease and water regulations?**
- Change in national flood insurance is going to occur next month – an increase in rates.
- Seeing more flooding in PA – **what is our vulnerable housing stock and how does it related to the building code? – As we are seeing more flooding – what might it cost to retrofit PA?**
- **What are the policy implications of moving communities as a whole?**

What expertise exists at Penn State in moisture and policy?

- Law; Health Policy; Epidemiologic Methods; Specific Health Outcomes
- lots on flooding, drought, outdoor/indoor air quality (mold, particulates, etc.). Lot of people on water borne diseases.
- Specific projects: Penn State Initiative for Resilient Communities (focused on flooding); Water (in(security): focused on private wells/health impacts in PA; Advancing Resilience in Low Income Housing
- RPC has access to a searchable database of legislation and related governmental documents, which might be helpful in understanding existing policies

Where do we typically find funding for this work?

- FEMA/PEMA
- USDA
- DOE
- NIH
- NIEH
- NSF
- Center for Rural PA
- William T Grant
- Burroughs Wellcome Fund

What 'rang a bell?'

Interdisciplinary topics, challenging research that could bring us together (at least some of us)

- Link to CJ/EJ. Important for policy as well.

- AI and link to the health care system. Interpret environmental data for health.

- Local sensors for health…individual data collection.

- Community input, flood risk and prediction and link to policy.

- Make sure we connect the science to policy – strong interest from funding sources.

- We have a diverse group together right now… let's build on that.

- Infrastructure links.

- Integration of environmental knowledge with the health care infrastructure…can we do this? How can we do this? This is an important challenge.

- Policy assessment by evaluation at the local level. What's useful and possible and feasible?

- PA as a case study. PA housing. Floods, mold, moisture, CJ/EJ, vulnerable populations. Health forecasts and diagnoses for local communities. Modify housing to be more resilient.

- Where are the hotspots to focus the PA case study? Where are folks the most vulnerable?

- What are the intersections with decarbonization and electrification? Holistic approaches to solutions / resiliency.

- Tie the water extremes to health. How does the moisture connect causally to health problems? Moisture and…mold, insects, asthma…can we say, when health impacts occur, how moisture has contributed? Do we need mechanistic research here?

- How does the above intersect with vulnerable populations?

- Can we use mapping tools to communicate vulnerability assessments?

- Local case study is good…and connect to global. PA is relevant to the world, and PA can learn from the world.

- Air and water connection…community engaged research. We need to clarify what community engagement principles are that we should follow. Determining the methods of community engagement is a research topic.

- What about AI to help clinical decision making and clinical conversations.. to predict most vulnerable patients and what needs to be discussed with them -- could be tied with environmental rx

- Systems approach to solutions. Holistic solutions with attention to CJ/EJ. Get granular about health outcomes. Help Becky advise a patient in particular.

- How is asthma impacted by water?

- How well does the dampness and moisture tool work? Should we be testing it?

- What about building conditions in rent vs. owned, rich vs. poor, developed vs. developing world?

- impact of outdoor on indoor water…research question?

- Could we write prescriptions for environmental remediation? at the ER or in the clinic?

- How will increased heat and humidity impact patients with poor cardiovascular health? Basic unknown?

- How much do our health scientists need high resolution, high quality environmental prediction?

- Does seem like there is an interesting proposal here.

- PA- one of the most flood prone states in the US

- Climate impact: more floods, more moisture

- Q: who is impacted? EJ question?

- Q: what are the impacts in the built environment?

- Q: what are the health impacts? (urgent, longer term)

- Q: what are the solutions - for individuals, communities, etc. ? and how can we use state of the art environmental data/models, and AI to evaluate and communicate? Where is better / more data and models needed? Where are the communications blockages and how can we alleviate them?

- Lot of direct linkages to law/policy/community engagement.