

Dioxins: U.S. Emissions and Health Risks

Impact of WTE

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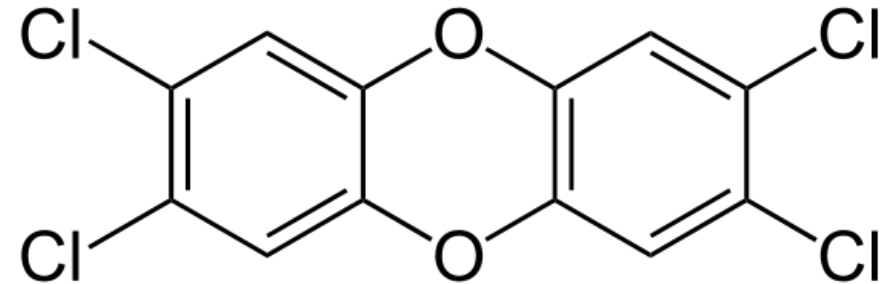


Outline

1. US Dioxin Emissions Inventory
2. Evaluating Dioxin Risk
3. Modeling the Risk of WTE Dioxins

What Are Dioxins?

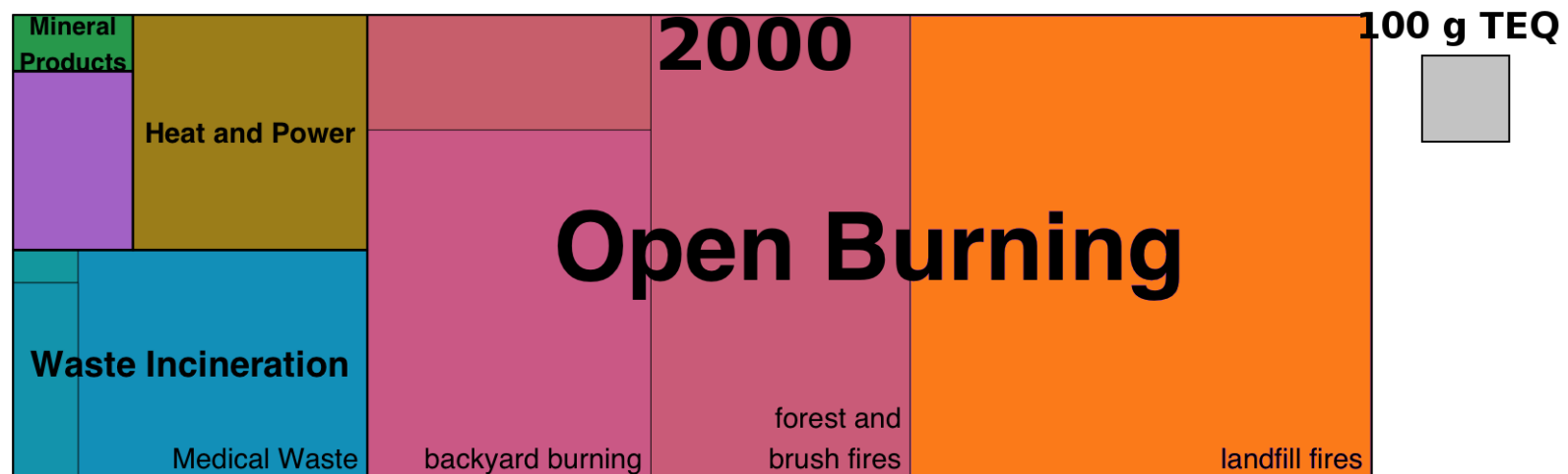
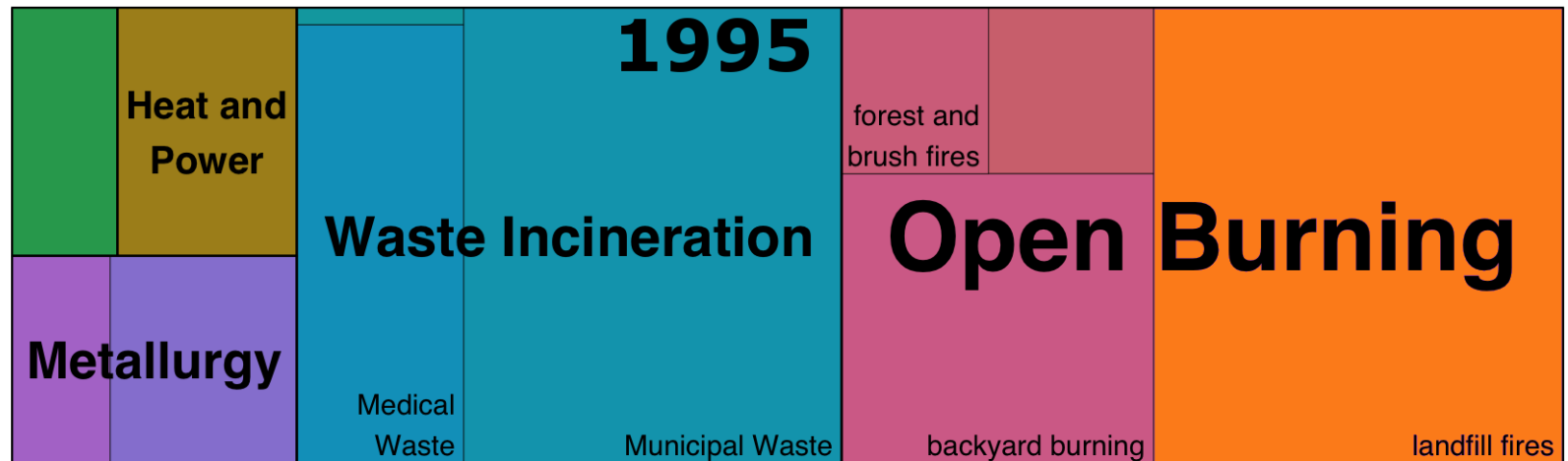
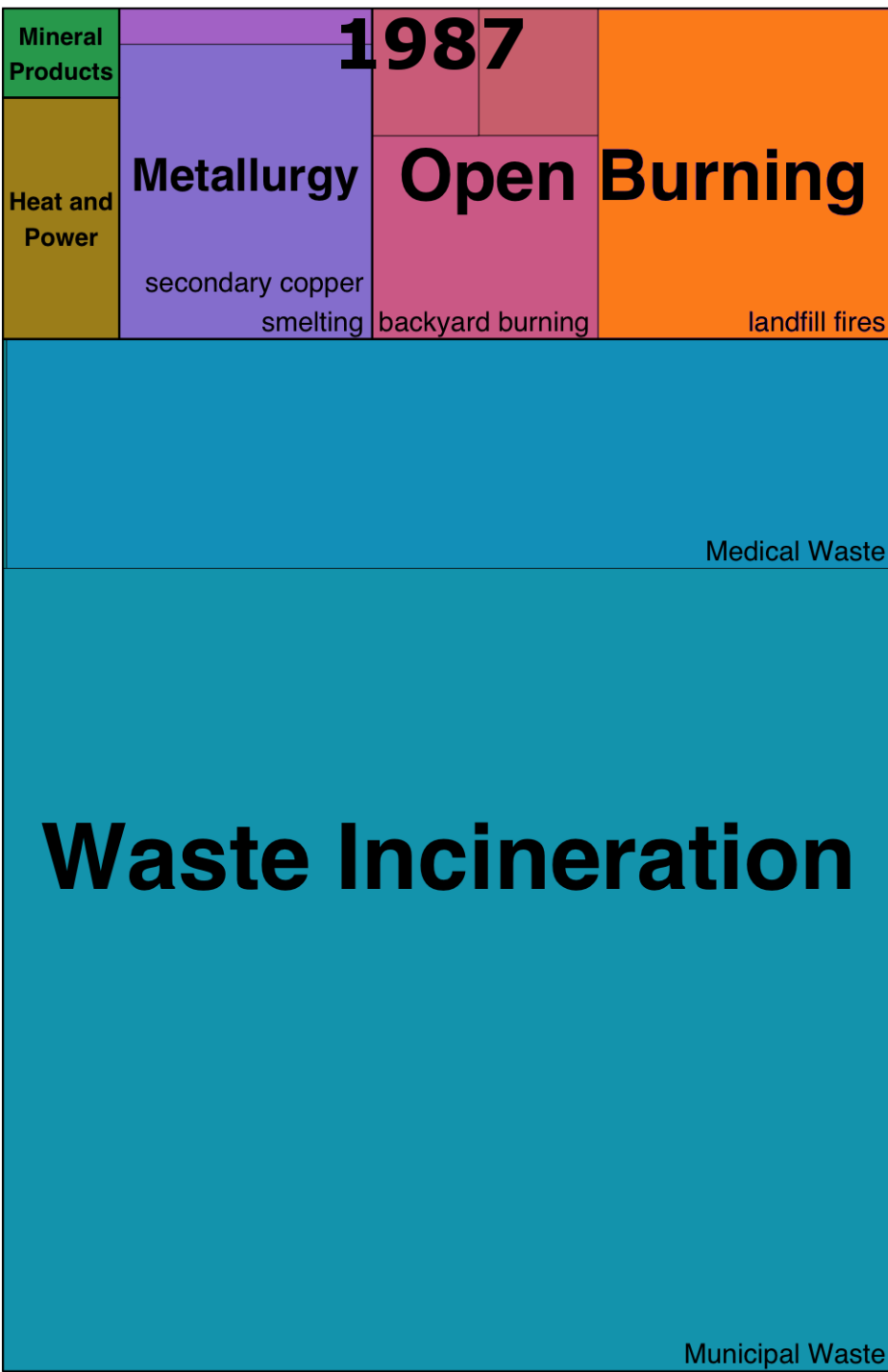
- Refers to hundreds of similar molecules – 29 are toxic.
- Persistent environmental pollutants.
- Bioaccumulate in the food chain.



