

Children in Jeopardy: Anthropogenic Toxins and Childhood Exposure

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Introduction

"In the Christian view, our treatment of children becomes a measure of our fidelity to the Lord himself."

John Paul II, 1981 Apostolic Exhortation, *Familiaris Consortia*

One could make a compelling argument that, from the perspective of Catholic social teaching (CST), the value and treatment of children is an essential standard by which public health and social justice must be measured. They are some of the most vulnerable members of the human family. The vulnerability of children, particularly to humanly produced environmental toxins, was recently highlighted by a group of two hundred scientists who gathered on the Faroe Islands in late May 2007 for the first International Conference on Fetal Programming and Developmental Toxicity. With a focus on pediatric toxicology, the researchers released a statement titled "The Faroes Statement: Human Health Effects of Developmental Exposure to Environmental Toxicants".¹ In their conclusion they state that "The accumulated research evidence suggests that prevention of efforts against toxic exposures to environmental chemicals should focus on protecting the fetus and small child as highly vulnerable populations. Given the ubiquitous exposure to many environmental toxicants, there needs to be renewed effort to prevent harm" (7). This conference statement appears to affirm the new and growing research indicating that pre and post-natal infants in the U.S. are increasingly at risk of exposure to a wide spectrum of toxic industrial chemicals, herbicides, pesticides and heavy metals. It is well established in medical research that neurotoxins

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¹ Conference on Fetal Programming and Developmental Toxicity. Torshavn, Faroe Islands. The Faroes Statement: Human Health Effects of Developmental Exposure to Environmental Toxicants. 24 May 2007 <[mV/v.precaution.org/lib/faroes_statement_text.070524.htm](http://mV.v.precaution.org/lib/faroes_statement_text.070524.htm)>.

like lead and methylmercury are extremely dangerous for developing children. Yet in spite of this knowledge the EPA states, in its 1997 Mercury Study Report to Congress, that 7% of women of childbearing age have elevated blood mercury concentrations and that 300,000 infants each year may have increased risk of having developmental problems due to in utero exposure to methylmercury.² Regarding lead, Steven Gilbert of the Institute of Neurotoxicology and Neurological Disorders reports that "lead exposure remains a significant hazard in the U.S. and around the world with significant numbers of children age 1-5 with elevated blood lead levels" (524).³

The data on lead, PCBs, and mercury exposure and the consequential health impacts on children are troubling enough; however, very recent ground breaking research released by the Environmental Working Group (EWG) forces us to re-imagine the extent to which pre and postnatal infants are exposed to toxic industrial chemicals, many of which are commonly found in household products. In a follow-up study to its initial research on Body Burden, The Pollution in People (2003), the EWG released in July 2005 its report titled Body Burden, The Pollution in Newborns. Self-described as "A benchmark investigation of industrial chemicals, pollutants, and pesticides in human umbilical cord blood" this research can only be described as startling. (1)⁴ Body burden is the term used by environmental toxicologists to refer to the toxic burden of pollutants carried in the human body. In the EWG research study on infants, researchers analyzed the umbilical cord blood of ten newborn babies in the U.S. between August and September 2004. The test results revealed a total of 287 chemicals found in umbilical cord blood. According to Jane Houlihan and her colleagues, "This study represents the first reported cord blood tests for 261 of the targeted chemicals and the first reported detections in cord blood for 209 compounds" (7). Furthermore they state: "Of the 287 chemicals we detected in umbilical cord blood, we know that 180 cause cancer in humans or animals, 217 are toxic to the brain and nervous system, and 208 cause birth defects or abnormal development in animal tests" (7-8).

The gravity of EWG's ground breaking study on the body burden of infants is compounded by the fact that current federal legislation in the

² United States. Environmental Protection Agency. Mercury: Human Exposure. 28 May 2007 <www.epa.gov/mercury/esposure.htm>.

³ Gilbert, Steven G. "Ethical, Legal and Social Issues: Our Children's Future." *NeuroToxicology*. 26 (2005): 522-527.

⁴ Houlihan, Jane, et al. *Body Burden: The Pollution in Newborns*. July 14, 2005.

Washington, D.C.: Environmental Working Group. 28 May 2007 <www.ewg.org/reports/bodyburden21>. 1, 13, 16, 27-29, 31, 35.

U.S. on safeguarding children from toxic exposure is at best mixed and at worse appallingly inadequate. On the upside, the Food Quality Protection Act of 1996 has, according to EWG, reduced the exposure of children to a host of very dangerous pesticides (28). On the downside, there is virtually no protection specifically focused on children to reduce or eliminate their exposure to toxic industrial chemicals. Bear in mind that the U. S. manufactures or imports nearly 75,000 chemicals a year, most of which have never been tested for safety regarding human health. The primary culprit in the lack of adequate control is the woefully weak and ineffective Toxic Substance and Control Act of 1976, particularly when one factors in the unique vulnerability of infants and young children. According to Houlihan and company, "The government gives children no explicit protection under the federal law meant to ensure the safety of other chemicals (the Toxic Substance Control Act), even though risks from childhood exposure to industrial chemicals are no lower than those from pesticides" (21). In EWG's judgment, "fetal exposure to industrial chemicals is quite literally out of control" (27).

