



**Measuring People's Exposure  
to Dioxin Contamination  
Along the Tittabawassee River  
and Surrounding Areas**

**FINDINGS FROM THE UNIVERSITY OF MICHIGAN  
DIOXIN EXPOSURE STUDY**

**Financial support for this study comes from The Dow Chemical Company through an unrestricted grant to the University of Michigan.**

**The University of Michigan has complete independence to design, carry out, and report the results of the study.**

**The investigators report to an independent Scientific Advisory Board (SAB).**

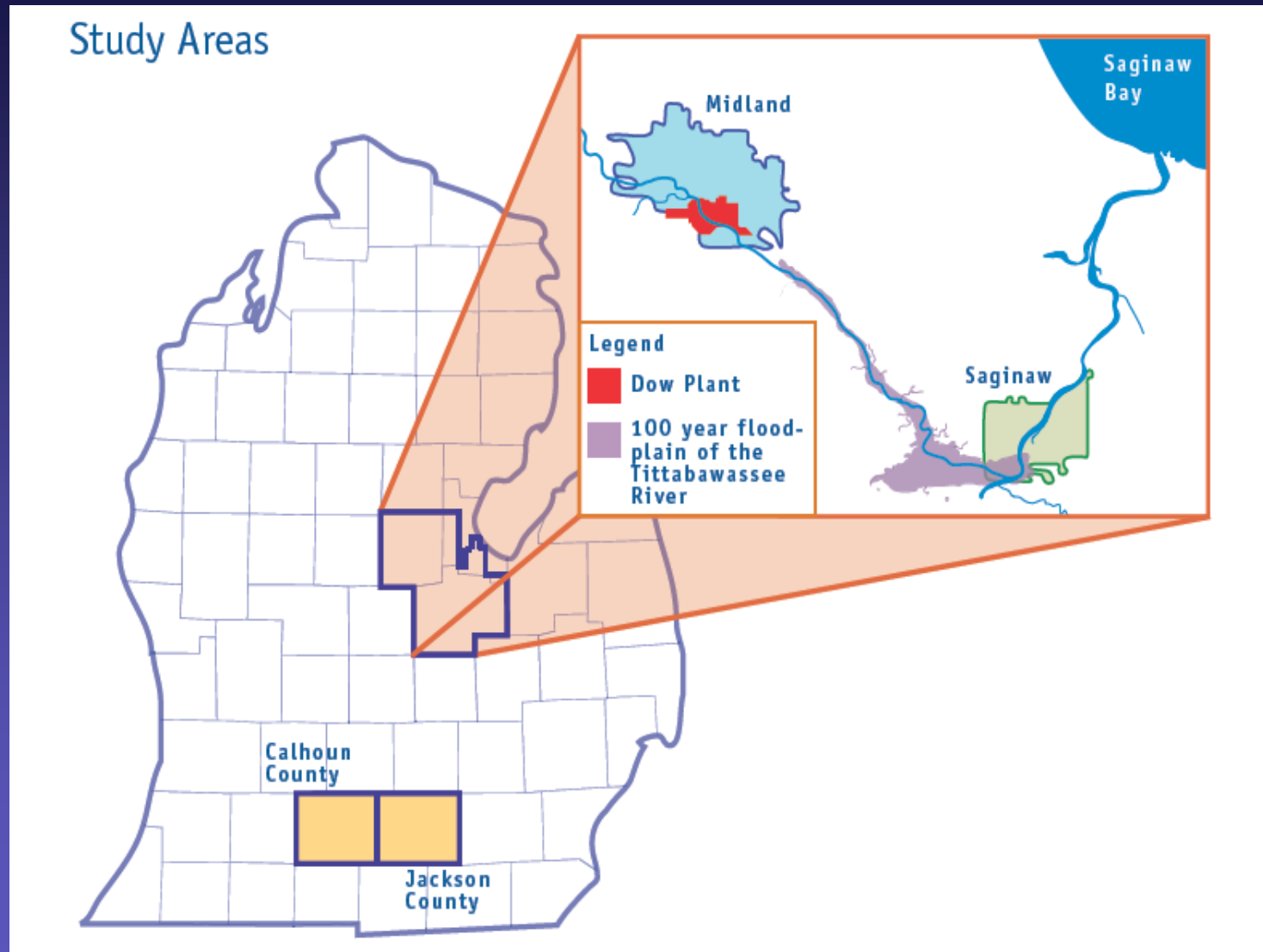
- ❖ This is the initial report of the University of Michigan Dioxin Exposure Study (UMDES).
- ❖ We measured 29 key chemicals within the family of dioxins. The summary measure -- called the "TEQ" (for Toxic EQuivalency) -- is the combined toxicity of all 29 dioxins.
- ❖ Today we are reporting the results for the TEQ and 7 specific dioxins within the group of 29 chemicals. The 7 chemicals are the major contributors to the TEQ in people's blood in our study and in the US population.
- ❖ It is important to note that all Americans have measurable levels of dioxins in their blood.