US Dioxin Inventory

- EPA assessed dioxin sources for 1987, 1995 and 2000.
- Methodology:





Sources	Subcategory	1987	1995	2000	2012
Waste Incineration	Municipal Waste	9500	1200	77	3
	Hazardous Waste	5	6	3	2
	Medical Waste	2700	510	400	7
	Sewage Sludge	6	14	10	0
Subtotal		12211	1730	490	12
Heat and Power Generation	Gasoline	55	6	7	8
	Diesel	70	75	87	118
	Wood Combustion	114	97	106	122
	Oil	25	20	22	12
	Coal Combustion	109	112	114	85
Subtotal		373	310	336	344
Open Burning Processes	Combustion Of Landfill Gas	2	7	22	19
	Structural Fires	24	18	16	12
	Vehicle Fires - Cars And Other Vehicles	39	29	24	39
	Landfill Fires	1300	1300	1300	1733
	Forest And Brush Fires	180	170	730	837
	Backyard Burning	610	630	600	385
	Residential Yard Burning	4	5	5	5
	Land Clearing Debris Burning	83	79	85	94
	Open Burning Of Demolition/Construction Wood	22	22	22	49
	Agricultural Burning (Sugarcane)	28	31	25	126
Subtotal		2292	2291	2829	3297
Metallurgical Processes	Primary Magnesium Smelting And Refining	13	13	8	8
	Secondary Aluminum Smetling	11	20	8	8
	Secondary Zinc Production	4	7	7	8
	Secondary Coper Smelting	990	270	1	1
	Sinter Production	33	28	24	16
	Coke Production	10	9	8	4
	Secondary Ferrous Metal Smelting/Refining	37	46	59	64
	Ferrous Foundries	13	19	16	6
Subtotal		1111	412	131	115
Mineral Products Production	Cement Kilns Burning Hazardous Waste	120	160	19	19
	Cement Kilns Not Burning Hazardous Waste	13	17	17	18
	Asphalt Mixing Plants	5	5	5	3
Subtotal		138	182	41	40

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Dioxin Risk

- Health Risks
 - Human Carcinogen
 - Skin problems
 - Reproductive problems
 - Hormonal problems
 - Developmental effects
- World Health Organization – Tolerable Daily Intake

TDI = 1-4pg TEQ per kg bodyweight per day
- Risk = Intake/TDI

Risk due to WTE?