The scenario briefly outlined above raises the question whether the primary issue is more intensive toxicological research on childhood exposure and health impacts or whether the heart of the matter is the creation of adequate public policy and advocacy for children. It is Steven Gilbert's view that "in many cases we have more than enough information on the effects of hazardous chemicals on children's health to make rational policy decision to protect health and prevent harm" (522). It is with this assessment in mind that this paper will investigate and analyze, in some measured detail, four basic aspects of children's exposure to environmental toxins and how this public phenomenon ought to be interpreted and assessed through the lens of Catholic social teaching. To begin, our analysis will summarize and highlight key scientific findings on toxic chemical exposure to pre-natal and newborn children and why, given the unique biological characteristics of infants, they are particularly vulnerable. Vulnerability of children to environmental toxicity is also a function of economic class. Poor and minority children are more susceptible to toxic exposure. This scientific assessment will also highlight the primary health threats to children exposed to anthropogenic toxicants.

Second, this paper will offer a brief analysis and summary of current federal legislation that directly impacts children's health as it relates to the control or lack of control of toxic chemicals. The case will be made that children and their health are not, as a rule, important factors in the creation of public policy and that there is an urgent need for sound policy that will protect infants and young children from harm.

Third, our investigation will assess the reality of childhood exposure from the perspective of Catholic social teaching. While CST has a long tradition of advocacy for children in cultivating a culture of life and justice, the issue of toxic exposure has gone unrecognized in official documents (e.g. pastoral letters) on children. Nevertheless a compelling case from CST can and must be made that-from within the modern Catholic rights tradition-children have a right to an environment free of harmful chemical exposure. Given this rights tradition our fourth point of analysis will be that the U. S. Church, as an expression of its mission in the public domain, must increase its advocacy for better public policy in the protection of children from harmful exposure and the negative, and often irreversible health impacts of environmental toxins. This is a matter of social and environmental justice.

A Scientific Assessment: Infant Development, Pathways of Exposure and Health Impacts of Anthropogenic Environmental Toxins

Routes of Exposure

The pathways by which infants and children are exposed to environmental toxins are often subtle and invisible. Toxic exposure doesn't require a pregnant mother who consumes alcohol or a father who fills the home environment with secondhand cigarette smoke. The pathways of exposure aren't limited to urban life or poor neighborhoods, although poor children tend to be more susceptible. Vulnerability to toxic exposure begins with the prenatal exchange of materials between mother and child through the umbilical cord and continues through breast feeding. As infants develop motor skills like thumb-sucking and crawling they are exposed to common household contaminants such as dust and toys that often end up in their mouth. The contamination continues through childhood exposure to what appears to be healthy food and air. Environmental toxins that can irreparably diminish the quality of later life are often invisible, detectable only with expensive and sophisticated analytical instrumentation.

Infants and children are rapidly growing organisms, with cell divisions taking place and biological tissues and organs forming. This makes them especially susceptible to acquiring large amounts of toxic material into their developing bodies, and also susceptible to the development of uncontrolled cell divisions known as pediatric cancer. Neurological development occurs rapidly through the infant and childhood year, with brain development taking place as an elaborate process

that becomes threatened if neurotoxins are present at crucial moments.⁵ Crawling and hand to mouth behaviors increase uptake of a wide variety of materials (Gilbert 523). For example, the typical sensory-motor activity of children exposes them to the toxic contamination of dust that includes heavy metals and pesticides.⁶

Infants and children are also especially vulnerable to toxins because their bodily defenses are incomplete. They have an immature blood-brain barrier that lets more toxins pass from their circulation into their central nervous system that would not occur with an adult. Children have lower levels of chemical binding proteins that would protect an adult from toxins reaching their vital organs. Infant biochemistry is also less capable of detoxification and excretion of poisons than an adult. These developmental characteristics, combined with a child's longer lifespan, increases the time for negative consequences to develop creating an unusual potential for impacting human health from environmental toxic exposures (Houlihan 13).

The special vulnerability of the young, along with the involuntary nature of the risks to which they are exposed, makes this a crucial issue. An unborn child cannot choose what materials enter it through the estimated 75 quarts of blood passing daily through the umbilical cord at four months gestation, or the roughly 300 quarts of umbilical cord blood that provide a nine month old unborn infant with daily nutrients and oxygen (Houlihan 16). Neither can a nursing child choose to drink breast milk that contains fewer toxins. As parents and as a society, choices are made for children at particularly fragile moments in their life. These choices are often made in ignorance, since parents may know nothing of the health threats that surround the pregnant mother or the nursery.

