



THE PSYCHOSOCIAL IMPACTS OF ENVIRONMENTAL CONTAMINATION

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OUTLINE

- Define Environmental Contamination
- Community Impacts
- Mental Health Impacts
- Case Examples – Flint, Red Hill, Kilauea
- Available Resources
- Needs

LEARNING OBJECTIVES

Understand	Understand the broad range of possible environmental contamination and how it can cause or worsen mental health disorders
Evaluate	Evaluate the contribution of environmental contamination in mental health conditions in patients in affected communities
Help	Help patients affected by environmental contamination using resources provided
Advocate	Advocate for more mental health services for communities impacted by environmental contamination



WHY IS THIS IMPORTANT?

Lack of understanding of the mental health and social impacts of environmental contamination on individuals and communities.

Leading to undiagnosed mental health disorders, not enough mental health resources for a community, insufficient mental health care and overall worse health and resilience.

ENVIRONMENTAL CONTAMINATION

Physical, chemical, biological, or radiological substance that has an adverse effect on air, water, soil, or living organisms.

Enter the air we breathe, the water we drink, the food we eat, and the places where we live, work, and play.



ENVIRONMENTAL CONTAMINATION IMPACTS

Illnesses

Financial losses

Relocation

Community discord

Loss of community fabric,
historical and family ties

**MENTAL
HEALTH
IMPACTS**

Stress/Worry/Fear

Anxiety

Depression

PTSD

Cognitive Functioning

Trauma Of Living Through A Disaster

Injury/Deaths

Loss of home, belongings,
community

Loss of livelihood

Relocation

MENTAL HEALTH AFTER KATRINA

- Suicide attempts and suicidal ideation more than doubled after Hurricane Katrina
- 1 in 6 residents had PTSD
- Did not see significant decreases (or return to historical baseline) on follow up nearly 2 years after the storm

RC Kessler Trends in mental illness and suicidality after Hurricane Katrina Mol Psychiatry 2008
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2556982/>



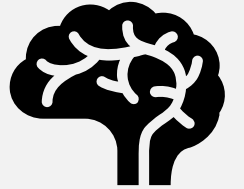
ABC News; Dave Martin; Superdome 8/28/05

**OTHER
EFFECTS OF
DIASTERS
IMPACTING
MENTAL
HEALTH**



- Increased substance use, risky behavior
- Mental health effects from declining physical health
- Loss of social support or employment
- Population migration, community changes

ILLUSION OF SAFETY



Psychic defense mechanism in which one believes that one is immune to misfortune, illness or death

When lost, people can feel unprotected and vulnerable

Loss is a significant contributor to mental health impacts after a disaster, violence or environmental contamination

FACTORS OF CONTAMINATION THAT MAY AFFECT PSYCHOSOCIAL IMPACTS

CONTAMINANT

AGE (Legacy vs. New)

SOURCE (Human or Natural)

TIMING (Acute or Chronic)

VISIBILITY of Health Effects (Obvious or Subtle)

ENVIRONMENTAL JUSTICE



ENVIRONMENTAL JUSTICE

Per EPA:

<https://www.epa.gov/environmentaljustice>

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. This goal will be achieved when everyone enjoys:

The same degree of protection from environmental and health hazards, and
Equal access to the decision-making process to have a healthy environment in which to live, learn, and work.

CASE EXAMPLE FLINT, MI



View into Flint drinking water pipes, showing various types of iron corrosion and rust. Min Tang and Kelsey Jeper

April 2014, the water source for the city of Flint, MI was changed from Lake Huron to the Flint River.

The switch caused water distribution pipes to corrode and leach lead and other contaminants into the drinking water.

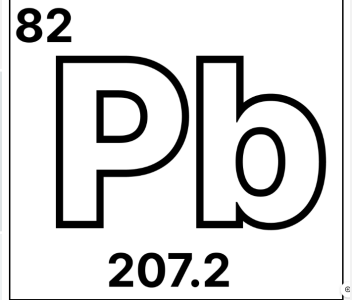
Despite many complaints, residents were reassured the water was fine.

2 years later, it was revealed that there was significant lead contamination in the water and the water was declared “not safe to drink.”