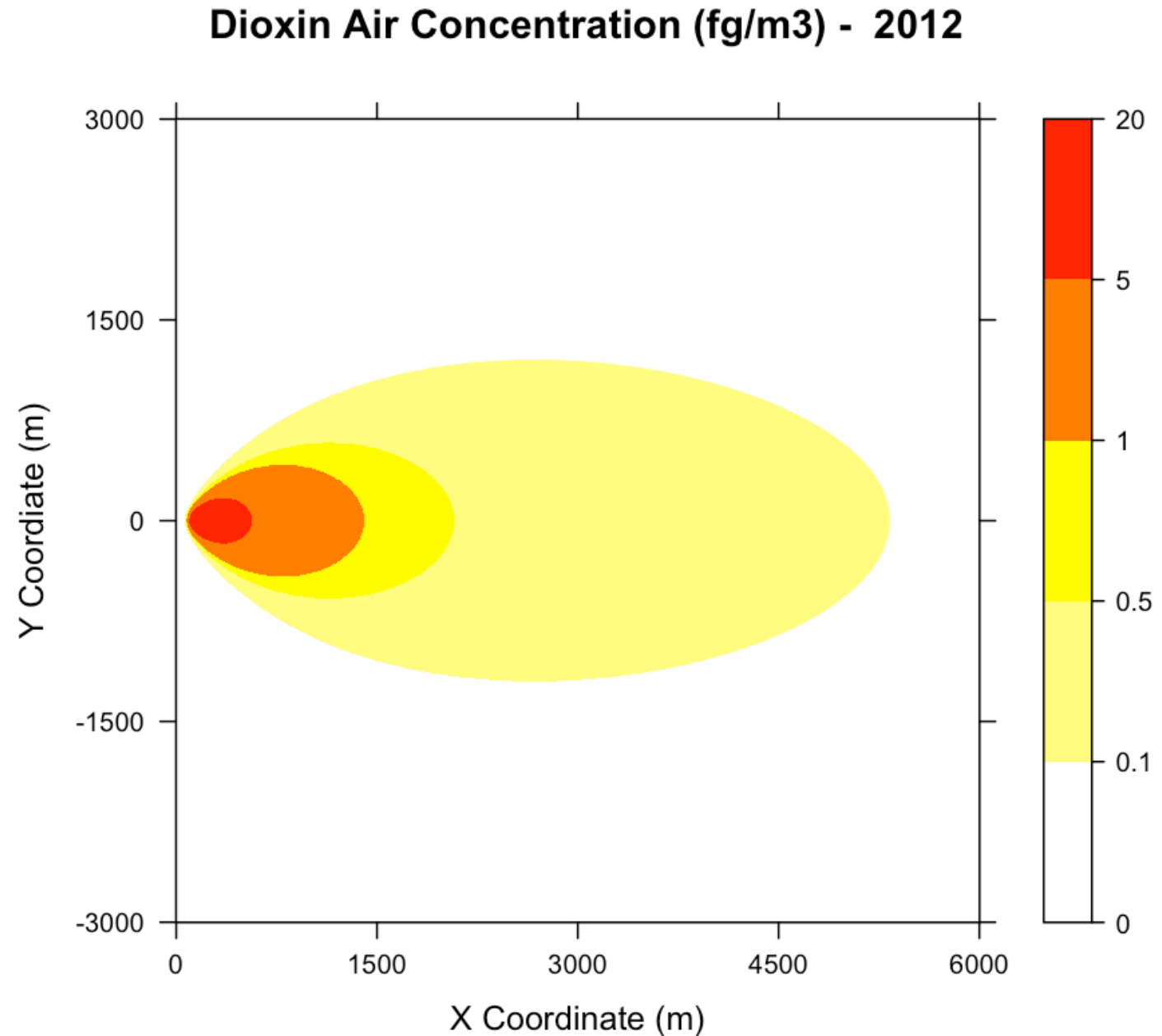
- 4 pathways for exposure:
 - Inhalation
 - Dermal absorption
 - Ingestion of dust and soil
 - Ingestion of locally produced food

Modeling Dioxin Risk From WTE Plant

1. Local air concentration
2. Deposition rate
3. Soil concentration
4. Plant concentration
5. Beef/egg/chicken concentration
6. Daily intake
7. Population

