

# The University of Michigan Dioxin Exposure Study

The University of Michigan

*School of Public Health*

*Institute for Social Research*

*College of Engineering*

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# The University of Michigan Dioxin Exposure Study

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- **The Dow Chemical Company has asked the University of Michigan to design and conduct a study of exposure to dioxins in the Midland and Saginaw County area**
  - *The Univ. of Michigan study will be funded by Dow.*
  - *The study will be independent.*
    - The investigators will not report to Dow.
    - The investigators will report to an independent Scientific Advisory Board (SAB)



# The University of Michigan Dioxin Exposure Study

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- **Between February 2004 and August 2004 we sought and received input on the study goals, design, and process from**
  - *Michigan Department of Community Health (MDCH)*
  - *Michigan Department of Environmental Quality (MDEQ)*
  - *ATSDR*
  - *Midland and Saginaw County Health Departments*
  - *The Dow Chemical Company*
  - *Other stakeholders*



# The University of Michigan Dioxin Exposure Study

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- **Goals of this presentation:**
  - *Present the study design, rationale, and schedule.*
  - *Explain how this study will advance our knowledge of serum dioxin levels in Midland and Saginaw and their sources.*



# The Questions We Want to Answer

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- The primary goal is to quantify the relationship between measures of ambient exposure to dioxin-like compounds and measures of these same compounds in blood serum.
- What factors explain the variation in serum dioxin levels among the population?
  - *Soil dioxins, house dust dioxins*
  - *Residential proximity to Tittabawassee River*
  - *Consumption of fish and game*
  - *Occupations*
  - *Age, BMI, sex, etc.*
- This is not a study of health effects of dioxins. It is a study of dioxin exposure pathways.



# Study Overview

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- **We will collect the following information/samples from each participant:**
  - *Responses to a 1-hour personal interview*
  - *Serum (80 ml blood draw)*
  - *House dust (vacuum sample from commonly used rooms)*
  - *Soil*
- **Blood, house dust, and soil will be analyzed for the WHO 29 list of dioxins, furans, and coplanar PCBs.**



# Congeners and WHO 29 TEF Values

Dioxin Congener	WHO TEF Value
2,3,7,8-TCDD	1.0
1,2,3,7,8-PnCDD	1.0
1,2,3,4,7,8-HxCDD	0.1
1,2,3,6,7,8-HxCDD	0.1
1,2,3,7,8,9-HxCDD	0.1
1,2,3,4,6,7,8-HpCDD	0.01
OCDD	0.0001

Furan Congener	WHO TEF Value
2,3,7,8-TCDF	0.1
1,2,3,7,8-PnCDF	0.05
2,3,4,7,8-PnCDF	0.5
1,2,3,4,7,8-HxCDF	0.1
1,2,3,6,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDF	0.1
2,3,4,6,7,8-HxCDF	0.1
1,2,3,4,6,7,8-HpCDF	0.01
1,2,3,4,7,8,9-HpCDF	0.01
OCDF	0.0001

PCB Congener	WHO TEF Value
PCB 77	0.0001
PCB 81	0.0001
PCB 126	0.1
PCB 169	0.01
PCB 105	0.0001
PCB 114	0.0005
PCB 118	0.0001
PCB 123	0.0001
PCB 156	0.0005
PCB 157	0.0005
PCB 167	0.00001
PCB 189	0.0001



# Study Population

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- **Random samples of adult residents (and their housing units) from three populations:**
  - *350 residents of the Tittabawassee River flood plain (175 from properties in the flood plain, 175 from properties adjacent to the flood plain)*
  - *175 residents of Saginaw County, Midland County, and part of Bay County who do not reside in the flood plains of the Tittabawassee or Saginaw Rivers or the confluence flood plain of the Shiawassee River*
  - *175 residents of Jackson and Calhoun Counties*