Thousands of children were diagnosed with childhood lead poisoning and 12 people died of Legionnaire’s Disease

CASE EXAMPLE - FLINT

CONTAMINANT	lead
AGE	new
SOURCE	human
TIMING	chronic
VISIBILITY	subtle
ENVIRONMENTAL JUSTICE	yes



CDC CASPER-FLINT-MAY 2016



Community Assessment for Public Health Emergency Response (CASPER)

- 66% of households reported one or more adult members reported experiencing at least one behavioral health issue “more than usual”
- 54% of households reported that at least one child experienced at least one behavioral health issue “more than usual”
- 22.5% of households reporting difficulties getting access to behavioral health services
- 34% of individuals self-reported symptoms of anxiety and 29% self-reported symptoms of depression

LOOKING AT MENTAL HEALTH IN FLINT 5 YEARS AFTER CRISIS ONSET

- 1970 surveys completed
- Evaluated:
 - * negative experiences and beliefs related to crisis,
 - * prevalence of major depression and PTSD,
 - * potential factors related to mental health outcomes (demographics, psychological risk factors related and unrelated to water crisis,)
 - * utilization of mental health services

Reuben A et al. Prevalence of Depression and Posttraumatic Stress Disorder in Flint, Michigan, 5 Years After the Onset of the Water Crisis. *JAMA Netw Open*. 2022;5(9):e2232556.



FLINT – 5 YEARS LATER

Key Points

Question What are the long-term psychiatric outcomes of environmental disasters, such as the Flint water crisis?

Findings In this cross-sectional household probability sample survey of 1970 adults living in Flint, Michigan, during the water crisis, more than one-fifth met criteria for presumptive past-year depression, nearly one-quarter for past-year presumptive posttraumatic stress disorder, and more than one-tenth for both disorders 5 years after the onset of the water crisis. Only 34.8% were ever offered mental health services to assist with water-crisis-related psychiatric symptoms; most (79.3%) who were offered services utilized them.

Meaning These findings suggest that public-works environmental disasters such as the Flint water crisis have lasting psychological sequelae and may require expanded mental health services to meet long-term psychiatric need.

THE FLINT WATER CRISIS:

Systemic Racism
Through the
Lens of Flint

*Report of the Michigan
Civil Rights Commission*

FEBRUARY 17, 2017

ENVIRONMENTAL INJUSTICE IN FLINT

“Environmental Justice requires that all people and communities receive the equal protection of environmental and public health laws and should have an equal and meaningful voice in decisions related to their environment. As the Governor’s Flint Water Advisory Task Force found, the Flint water crisis is an example of environmental injustice. The people of Flint did not enjoy the equal protection of environmental or public health laws, nor did they have a meaningful voice in the decisions leading up to the Flint Water Crisis. Many argue they had no voice.”

CASE EXAMPLE RED HILL

- Nov 20, 2021, a large amount of JP-5 jet fuel from the Red Hill Bulk Fuel Storage Facility owned and operated by the US Navy contaminated the drinking water sickening thousands on Oahu
- Clean-up took many months
- Communication challenges



CASE EXAMPLE – RED HILL

CONTAMINANT	JP-5 jet fuel
AGE	new
SOURCE	human
TIMING	acute & chronic
VISIBILITY	overt
ENVIRONMENTAL JUSTICE	controversial

MENTAL HEALTH IMPACTS

RED HILL

Event was an
extreme source of
stress

Likely to be
persistent

Significant reports of mental health
impacts in health impact survey, DOH
complaints and observed in callers, on
social media

CDC/ATSDR Assessment of Chemical Exposure (ACE) Investigation

- January 7 – February 10, 2022
- Extensive Recruitment
- 2,289 participants

HEALTH IMPACT SURVEY



Water Use



Health Symptoms



Medical Care



Children



Pets



From MMWR reporting on First ATSDR ACE “Notes from the Field: Self Reported Health Symptoms Following Petroleum Contamination of a Drinking Water System – Oahu, Hawaii, November 2021-February 2022”

TABLE. Occurrence of new or worsened symptoms, and symptoms persisting for ≥ 30 days after the contamination of a water system by a petroleum leak on November 20, 2021, self-reported by participants of the Hawaii Assessment of Chemical Exposures survey (N = 2,289) — Oahu, Hawaii, November 2021–February 2022



Self-reported symptom	No. (%) of survey participants	
	Experiencing new or worsened symptoms	Experiencing symptoms for ≥ 30 days*
Mental health	1,049 (46)	865/1,049 (83)
Anxiety	839 (37)	667/839 (80)
Agitation/Irritability	696 (30)	549/696 (79)
Difficulty sleeping	744 (33)	590/744 (79)
Feeling depressed	463 (20)	364/463 (79)
Paranoia	226 (10)	179/226 (79)
Tension/Nervousness	656 (29)	524/656 (80)

8 MONTH FOLLOW UP CDC/ATSDR ACE SURVEY RESULTS

September 2022

health.hawaii.gov/about/files/2022/11/ATSDR-Follow-Up-Survey-One-Page.pdf

80% of participants reported symptoms in the last 30 days with 65% convinced related to the water

