**March 28, 2024**

**Comments to UN Special Rapporteur on Toxics and Human Rights**

**Response to Call for Input on Gender and Toxics**

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***Most electronics production workers are women of child bearing age: Silicon Valley’s toxic legacy demonstrates lasting impacts on women electronics workers and their children***

Workers like Yvette Flores didn’t know electronics work could harm their children. And the U.S. does tragically little to protect them.

“When it comes to protection against toxic hazards, workers in America are treated differently—that is to say, more callously—than the general public. This legal disparity allows someone who toils inside a factory to face higher risks of cancer and other maladies than someone who lives just beyond the plant fence.

The damage … isn’t confined to the workers themselves. Building on science more than a century old, recent studies have found ties between parental exposures and afflictions in offspring such as brain tumors, malformations, and learning disabilities.”[[1]](#footnote-1)

We urge t*he Special Rapporteur for Toxics and Human Rights to be a strong advocate to focus global attention on this huge and growing challenge and thus mobilizing efforts to make the “clean industry’ truly safe for workers and their offspring.*

**I*ssues needing immediate attention: (see pp 6-10 for details)***

1. **Neurodevelopmental impacts of toxics have been well understood for decades but are still not adequately controlled**
2. **Permissible Exposure Limits and Threshold Limit Values are not health protective; even when they exist and they are rarely established to protect against neurodevelopmental toxic exposure**

**3 Most chemicals have *no* legal or regulatory “SAFETY STANDARD” based on neurodevelopmental toxicity**

4. **The orders of magnitude disparity between occupational & environmental exposure standards**

**5**. **Multiple chemical exposure is the norm in global electronics**

In September 2019 the Special Rapporteur noted the importance of these issues:

"...States must also integrate gender-specific approaches to prevention of workers’ exposure to toxic substances. Safeguarding reproductive health from hazardous working conditions is a core obligation of States in the elimination of discrimination against women in employment. Women workers have a right to special protection during all periods that pose reproductive risks to them31 as well as to their offspring, which requires protection from work that exposes them or their fetus to toxic chemicals…. Women workers may also be exposed to toxic substances at work before and during the earliest stages of pregnancy, or even before they may know they are pregnant. This reality requires special care {by}States and businesses to protect women’s reproductive health by preventing their exposure to toxic substances without limiting employment in a discriminatory fashion. The best means of doing so is by eliminating toxic substances at work and applying appropriate standards of protections to all workers.[[2]](#footnote-2)”

**Historical Context: Early warning signs emerged in Silicon Valley by the early 1970s**

Developments in Silicon Valley showed the so-called “clean industry” was anything but safe for workers - later characterized as “canaries in the coal mine” - as more reports showed that the chip industry was hazardous.

“In 1979, NIOSH conducted a health hazard evaluation in the Signetics fabrication plant in Sunnyvale, CA, where workers claimed chronic harmful exposure to chemicals. NIOSH identified chemicals as ‘irritant’ and ‘narcotic’ in nature, although their concentrations were all well below the permissible exposure levels. NIOSH concluded that ‘a larger, more systematic study’ was required to characterize medical problems and determine the size of the affected workforce. The next year, the California Department of Industrial Relations reported that semiconductor workers were exposed to many hazardous chemicals including a variety of carcinogens and reproductive toxins.“[[3]](#footnote-3)

In 1980, another “cluster” of health problems was uncovered in Matamoros, Mexico.[[4]](#footnote-4) A teacher of “special eduction” students with intellectual impairments discovered their mothers all worked at the same electronics assembly factory and were exposed to glycol ethers - EGEs - a serious reproductive hazard later phased out after epidemiological studies linked high rates of miscarriages to exposure to EGEs.