# Study Population

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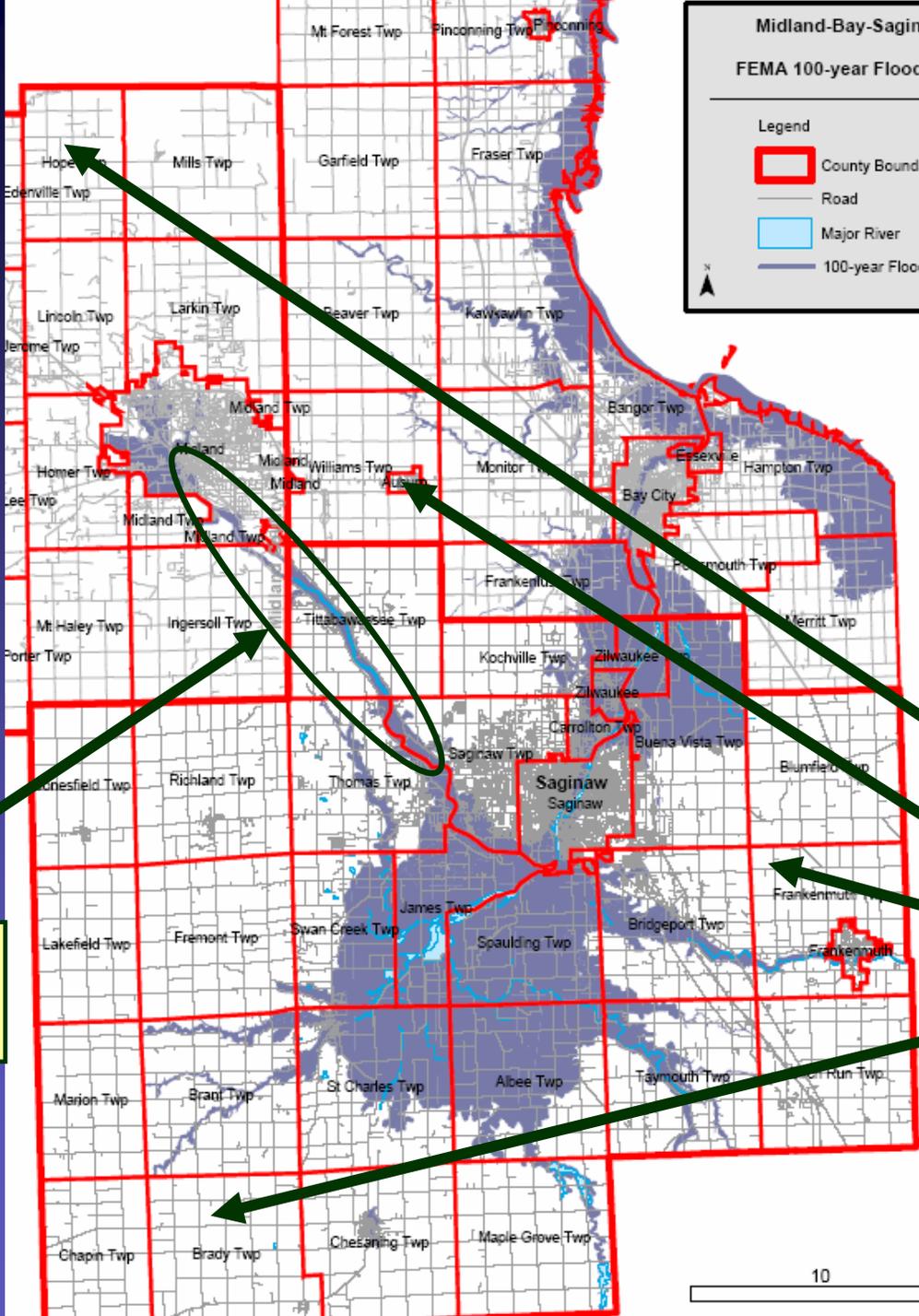
- **We will select a random sample of the population**
  - *Participation is very important to the success of the study*
  - *We cannot accept volunteers because volunteers are not a representative sample of the population*
  - *Relying on volunteers would make it difficult to draw conclusions that are applicable to the entire population*