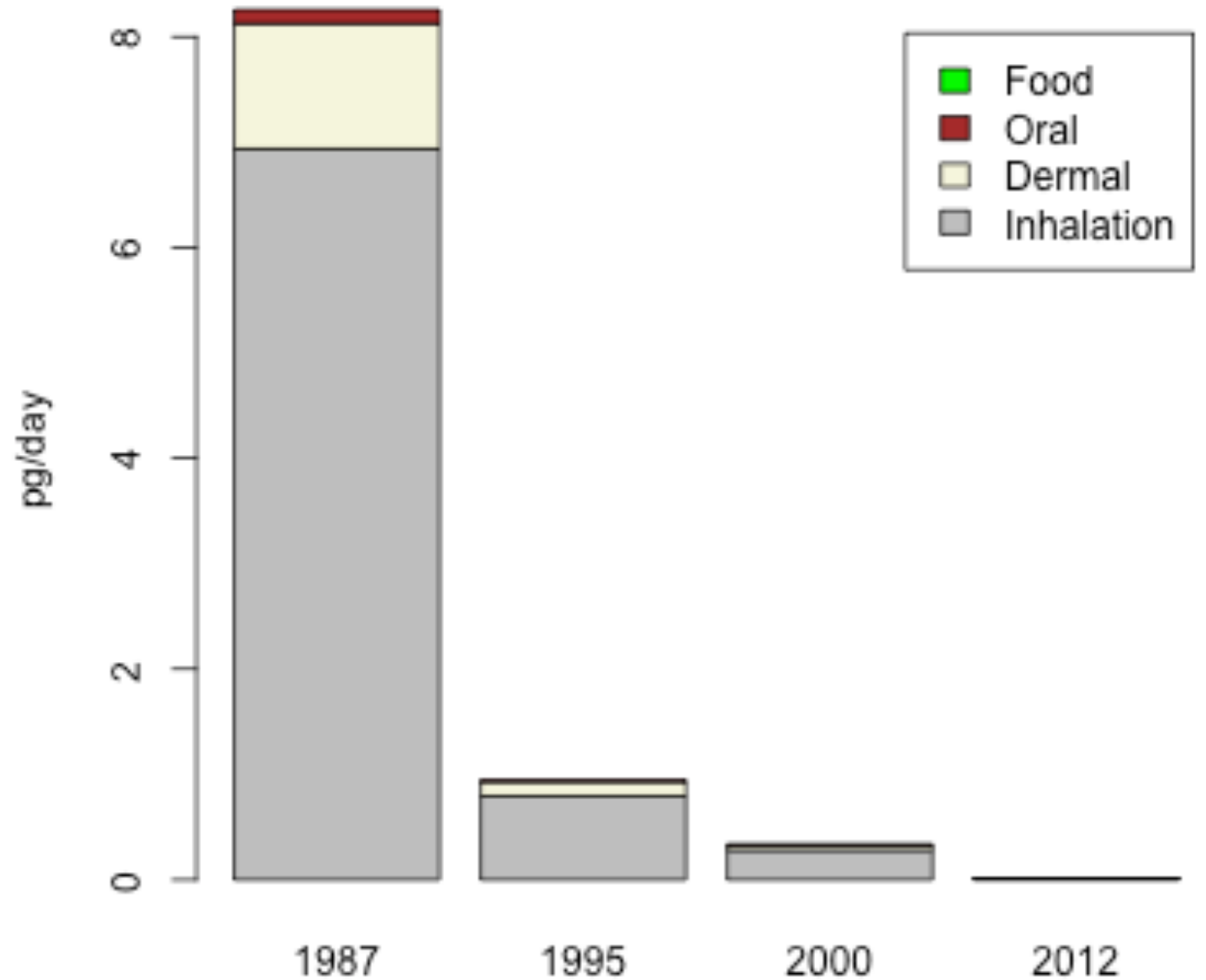
Gaussian Plume Model

- 24 h
- Constant 3m/s wind
- 100 m stack
- Average atmospheric sta



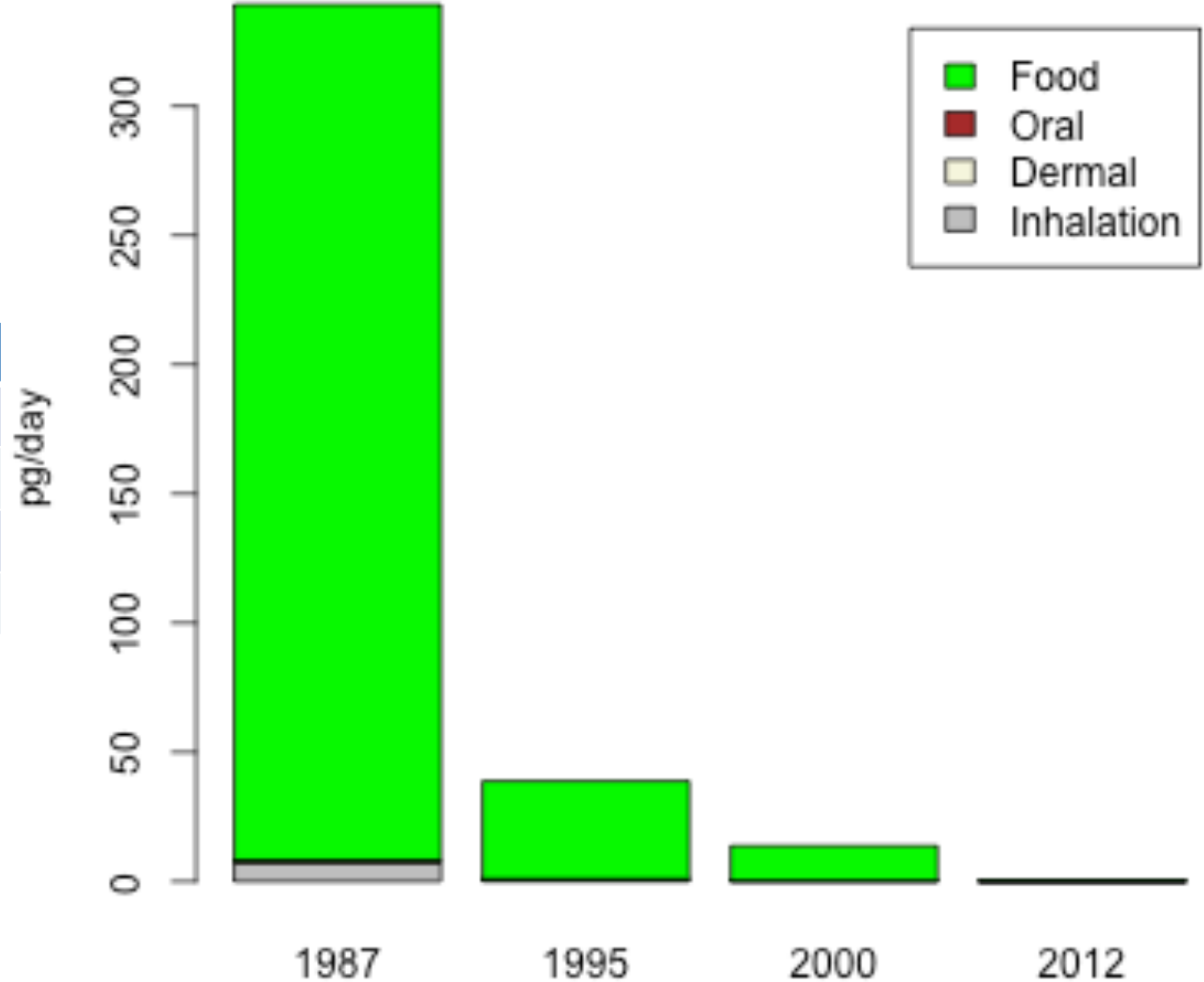
Maximum Risk No Local Food

	1987	1995	2000	2012
Inhalation	6.93	0.79	0.28	0.009
Dermal	1.19	0.14	0.050	0.0016
Oral	0.13	0.015	0.0055	0.00018