- ❖ Older age is by far the most important factor related to higher levels of dioxins in people's blood.
- ❖ Eating fish from the Tittabawassee River, Saginaw River, and Saginaw Bay also leads to higher levels of dioxins in blood.
- ❖ Living on contaminated soil contributes a small amount to the levels of dioxins in people's blood.

We studied people who live in five geographic areas:

- ❖ The Floodplain of the Tittabawassee River
- ❖ The Near Floodplain
- ❖ The Midland Plume
- ❖ Other Midland/Saginaw
- ❖ For comparison, Jackson/Calhoun Counties

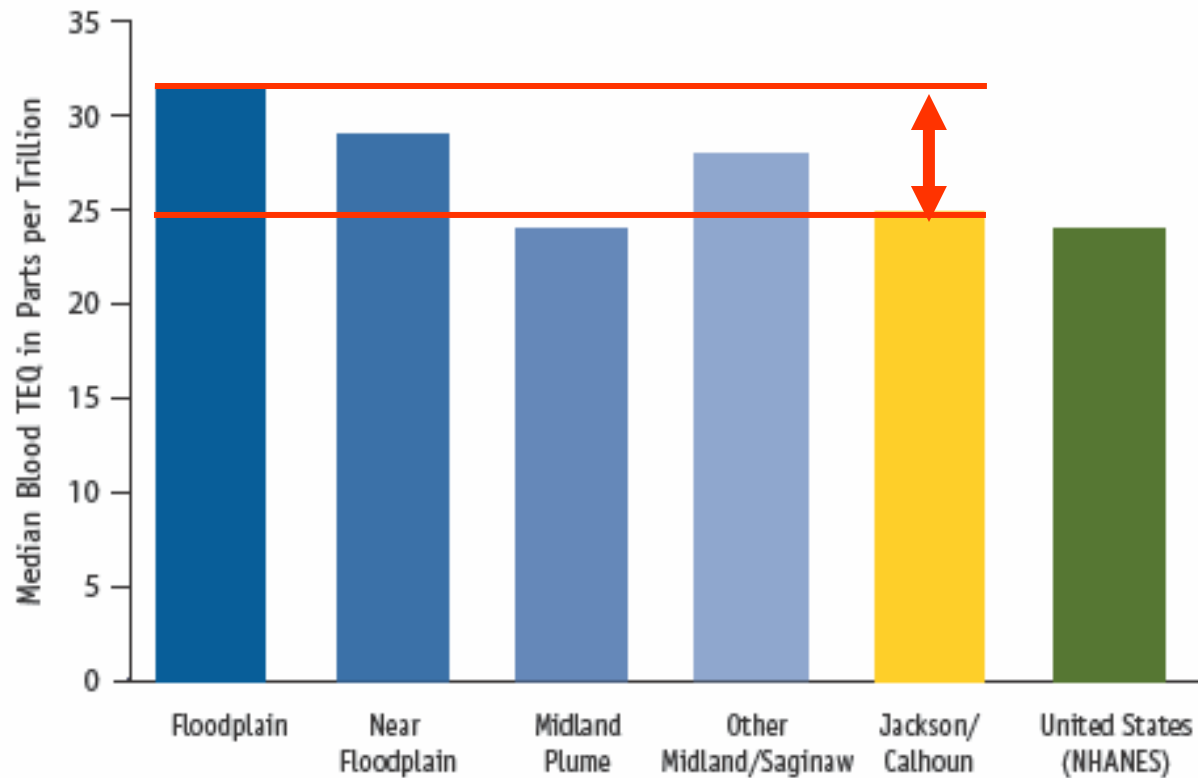
**Midland/Saginaw:** Floodplain, Near Floodplain, Midland Plume and Other Midland/Saginaw combined into one geographic area.