**Midland-Bay-Saginaw**  
**FEMA 100-year Floodplain**

**Legend**

- County Boundary
- Road
- Major River
- 100-year Floodplain

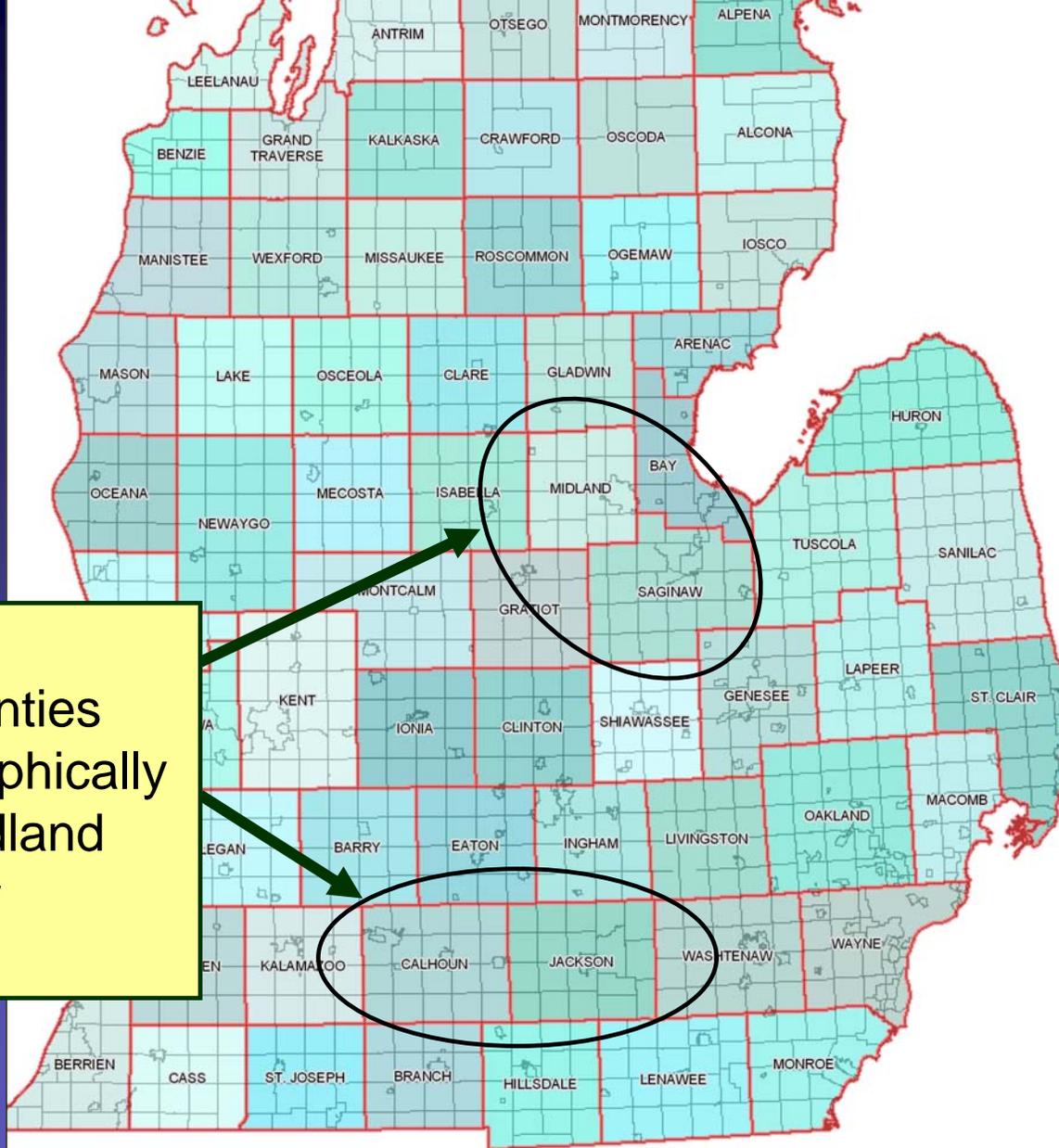
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Tittabawassee River flood plain

Other areas of Midland, Saginaw, and Bay counties

10 Miles



Jackson and Calhoun counties are demographically similar to Midland and Saginaw counties.