Maximum Risk Local Food

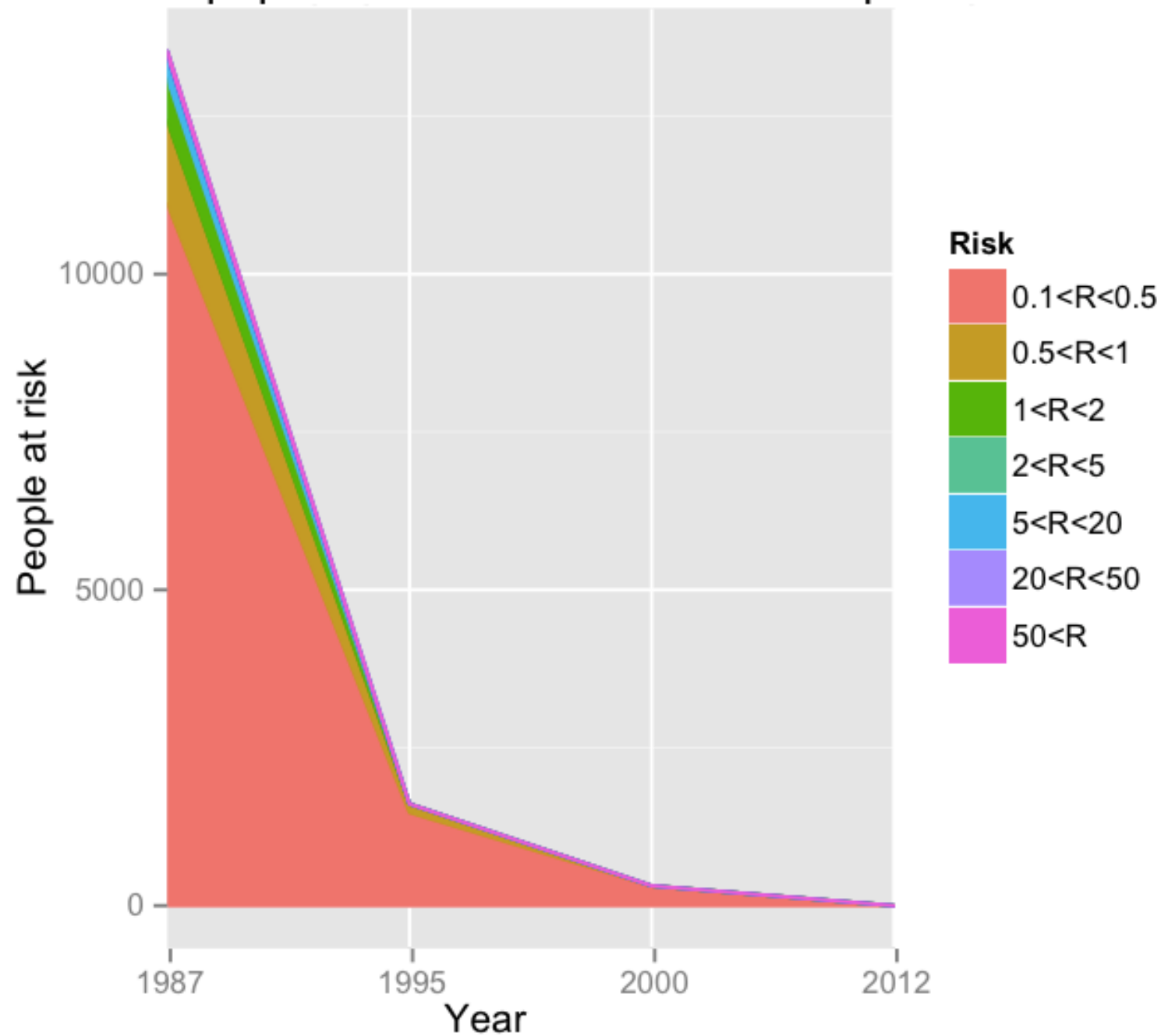
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Dermal	1.19	0.14	0.050	0.0016
Oral	0.13	0.015	0.0055	0.00018
Food	331.	38.95	13.79	0.453



No Local Food

	Population			
Risk	1987	1995	2000	2012
$0.1 < R < 0.5$	11087	1461	326	0
$0.5 < R < 1$	1323	137	0	0
$1 < R < 2$	644	0	0	0
$2 < R < 5$	393	0	0	0
$5 < R < 20$	72	0	0	0
$20 < R < 50$	0	0	0	0
$50 < R$	0	0	0	0