## Number of Participants

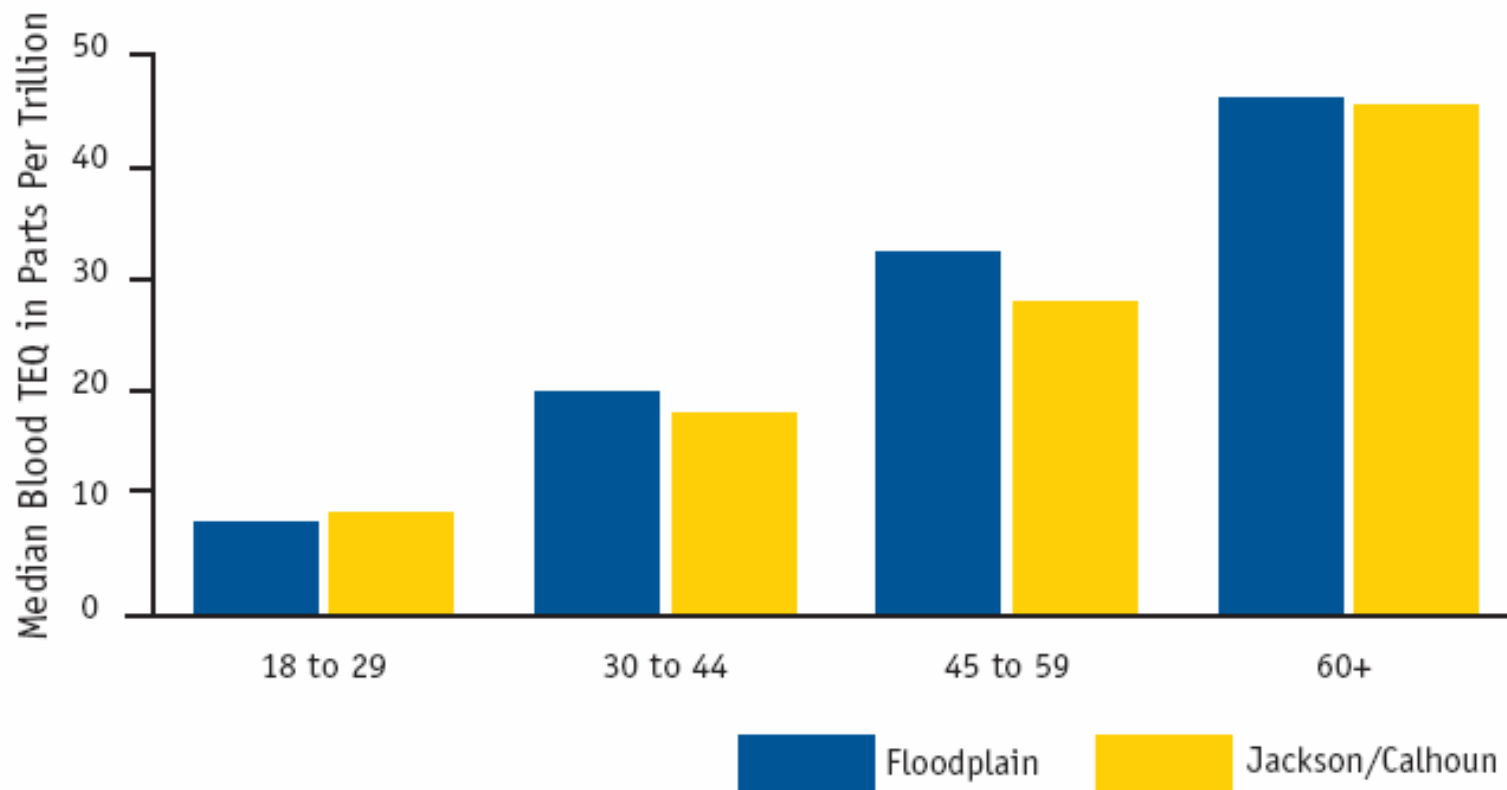
	Floodplain	Near Floodplain	Midland Plume	Other Midland/Saginaw	Jackson/Calhoun	Total Across All Areas
Interviews	314	276	66	309	359	1324
Blood Samples	243	205	43	204	251	946
Household Dust Samples	205	161	32	168	198	764
Soil Samples	203	164	32	173	194	766
Interviews, blood, dust and soil	195	156	30	167	183	731

