

Women's Occupations and Risks from Chemicals: Introduction to a Visualization Tool

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CHE webinar
March 4, 2020



University of California
San Francisco

Women's Occupations and Risks from Chemicals (WORC) Study

- Funded by California Breast Cancer Research Program (CBCRP, Grant #21ZB-0901)
- Co-PIs: Robert Harrison (CDPH, UCSF), Peggy Reynolds (UCSF)
- Overarching objective: advance our understanding of the degree to which workplace chemical exposures may increase breast cancer risk among California working women
- 5-year project (2016-2020)
- 3 phases



● <http://www.cbcrp.org/research-topics/worker-exposure.html>

Reasons for developing the tool

- To make the chemical exposure hazards faced by working women more visible
- To point to the key data gaps in understanding occupational exposures to breast carcinogens in California

Not (fully) achieved:

- To point to industries in California that appear to pose the greatest breast cancer risk and should be investigated further
- To explore differences in exposures based on race, class, age, immigrant status and other demographic markers

Where Women Work

Reviewed variety of data sources for California workforce

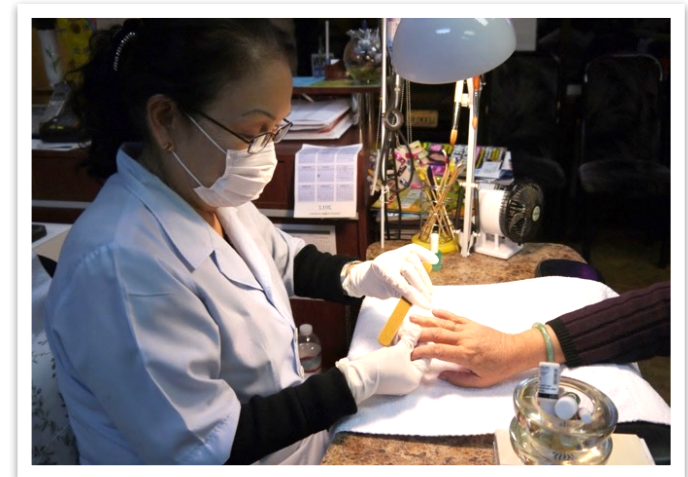
- American Community Survey (ACS) data from US Census identified as most complete (2010-2014)

Summarized and compiled data on ~ 8 million women employed in CA

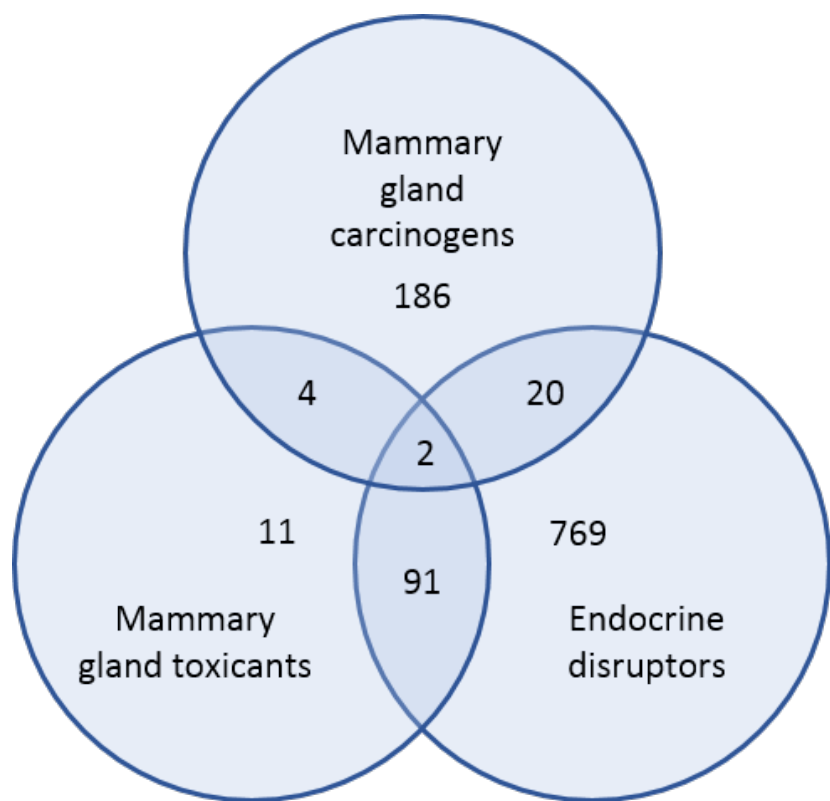
- For all industries and occupations (~ 500 occupations)
- Includes sociodemographic characteristics (age, race/ethnicity, education, income, citizenship, language, presence/age of children in home)