“Spontaneous abortion is a relatively well-documented outcome among many reproductive problems in the semiconductor industry. An early clue was presented by a Finnish study in 1980, which found particularly higher risks for Spontaneous abortion (SAB) among electronics workers compared to other manufacturing workers as well as the general population. Based on a questionnaire survey of female workers and spouses of male workers in semiconductor industry, Pastides *et al.* reported that working in diffusion and photolithography process was associated with higher risk for SAB, while through a community survey Lipscomb *et al.*  observed that women with a solvent exposure history in electronics production during the first trimester of pregnancy were more likely to experience SAB than controls. [[5]](#footnote-5)

“In 1987, the University of Massachusetts conducted a reproductive study among semiconductor workers at the Digital Equipment Corporation.… The relative risks of SAB for women working in "diffusion" was 2.18 and those in "photolithography" was 1.75…“Facing public pressure, SIA’s member companies agreed to fund more research…

Scientists from the University of California - Davis designed one of the biggest worker-health studies in history, involving 14 Semiconductor Industry Association (SIA) companies, 42 plants, and 50,000 employees. IBM opted out, hiring Johns Hopkins University to study its plants, because IBM executives said their facilities were safer than the others.”

The SIA miscarriage study is the industry’s most comprehensive reproductive health study. It covered 14 US companies with silicon-based wafer-fabrication rooms, and examined SAB retrospectively and prospectively, via menstrual cycles and fertility…. They reported elevated risks for SAB among workers in fabrication processes, especially masking and photolithography. Ethylene glycol ether (EGE) and fluoride-containing compounds were associated with the excess risk… Such consistent results strongly suggest a causal association…“[[6]](#footnote-6)

**Exposure levels in the SIA study were well below “legal limits”**

“Risk of spontaneous abortion (SAB) was examined in relation to chemical and physical agents in a retrospective study of … 14 semiconductor manufacturers: After screening over 6,000 employees, 506 current and 385 former workers were eligible.… Two chemical groups accounted for the 45% excess risk of SAB among fabrication-room workers: photoresist and developed solvents (PDS), including glycol ethers, and fluoride compounds used in etching. Women exposed to high levels of both agents were at greater risk…”[[7]](#footnote-7)

“***All personal solvent and fluoride levels were less than 2 percent of current Occupational Safety and Health Administration (OSHA) standards*.** {emphasis added}….[[8]](#footnote-8)

“Glycol ether exposure of workers in wafer fabricating clean rooms of 14 companies was evaluated by measuring exposures while workers performed selected tasks… **All measured TWA exposures were under I ppm, and the geometric mean (geometric standard deviation) (GM,GSD) for 2-EEA was 22 ppb (3.7 ppb); the two highest values were 120 and 740 ppb.**”[[9]](#footnote-9)

**“All three studies—all paid for by the industry—showed similar results: roughly a doubling of the rate of miscarriages for thousands of potentially exposed women” even though the exposure levels were a small fraction of the PELs**.[[10]](#footnote-10)

The SIA and IBM studies were the last health studies published with the cooperation of the US chip industry. Many challenges still exist in electronics global supply chain which require coordinated global response to prevent future health problems.

**Several issues need immediate attention:**

**1. Neurodevelopmental impacts of toxics have been well understood for decades but are still not adequately controlled**

The California Department of Public Health reported in 1990 on reproductive hazards in the workplace, noting that the developing fetus - particularly the fetal brain - is the most vulnerable to toxic chemical impacts.

“First Trimester After implantation and up until the end of the third month of pregnancy, the cells of the fetus rapidly divide and form the organs and limbs. This is the period in which the fetus is most susceptible to agents which can cause physical defects… Susceptibility to developmental delay continues throughout pregnancy.”

“Chemicals can cause birth defects by directly damaging tissues in the developing fetus… The period of most concern is the first trimester, because this is when the organs and limbs are being formed. During this period many women are not yet aware that they are pregnant and therefore may not take appropriate measures to protect themselves from exposure to agents which can cause birth defects.”