Figure 1. People in the Floodplain, Near Floodplain and Other Midland/Saginaw have higher median TEQ levels than people in Jackson/Calhoun and the national levels.



The differences are largely due to age and other factors. Small parts of the differences are due to living in Midland/Saginaw.

Figure 2. Levels of dioxins in blood increase with age no matter where people live.



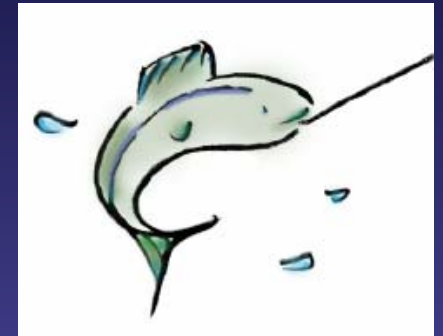
## Factors associated with higher levels of dioxins in people's blood

- Being older
- Eating fish, especially fish from the Tittabawassee River, Saginaw River, and Saginaw Bay
- Eating game, regardless of where it came from
- Eating meat, dairy, or eggs
- Living on property with soil contaminated by some dioxins
- Having household dust contaminated by PCB-118
- Living in the Floodplain, Near Floodplain, Midland Plume, and Other Midland/Saginaw, areas that are contaminated by some dioxins

## Factors associated with lower levels of dioxins in people's blood

- Being younger
- Smoking
- Breastfeeding
- Eating fruit and vegetables

*People who ate fish from the Tittabawassee River, Saginaw River, and Saginaw Bay between 1980 and the present have higher levels of some dioxins in their blood than people who did not eat fish from these areas.*



For every one year of consumption the increase is:

- ❖ 0.23 parts per trillion (0.9%) for the TEQ
- ❖ 0.03 parts per trillion (2%) for TCDD
- ❖ 0.05 parts per trillion (1.1%) for 1,2,3,7,8 PentaCDD
- ❖ 0.34 parts per trillion (0.9%) for 1,2,3,6,7,8 HexaCDD
- ❖ No apparent effect on the other specific dioxins

## Living on property with soil containing

- ❖ 1,000 parts per trillion TEQ of dioxins was associated with higher levels in blood of 0.7 parts per trillion (2%) for the TEQ.

4% of the properties tested had a soil TEQ at or above 1,000 parts per trillion (among all soil samples on the property).



## Living on property with soil containing

- ❖ 1,000 parts per trillion of PCB-118 was associated with higher levels in blood of 18 parts per trillion (less than 1%) for PCB-118.
- ❖ 40 parts per trillion of PCB-126 was associated with higher levels in blood of 0.9 parts per trillion (5%) for PCB-126.



- Gardening in soil containing 22 parts per trillion of TCDD was associated with higher levels in blood of 0.7 parts per trillion (53%) for TCDD. Fifty percent of the gardens tested in the Midland Plume had soil TCDD levels at or above 22 parts per trillion.
- Gardening in soil containing 1,000 parts per trillion of PCB 118 was associated with higher levels in blood of 18 parts per trillion (0.2 %) for PCB 118.
- Gardening in soil had no apparent effect for the TEQ or any other specific dioxins in blood.