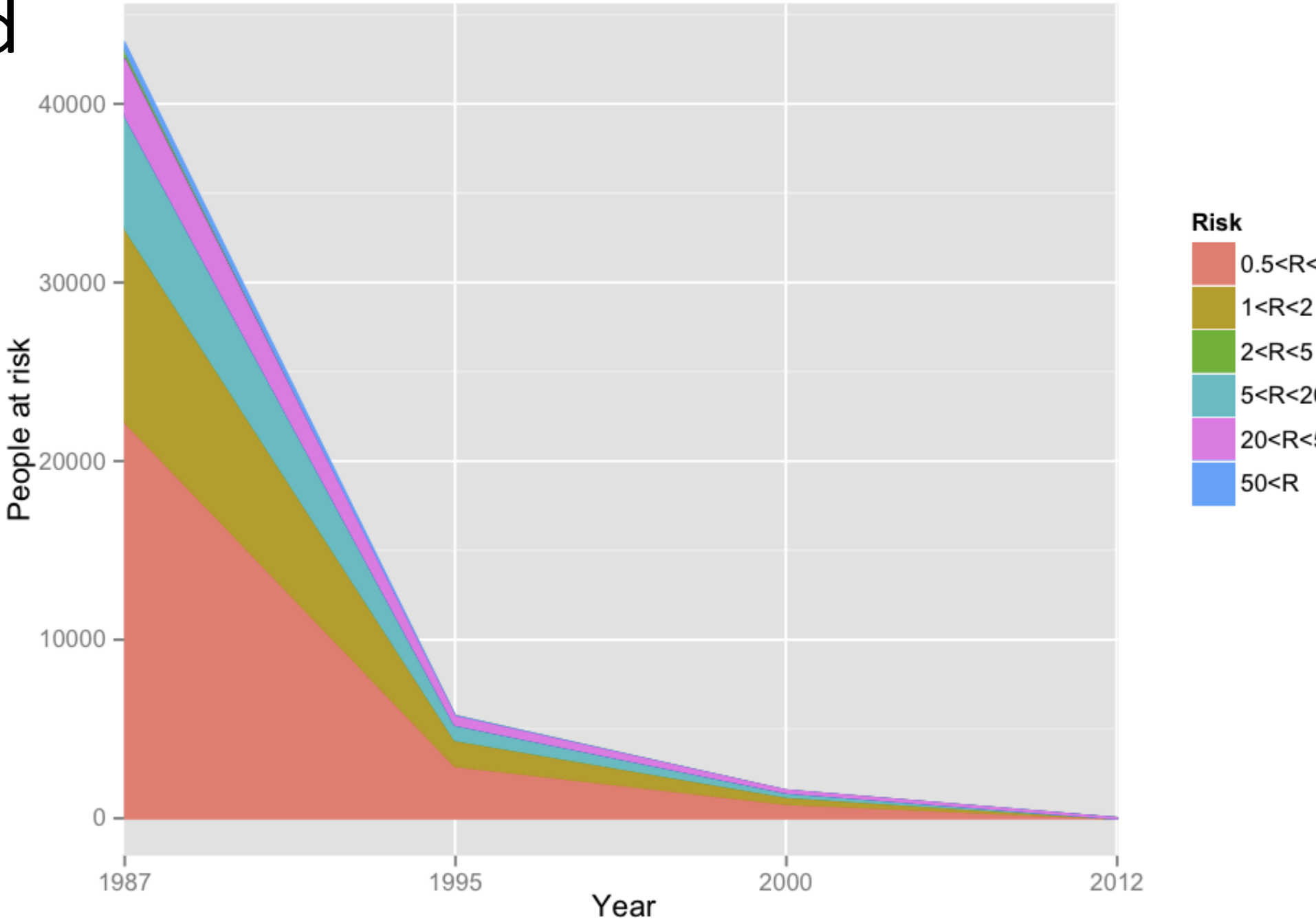
Total US population at risk from dioxin exposure from WTE



Local Food

Total US population at risk from dioxin exposure from WTE

	Population			
Risk	1987	1995	2000	2012
$0.1 < R < 0.5$	187398	24353	6730	157
$0.5 < R < 1$	22173	2922	815	0
$1 < R < 2$	10729	1461	390	0
$2 < R < 5$	6437	841	237	0
$5 < R < 20$	3111	421	96	0
$20 < R < 50$	608	62	0	0
$50 < R$	322	0	0	0



Thank-you for your attention.

Thank you to Covanta Energy and Wheelabrator Technologies for plant emissions data.

- *An Inventory of Sources and Environmental Releases of Dioxin-Like Compounds in the U.S. for the Years 1987, 1995, and 2000*. 2006. Washington DC: U.S. Environmental Protection Agency. <http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm?deid=159286>.
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