“The mental development and behavior of infants and children can be harmed by substances their mother was exposed to during pregnancy. The effects include hyperactivity, irritability, decreased attention span, slow learning ability, and in severe cases, mental retardation. They can occur in addition to physical defects or alone, and may not be apparent at the time of birth.'-Some of these effects may be temporary (e.g., irritability), while others are permanent (e.g., mental retardation). “[[11]](#footnote-11)

In 2009 world renown experts on workplace neurodevelopmental hazards - Grandjean and Julvez - explained why the developing brain is so sensitive to toxic chemical harm:

“Exposure to neurotoxic chemicals is of particular concern when it occurs during early development. The immature brain is highly vulnerable prenatally and is therefore at risk due to occupational exposures incurred by pregnant women. A systematic search of the literature has been performed with emphasis on epidemiological studies on female workers and the neurodevelopment of their children…. Due to the vulnerability of the brain during early development, a precautionary approach to neurodevelopmental toxicity needs to be applied in occupational health.”[[12]](#footnote-12)

1. A new initiative focusing on neurodevelopmental toxics brings more attention to children of mothers exposed to toxic chemicals. See the following: *Targeting Environmental Neurodevelopmental Risks The TENDR Consensus Statement* [[13]](#footnote-13)

"Based on these findings, we assert that the current system in the United States for evaluating scientific evidence and making health-based decisions about environmental chemicals is fundamentally broken. To help reduce the unacceptably high prevalence of neurodevelopmental disorders in our children, we must eliminate or significantly reduce exposures to chemicals that contribute to these conditions. We must adopt a new framework for assessing chemicals that have the potential to disrupt brain development and prevent the use of those that may pose a risk. .. These measures are urgently needed if we are to protect healthy brain development so that current and future generations can reach their fullest potential.”

2. The Korean Workers' Compensation and Welfare Service recently recognized as compensable work-related injuries in children of three women workers who worked at Samsung Electronics' chip plant. Since January 2023, the ‘Fetal Occupational Injury Law’ recognizes industrial accidents if a worker is exposed to harmful environments during pregnancy and gives birth to a child with congenital disease. [[14]](#footnote-14)

1. **Permissible Exposure Limits and Threshold Limit Values are not health protective; even when they exist and they are rarely established to protect against neurodevelopmental toxic exposure**

OSHA acknowledges its Permissible Exposure limits - the legally enforceable exposure standards - are out of date.[[15]](#footnote-15) Most PELs were adopted in the 1970s; only a handful have been updated in the last 30 years despite greater understanding of the toxic effects of these chemicals — in particular, PELs are not set based on neurodevelopmental effects. Worse, most chemicals have no PELS at all; legally enforceable limits apply to fewer than 500 chemicals used in commerce.

**3. Most chemicals have *no* legal or regulatory “SAFETY STANDARD” based on neurodevelopmental toxicity**

“ A survey of the chemical inventories of 19 countries and regions revealed that about **350,000 chemical substances have been registered for production and large scale use over the past 30 to 40 years**. About 700 new chemicals per year are officially added to the US Toxic Substances Control Act (TSCA) inventory each year, while the European Chemicals Agency has registered about 1700 (new and existing substances) per year under Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) since 2009.[[16]](#footnote-16)

“More than 160 million chemicals are known to humans. About 40 000 to 60 000 can be found in commerce; …In 2017, the chemical industry was the second largest manufacturing industry in the world and the trend is going upwards – chemicals sales are projected to almost double from 2017 to 2030.”[[17]](#footnote-17)

**5. The orders of magnitude disparity between occupational & environmental exposure standards**

Testimony to Congress by [Adam Finkel](https://www.linkedin.com/in/adam-finkel-8433188/) at a Hearing on “Mismanaging Chemical Risks: EPA’s Failure to Protect Workers” -

“occupational {exposure} levels are ten thousand, often one million times higher than in the ambient environment”

“science is increasingly finding … that children born to workers – both women and men– who are exposed to chemicals on the job are at increased risk of a variety of health problems, including cancer, neurodevelopmental disorders, and reproductive problems;”[[18]](#footnote-18)

6. **Multiple chemical exposure is the norm in global electronics**

“A variety of chemicals including organic solvents, gases, acids, and metals are heavily used in electronics manufacturing. Some are simply irritants to skin or respiratory organs; others are carcinogens, reproductive toxins, and/or neurotoxins. Air recirculation systems designed to minimize dust make workers more vulnerable to effects from these chemicals both singly and in complex combinations {emphasis added}.[[19]](#footnote-19)

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