***Region accounts for about 1% of the variability in levels of TEQ and the 7 specific dioxins in people's blood.***

People who live in the

- ❖ Floodplain have higher levels of TCDD, 2,3,4,7,8-PeCDF, and 1,2,3,7,8-PeCDD
- ❖ Near Floodplain have higher levels of TEQ, TCDD, 2,3,4,7,8-PeCDF, 1,2,3,7,8-PeCDD, and PCB-126
- ❖ Midland Plume have higher levels of TCDD
- ❖ Other Midland/Saginaw have higher levels of TCDD and 1,2,3,7,8-PeCDD.

than do people who live in Jackson/Calhoun.

## Levels of Dioxins in People's Blood

### *In summary,*

- ❖ The absolute increases in blood levels of dioxins due to living on contaminated soil or living in Midland/Saginaw were small.
- ❖ The percentage increases were in some instances appreciable.
- ❖ It is important to consider which factors accounted for the variation in blood levels of dioxins among people.

- ❖ Age, sex, and BMI, accounted for ~50% of the variation in the blood levels of dioxins (TEQ) among people. These are the most important factors related to levels in people's blood.
- ❖ Eating fish and game (especially from the contaminated areas), doing water-related activities and certain occupations combined to account for 1-6% of the variation in blood levels of dioxins among people.
- ❖ Living on contaminated soil, living in Midland/Saginaw, and contaminated household dust accounted for about 0.2-1.0% of the variation in the blood levels of dioxins among people.

Figure 3. Soil taken from around houses in the Floodplain and the Midland Plume has higher median levels of dioxins than soil in Jackson/Calhoun.