### Michigan

Minor Civil Divisions  
0 5 10 20 30 40 Miles  
S. Swan, UM-CSCAR/NSDS, 2004





# Household Dust and Soil Collection

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- One indoor household dust sample will be collected from the residence of each respondent using a vacuum collection method
- Soil samples from
  - *Around the residence*
  - *Spots where there are soil contact activities*
  - *The flood plain (if the property is in the flood plain)*



# Household Dust Collection



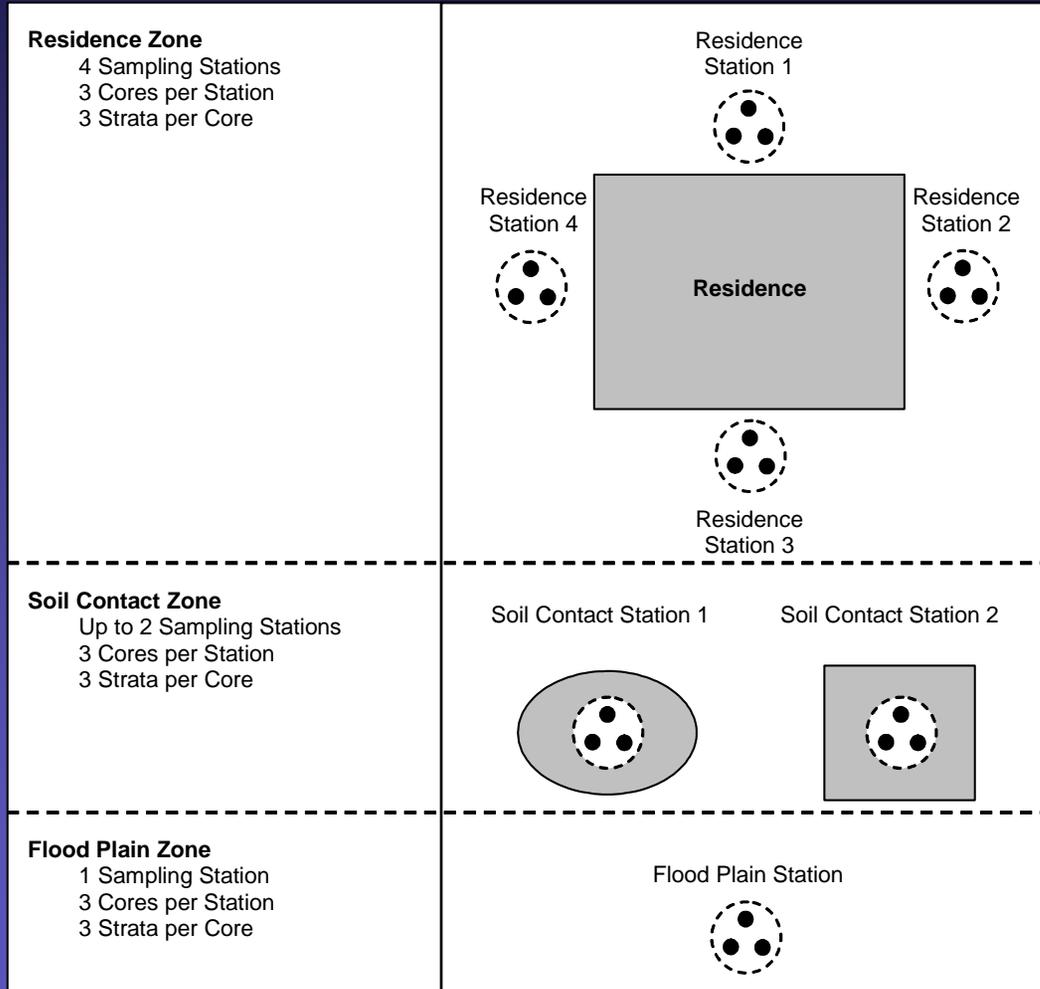


# Soil Collection





# Soil Collection and Compositing



## Compositing Strategy

- Cores (6") are stratified in vegetation, top 1" and bottom 5"
- Residence zone core strata are composited
- Soil contact zone strata composited
- Flood plain zone strata composited