⁵ Faustman, E. M., et al. "Mechanisms Underlying Children's Susceptibility to Environmental Toxicants." *Environmental Health Perspectives* 108, Supplement 1(2000): 13-21 and Rice, D. and S. Barone, Jr. "Critical Periods of Vulnerability for the Developing Nervous System: Evidence from Humans and Animal Models," *Environmental Health Perspectives* 108, Supplement 3 (2000): 511-533.

⁶ Cohen, Hubel, et al. Children's Exposure Assessment: A Review of Factors Influencing Children's Exposure, and the Data Available to Characterize and Assess that Exposure." *Environmental Health Perspectives* 108 (2000): 457-486; Lioy, P. J., N. C. Freeman and J. R. Millette. "Dust: A Metric for Use in Residential and Building Exposure Assessment and Source Characterization." *Environmental Health Perspectives* 110 (2000): 969-983 and Simcox, N. J., et al. "Pesticides in Household Dust and Soil: Exposure Pathways for Children of Agricultural Families." *Environmental Health Perspectives* 103(1995):1126-1134.

Toxins known to enter unborn children through the umbilical cord include methylmercury and inorganic mercury. Mercury also passes from mother to infant via breast milk, with methylmercury passing more readily.⁷ Methylmercury is absorbed by mothers when they eat predatory fish (e.g. albacore tuna, salmon, mackerel, shark, swordfish, etc). Inorganic mercury exposure results from mercury leaching out of amalgam dental fillings and from atmospheric mercury released from coal burning power plants and other industrial facilities. It should also be noted, however, that consumption of fish low in mercury during pregnancy is actually beneficial for the unborn child's brain development.⁸

Prenatal exposure to DDE (a breakdown product of DDT, now banned in the U.S. but persistent and still widely used around the world) is demonstrable in children whose umbilical cord blood has been sampled.⁹ Fish consumption, especially of predatory fish, is often linked to higher maternal levels of DDE as well as other fat soluble contaminants like PCBs. The most egregious situation is for Alaskan natives and Canadian Inuit, whose excessive blood DDE levels are associated with their diet of marine mammals and predatory fish, but who live in a region that never used DDT to protect crops.¹⁰

The Body Burden report stated that an average of 200 chemicals was found in any one baby's umbilical cord blood. Among the chemical compounds discovered were eight perfluorocarbons used in fast food packaging and clothing, including PFOA, categorized as a likely human carcinogen by the EPA's Science Advisory Board. Other toxins included dozens of the brominated flame retardants and many pesticides (Houlihan 31, 33). Brominated flame retardants, also known as polybrominated diphenyl ethers (PBDEs) are absorbed by mothers due to the high U.S. background level and passed through breast milk. These are toxic

⁷ Bjornberg, Karolin A., et al. "Transport of Methylmercury and Inorganic Mercury to the Fetus and Breastfed Infant." *Environmental Health Perspectives* 113 (2005): 1381-1385, and Grandjean, Philippe, et al. "Umbilical Cord Mercury Concentration as Biomarker of Prenatal Exposure." *Environmental Health Perspectives* 113 (2005): 905-908.

⁸ Oken, E., et al. "Maternal Fish Consumption, Hair Mercury, and Infant Cognition in a U.S. Cohort." *Environmental Health Perspectives* 113 (2005): 1376-1380.

⁹ Sunyer, Jordi, et al. "Prenatal Dichlorodiphenyldichloroethylene (DDE) and Asthma in Children." *Environmental Health Perspectives* 113 (2005): 1787-1790.

¹⁰ United States National Environmental Justice Advisory Council, Federal Advisory Committee to the U. S. Environmental Protection Agency. 2002. Fish Consumption and Environmental Justice. 15 May 2007
<<http://wvw.epa.gov/compliance/environmentaljustice/nejac/fish-consump-recom-report.html>>.

materials that the U.S. and Canada allow for use as fire retardants (in furniture, computers, TVs, automobiles, etc.) despite medical evidence that has resulted in the banning of PBDEs by the European Union. The average level of brominated fire retardants in the breast milk of 20 first-time U.S. mothers was approximately 75 times higher than was found in European women.¹¹ PEDE concentrations in breast milk in the U.S. correlated to concentrations in house dust and increased maternal consumption of dairy products and meat.¹²