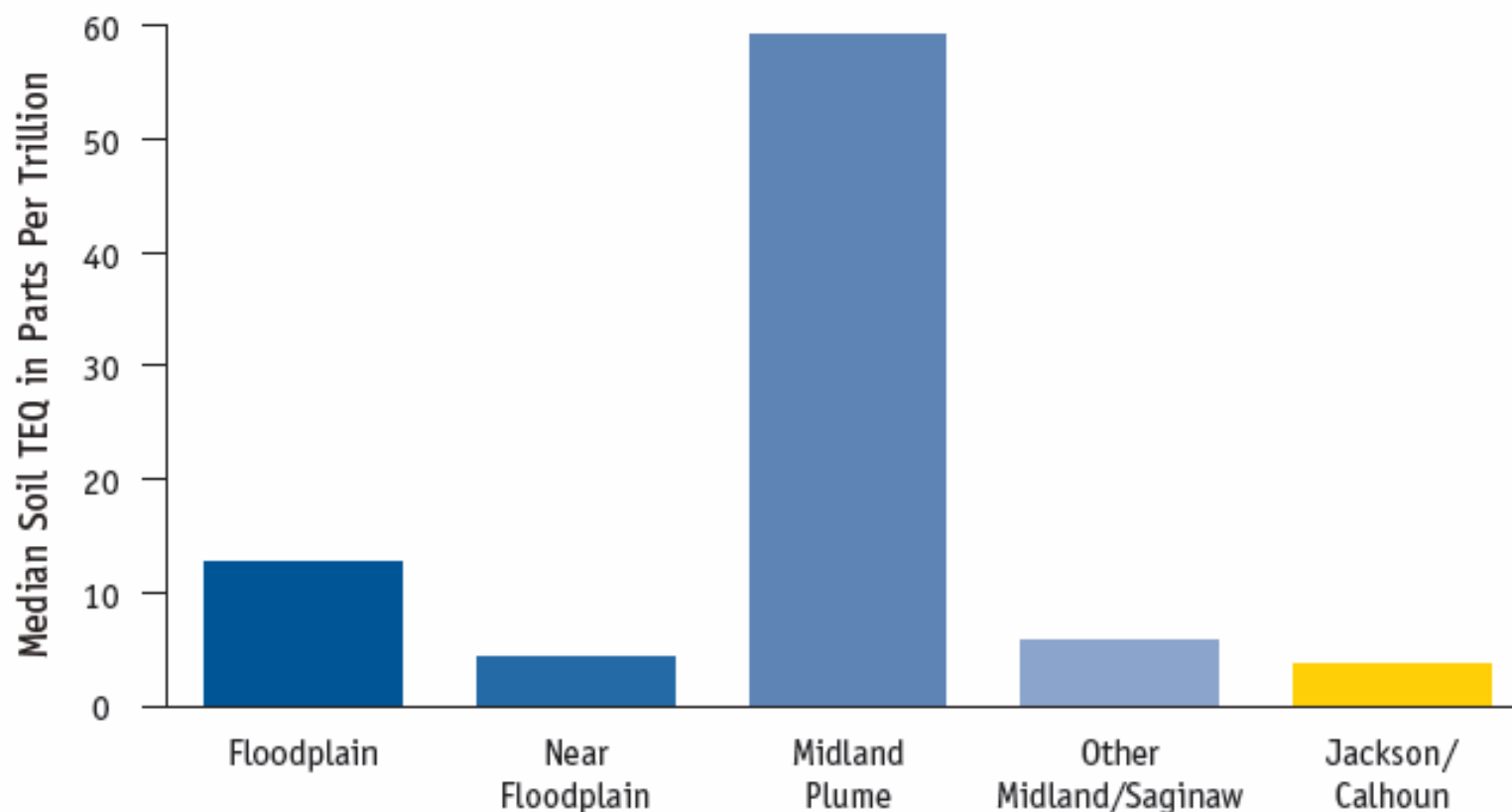


Figure 4. Properties in the Midland/Saginaw regions are more likely to have at least one soil sample above the TEQ level of 90 parts per trillion than properties in Jackson/Calhoun.