# Statistical Analysis

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- **Comparison of serum dioxin levels from participants who live**
  - *In the Tittabawassee River flood plain*
  - *Near the Tittabawassee River flood plain*
  - *In Midland/Saginaw Counties outside flood plain*
  - *In Jackson/Calhoun Counties*
- **Regression modeling will be used to examine the effects of variables on serum dioxin levels**



# Statistical Analysis

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- **These analyses will answer the principal hypothesis:**
  - *Are serum dioxin levels related to soil dioxin levels? (congener specific analyses and TEQ)*
- **These analyses will control for the effects of other factors (age, sex, BMI, fish consumption, meat consumption, residential proximity to Dow, etc.)**



# Communications Plan

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- **Communicate with the population of Midland, Saginaw, and Bay Counties for the purposes of**
  - *Soliciting input on their concerns regarding dioxin contamination in their environment*
  - *Designing a scientific study that will help to address these concerns*
  - *Providing reliable scientific evidence that is responsive to their concerns*
  - *Explaining what the scientific evidence means and how it addresses the concerns of the affected population*



# Scientific Advisory Board

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- Nominations to the Scientific Advisory Board were submitted by MDCH, MDEQ, ATSDR, and the University of Michigan and were agreed upon.
  - *Four nationally recognized scientists serve on the SAB*
    - Linda Birnbaum, PhD (Toxicologist, EPA)
    - Paolo Boffetta, MD (Epidemiologist, IARC)
    - David Kleinbaum, PhD (Statistician, Emory Univ.)
    - Ronald Hites, PhD (Environmental Scientist, Indiana Univ.)
  - *The SAB reviewed the scientific protocol, provided written comments, and discussed their comments with the investigators.*
  - *The investigators are modifying the protocol in response to the SAB comments.*



# Independence and Integrity of the Study

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- Independence and integrity are essential to the success of the study
  - *The University of Michigan alone has control over the conduct of the study.*
  - *The University has the right to publish the results of the study as it sees fit.*
  - *The University researchers will report on the progress, conduct, and results of the study to the SAB.*
  - *The SAB will report results to the public, including Dow.*
  - *The Dow Chemical Company has no involvement in the conduct of the study.*
  - *The University of Michigan has asked ATSDR to audit the data as the study is conducted to assure impartiality.*



# Schedule

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- **September 2004 – November 2004**
  - *Interviews, house dust collection, soil collection among*
    - *Population in Tittabawassee River flood plain*
    - *Population in Midland, Saginaw, part of Bay Counties*
  - *Begin work on population of Jackson and Calhoun Counties (4-month startup phase)*
  - *Analyses of dioxins in serum*
- **Fall 2004 – Spring 2005**
  - *Analyses of dioxins in dust and soil*



# Schedule

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- **March 2005 – November 2005**
  - *Interviews, house dust collection, soil collection among*
    - *Population of Jackson and Calhoun Counties*
    - *Populations of Midland and Saginaw Counties*
  - *Analyses of dioxins in serum, dust, soil*
- **November 2005 – Summer 2006**
  - *Data analysis and report writing*
- **Summer 2006 – Fall 2006**
  - *Reporting of results*



# Reporting of Results

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- Individual participants will be given the results of their tests (if they wish to receive them).
- Aggregate data will be presented in scientific reports which will be peer-reviewed by the SAB.
- Scientific reports that have been approved by the SAB will be posted to a website which is publicly available: [www.umdioxin.org](http://www.umdioxin.org)
- The investigators will meet with community members to discuss results and answer questions.



# Assurance of Confidentiality

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- Usual confidentiality procedures (e.g., do not use names in reports, assign identify codes, keep materials secure, chain of custody of specimens, etc.)
- Confidentiality pledge – to be signed by all investigators and staff
- Certificate of Confidentiality
  - *Based on federal legislation that assures confidentiality in perpetuity (Section 301(d) of the Public Health Service Act (42 U.S.C. 241(d))*
  - *Issued by NIH*  
*(<http://grants1.nih.gov/grants/policy/coc/index.htm>)*
  - *Protects investigators and institutions from being compelled to release information that could be used to identify research study participants (civil, criminal, administrative, legislative, or other proceeding, whether at the federal, state, or local level)*



**END**

UMDES Website: [www.umdioxin.org](http://www.umdioxin.org)

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