Chemicals of Concern

- Evaluated multiple data resources, final list based primarily on:
 - Silent Spring Institute's list of mammary gland carcinogens and mammary gland toxicants
 - TEDX list of endocrine disruptors
- Created a list of 1,000+ chemicals of concern for breast cancer
 - Includes indicators for mammary gland carcinogens, endocrine disruptors, mammary gland toxicants, and high production volume chemicals
 - Categorized in 27 groups based on chemical properties and/or usage
- Constructed another dataset summarizing workplace sampling data (OSHA) - data sparse by chemical and industry



Results - Chemicals of Concern



Chemicals-of-concern (n=1,082) in 27 categories

Category	# Chemicals
Alkyphenols/ethoxylates	15
Antimicrobials	32
Biogenic substances	54
Combustion products	62
Dioxins	121
Dyes	34
Flame retardants	52
Food constituents and additives	49
Fragrance ingredients	62
Household products	28
Industrial chemicals	172
Metabolites and degradates	20
Metals	27
Natural hormones	5
Other	6
Parabens	12
Perfluorinated compounds	13
Personal care products	74
Pesticides	308
Pharmaceuticals - antineoplastic	20
Pharmaceuticals - other	57
Phthalates	16
Plastics	61
Research chemicals	58
Solvents	31
Surfactants	10

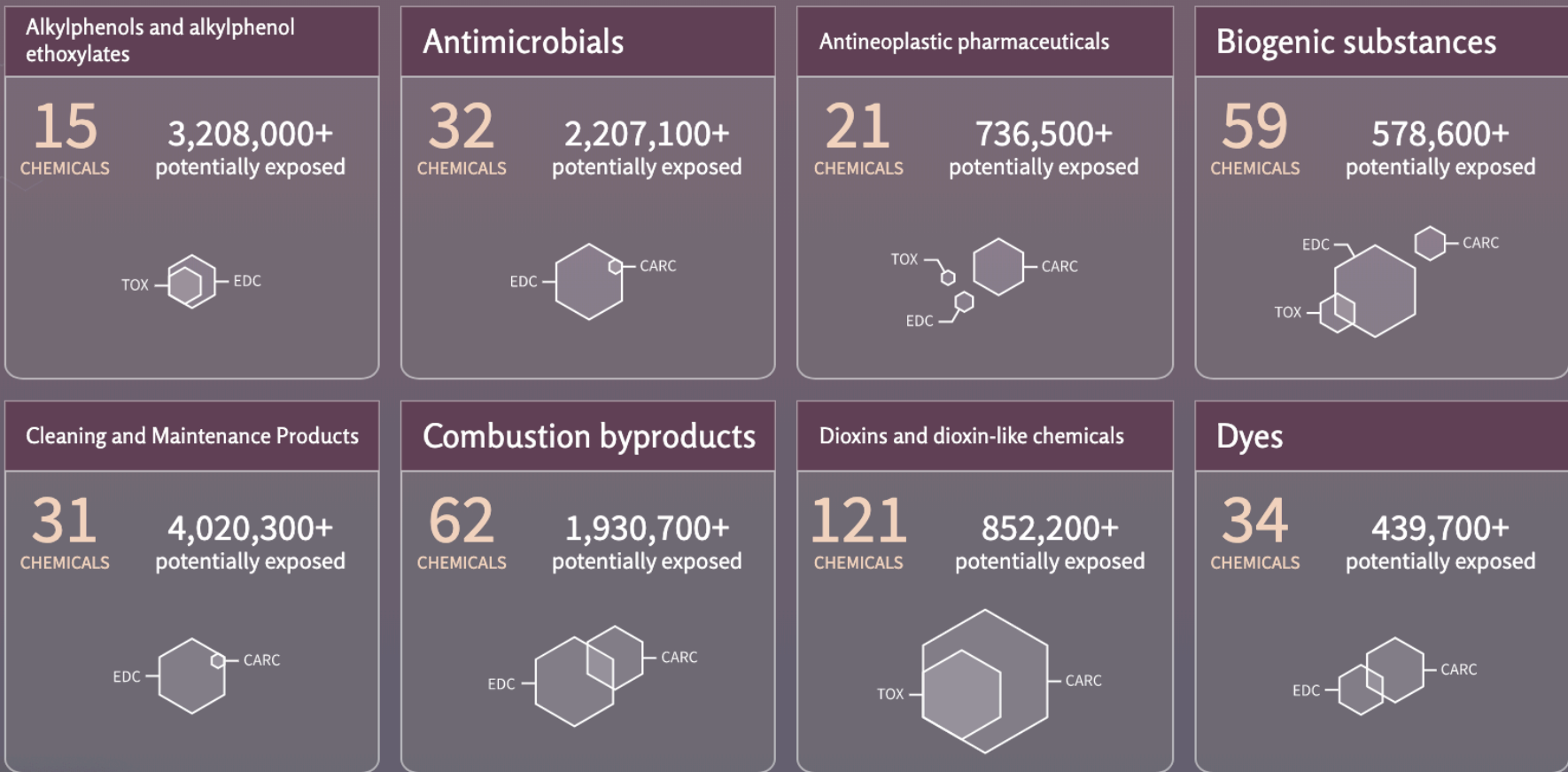
Chemical Groups

What chemicals of concern for breast cancer are working women exposed to on the job?