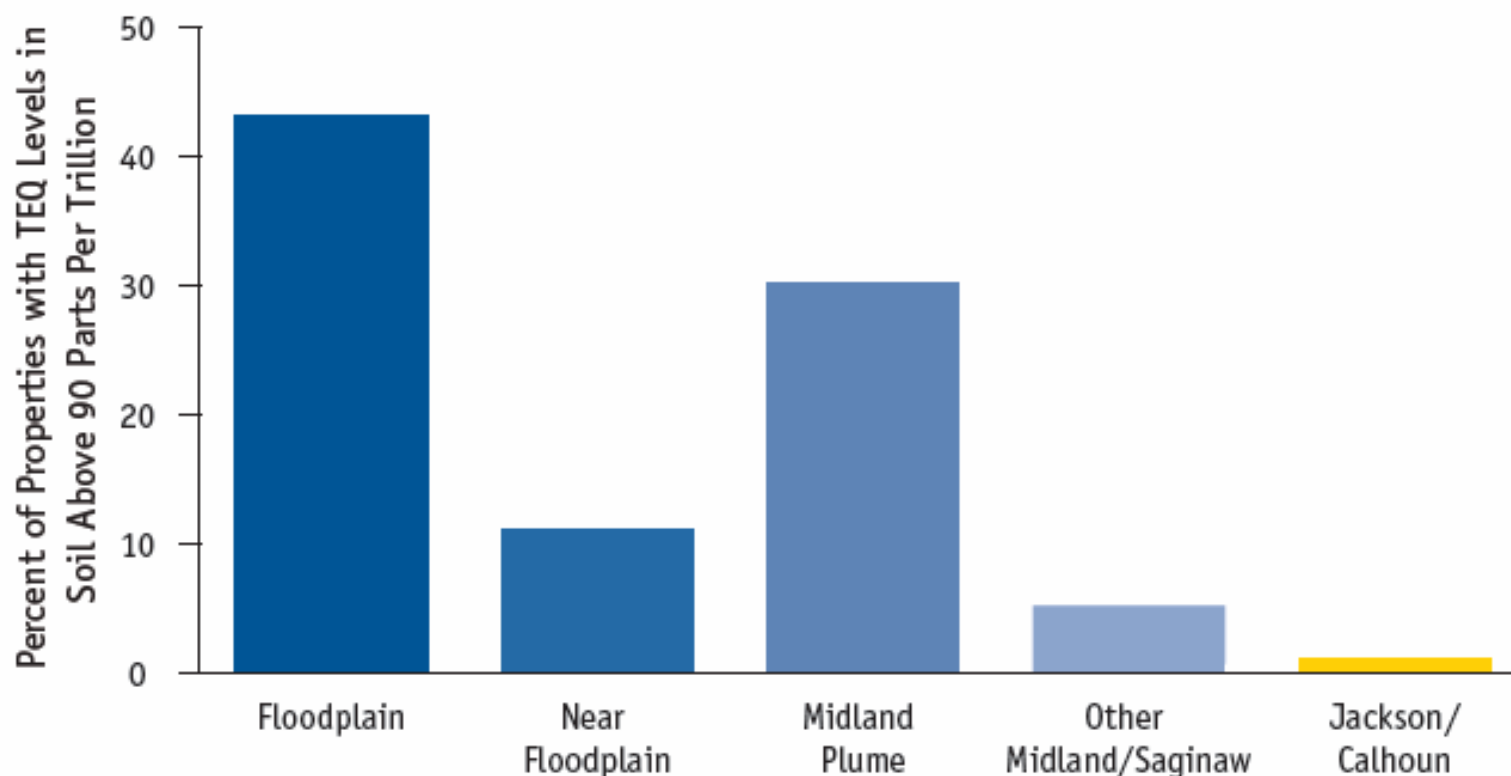
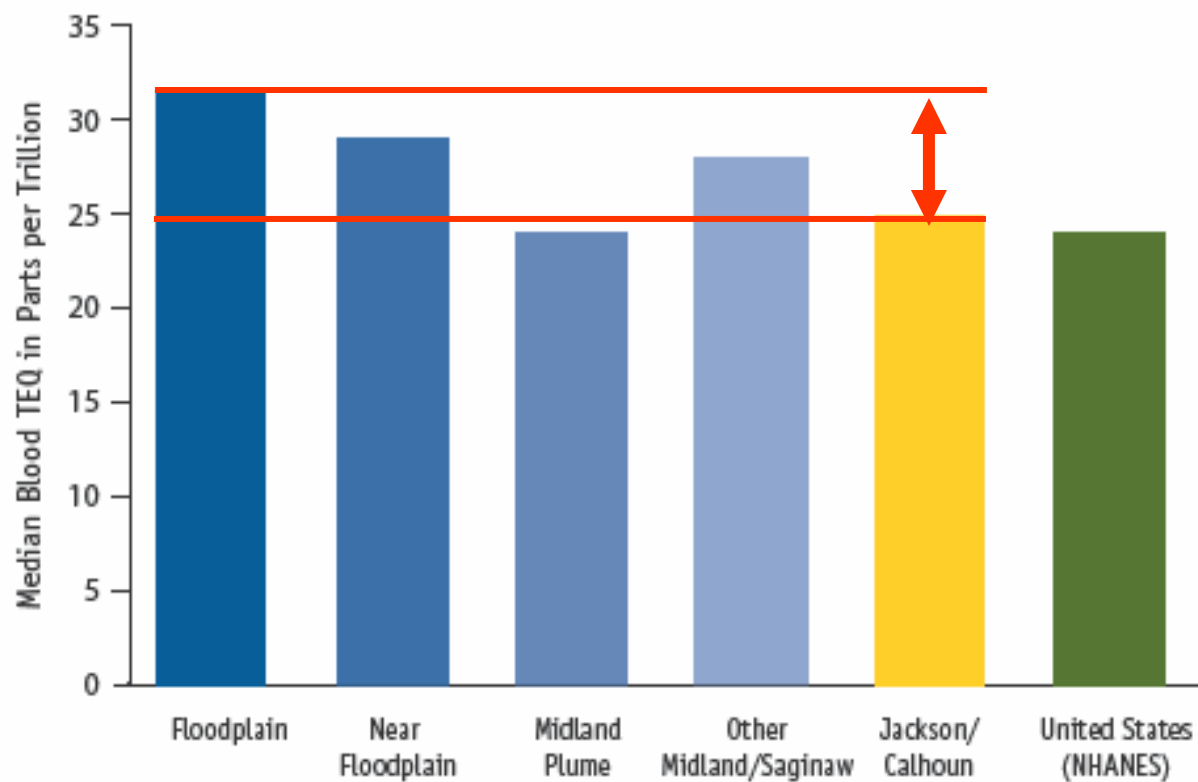


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