Headaches, Anxiety, dry/itchy skin, fatigue

85% are still using an alternative water source

50% reported worse mental health

Massive concern and frustration with communication, transparency and trust

OVERALL HEALTH AT FOLLOW-UP

55%

reported worse physical health after the incident when compared to before

50%

reported worse mental health after the incident when compared to before

21%

kept from usual activities for 14+ of the past 30 days due to poor health

CASE EXAMPLE KĪLAUEA

- Effusive (Shield) Volcano
- Erupting intermittently since 1983
- Massive eruption May 3 –Aug 4, 2018
- Acute event
- Many immediate impacts



photo: USGS



2020/2021/2022/2023 ERUPTIONS

- Confined to the summit of Kīlauea within Hawaii Volcanos National Park
- Intermittent high emissions
- Vog continues to impact downwind communities (chronic)

KĪLAUEA CONTAMINANTS

- Lava
- Ash, Laze, Volcanic Glass
- Lava Projectiles
- Extreme amounts of SO_2 (up to 50,000 metric tons per day) particulate matter and other volcanic gases



photo: USGS

ASH & LAZE



Photo: The Guardian



Photo: Scientific American

SULFUR DIOXIDE



Photo: weather channel

VOG



source: konaweb.com/vog

CASE EXAMPLE - KĪLAUEA

CONTAMINANT	SO ₂ /VOG
AGE	old
SOURCE	natural
TIMING	acute & chronic
VISIBILTY	overt & subtle
ENVIRONMENTAL JUSTICE	variable

MENTAL HEALTH
IMPACTS

KĪLAUEA





POOR AIR QUALITY ASSOCIATED WITH
ANXIETY, SI, POST-PARTUM
DEPRESSION

Uncertainty

Fear

Lack of
Agency

Distrust in
Response/
Responding
authorities

**ADDITIONAL
CONTRIBUTING
FACTORS**

HOW CAN WE HELP PATIENTS?

- Recognition
- Acknowledgement of Uncertainty
- Stay Informed
- Take an Exposure History, Document
- Connect to resources
- Recommend counseling or increase MH care when appropriate

<https://atsdr.cdc.gov/stress>

ATSDR Agency for Toxic Substances and Disease Registry

Community Stress Resource Center

WE NEED MORE MENTAL HEALTH
RESOURCES!!

ADVOCACY

ADDITIONAL
NEEDS



Awareness



Communications



Research



Education & Training



Environmental Clean-Ups

RESOURCES

- Couch and Cole “Community Stress, Psychosocial Hazards, and EPA Decision-Making in Communities Impacted by Chronic Technological Disasters” AJPB 2010 <https://ajph.aphapublications.org/doi/10.2105/AJPB.2010.300039>
- Schmitt HJ et al “Chronic environmental contamination: A systematic review of psychological health consequences” Sci of Total environment 2021 <https://www.sciencedirect.com/science/article/abs/pii/S0048969721000917?via%3Dihub>
- Sullivan D et al “Chronic environmental contamination: A narrative review of psychosocial health consequences, risk factors, and pathways to community resilience” Social Science and Medicine 2021 <https://www.sciencedirect.com/science/article/abs/pii/S0277953621002094>
- Reuben A et al “Prevalence of Depression and Posttraumatic Stress Disorder in Flint, Michigan, 5 Years After the Onset of the Water Crisis” JAMA 2022 <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2796540>
- CDC/NCEH Division of Environmental Hazards and Health Effects “CASPER After the Flint Water Crisis: May 17-19, 2016” Final Report 2016 https://www.michigan.gov/-/media/Project/Websites/flintwater/documents/2016/CASPER_Report.pdf?rev=d49ce88517a34da9b3b8887076e07e10
- Michigan Civil Rights Commission “The Flint Water Crisis: Systemic Racism Through the Lens of Flint” 2017 <https://www.michigan.gov/-/media/Project/Websites/mdcr/mcrc/reports/2017/flint-crisis-report-edited.pdf?rev=4601519b3af345cfb9d468ae6ece9141>
- Troeschel A et al “Notes from the Field: Self Reported Health Symptoms Following Petroleum Contamination of a Drinking Water System – Oahu, Hawaii, November 2021-February 2022” MMWR 2022 <https://www.cdc.gov/mmwr/volumes/71/wr/mm7121a4.htm>
- Tucker P et al “Report of the Expert Panel Workshop on the Psychological Responses to Hazardous Substances” CDC-ATSDR 1995 <https://atsdr.cdc.gov/risk/prhs/psych5ed.pdf>
- Tzivian L et al “Effect of long-term outdoor air pollution and noise on cognitive and psychological functions in adults” International Journal of Hygiene and Env Health 2015 <http://dx.doi.org/10.1016/j.ijheh.2014.08.002>

QUESTIONS?



Photo: Daniel Davila

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