24 Chemical Groups | 1,037 Chemicals of Concern linked to breast cancer risk

California working women have potential exposure to the following chemical groups. These groups may contain hundreds of chemicals-of-concern that have evidence linking them to breast cancer or relevant effects such as endocrine disruption. The size of each hexagon signifies the number of chemicals with that particular hazard, with overlapping hexagons showing where they share chemical traits, including mammary gland carcinogens ("CARC"), developmental toxicants ("TOX"), and endocrine disruptors ("EDC"). Explore each chemical group in more detail.

sort by **ABC** ▼
WOMEN ▼
CHEMICALS ▼



Estimating Chemical Exposures Among Workers

- Created Job Exposure Matrix (JEM) to identify overlap of occupations with exposures to categories of chemicals of concern
- Based on expert review by two industrial hygienists
 - Tie-breaking review by board-certified occupational medicine physician
- JEM includes 145 occupations (representing ~ 85% of CA female workforce)



Informal workers

- Jobs that do not show up in formal data sources and that operate outside of established labor laws
- Reliable data on the numbers of informal workers by industry or occupation is not available
- We generated estimates of numbers of women informally employed, using self employed women in ACS data as a proxy- **interpret with caution**



Chemical Concerns for Occupations with Informal Employment

from WORC Advisory Committee (AC)

Workforce	Chemical Concerns
Domestic Workers	Chemicals in cleaning products
Restaurant Workers	Disinfectants, indoor air pollutants (e.g. PAHs)
Agriculture Workers	Pesticides
Makeup Artists and Hairdressers	Chemicals in cosmetics
Janitors and Custodians	Chemicals in cleaning products
Day Laborers	Formaldehyde, wood preservatives, paints, pesticides
Garment Workers	Flame retardants and fabric preservatives
Artists	Solvents, paints
Street Vendors	Air pollutants from traffic

Working Women at Risk

PERSONAL CARE AIDES

Maids and housekeeping cleaners

CUSTOMER SERVICE REPRESENTATIVES

Women may be exposed to harmful chemicals on the job. 24 categories of chemicals that include chemicals of concern for breast cancer are shown below. We investigated the potential exposure of women in this occupation group to these 24 categories of chemicals.

Being exposed to even *one* of the chemicals in these groups may be cause for concern.

Select a category to learn more about exposure, the chemicals, and the women who are exposed.

SHOW ?

197,778 formal workers 76,600 informal workers

Occupational exposure to chemical groups ?

- PROBABLE
- POSSIBLE
- UNLIKELY

- Alkylphenols and alkylphen...
- Antimicrobials
- Antineoplastic pharmaceuti...
- Biogenic substances
- Cleaning and Maintenance ...
- Combustion byproducts
- Dioxins and dioxin-like che...
- Dyes
- Flame retardants
- Food substances
- Fragrance ingredients
- Human hormones
- Industrial chemicals
- Metals
- Parabens
- Perfluorinated compounds
- Personal care product ingre...
- Pesticides
- Pharmaceuticals (other tha...
- Phthalates
- Plastics
- Research chemicals
- Solvents
- Synthetic hormones

What is the ethnic/racial and age breakdown for these women?

Asian
9,399 women | 5% of this occupation



Customer service representatives
173,840 women

Managers, all other

Key Findings

- Constructed a database of chemicals of concern for breast cancer and occupations that employ many women in California
- Among working women in CA
 - > 1 million at risk for exposures to industrial chemicals
 - > 2 million at risk for exposures to antimicrobials
 - > 4 million at risk for exposures to phthalates
- US Census data pretty good for tracking contemporary workplaces occupations and industry
 - Grouping of occupations not optimal
 - Lack information on informal workers
- Lack of systematically-collected quantitative chemical exposure data

Who we hope will use the tool

- Lay audience: Breast cancer and/or Workplace stakeholders
 - Community-based organizations
 - Workers, worker centers, unions
- Researchers/Policy makers
 - Prioritize occupations/industries for targeted exposure surveillance, health studies, and/or biomonitoring
 - Continue / Enhance statewide surveys
- We want feedback!
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WORC Advisory Committee



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CA Healthy Nail Salon Collaborative/
Asian Health Services (Shared Role)



Lisa Fu, MPH



Gail Bateson
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SEIU Local 790

Data Visualization Development

PERISCOPIC
DO GOOD WITH DATA

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