In Salinas Valley, California, scientists collected urinary samples from low-income women in agricultural settings and discovered elevated levels of organophosphate pesticides during pregnancy and the breastfeeding period.¹³ These highly soluble materials were passing to their children before and after birth. A large study in Washington State concluded that children in agricultural communities had greater levels of pesticide contamination during crop spraying and if they lived with someone who applied pesticides.¹⁴ Pesticides in agricultural communities might be in the air, water, food, on parents' clothing or concentrated in toxic waste sites. A study of 5,302 fetal deaths in Washington State found no overall relationship between fetal death rates and proximity of the mothers' residences to known toxic waste sites, but for waste sites specifically known to contain pesticides a small but significant increase in fetal deaths occurred when the residence of the pregnant woman was within five miles of the toxic site. The risk of fetal death increased slightly with every mile closer to the waste site where the pregnant woman lived.¹⁵

A recent study of the efficiency of perfluorinated compounds (PFCs) transferred between mother and child by breast feeding indicated PFC exposure of children at levels that raises serious questions of

¹¹ Lunder, Sonya and Renee Sharp. Mother's Milk, Record Levels of Toxic Fire Retardants Found in American Mothers' Breast Milk. 2003. Washington, D.C.: Environmental Work Group. 16 May 2007 <<http://www.ewg.org/reports/mothersmilk>>. 16, 27-31.

¹² Wu, N., et al. Human Exposure to PBDEs: Association of PEDE Body Burdens with Food Consumption and House Dust Concentrations." Environmental Science and Technology 41(2007):1584-1589.

¹³ Brachnan, Asa, et al. "Organophosphate Urinary Metabolite Levels During Pregnancy and After Delivery in Women Living in an Agricultural Community." Environmental Health Perspectives 113(2005): 1802-1807.

¹⁴ Fenske, R., et al. "Biologic Monitoring to Characterize Organophosphorus Pesticide Exposure Among Children and Workers: An Analysis of Recent Studies in Washington State." Environmental Health Perspectives 113(2005): 1651-1657.

¹⁵ Mueller, B., et al. "Fetal Deaths and Proximity to Hazardous Waste Sites in Washington State." Environmental Health Perspectives 115(2007): 776-780.

health risks, sufficient for the study authors to call for an assessment of hazardous exposure via nursing.¹⁶ PFCs are linked in laboratory animals to liver and testicular cancer, immune system disorders, birth defects, and other medical issues. PCFs are a component of nonstick coatings, fabric, leather, food packaging, and other industrial uses.

Neurodevelopment and Anthropogenic Environmental Toxins

The development of the human brain, in prenatal and early childhood periods, is especially vulnerable to environmental toxins. Alterations in brain development are irreversible, and lead to some degree of diminution in cognitive capacity, ability to maintain mental concentration, sensory deficits, and so forth. Cause for alarm is the fact that autism has increased tenfold from the early 1980s to 1996, and higher ambient levels of heavy metals and chlorinated solvents increase the number of children born with the disease.¹⁷ A recent study indicates that a link appears to exist between the proximity of maternal residence during pregnancy to pesticide applications, and increases in autism spectrum disorders due to pesticide drift. Two pesticides, the organochlorine compounds dicofol and endosulfan are specifically implicated in the California Central Valley.¹⁸ Other neurological disorders are also on the rise in our increasingly contaminated world.

As noted above, methylmercury is a dangerous neurotoxin. Research has found that methylmercury and inorganic mercury, passing through umbilical cord blood and breast milk, cause measurable neuropsychological deficits when children are subsequently tested at age seven.¹⁹ A recent analysis of prenatal mercury dose versus IQ estimated that the IQ of children diminished by 0.18 IQ points for every part per million

¹⁶ Karrman, Anna, et al. "Exposure of Perfluorinated Chemicals Through Lactation: Levels of Matched Human Milk and Temporal Trend, 1996-2004, in Sweden." *Environmental Health Perspectives* 115 (2007): 226-230.

¹⁷ Yeargin-Allsopp, M., et al. "Prevalence of Autism in a US Metropolitan Area."

Journal of the American Medical Association 289 (2003): 49-55.

¹⁸ Roberts, E. I., et al. "Maternal Residence Near Agricultural Pesticide Applications and Autism Spectrum Disorders among Children in the California Central Valley." *Environmental Health Perspectives* 115 (2007): 1482-1489.

¹⁹ Grandjean et al.; Bjornberg et al.; Rice, D. C. "Neurotoxicity of Lead, Methylmercury, and PCBs in Relation to the Great Lakes." *Environmental Health Perspectives*

103, Supplement 9 (1995): 71-97; Clarkson, T. W. "Mercury: Major Issues in Environmental Health." *Environmental Health Perspectives* 100 (1992): 31-38; Gilbert, S. G., and K. S. Grant-Webster. "Neurobehavioral Effects of Developmental Methylmercury Exposure." *Environmental Health Perspectives* 6 (1995): 135-142.

increase in maternal hair mercury concentrations during pregnancy.²⁰ The authors noted that their study of IQ deficits did not take into account the possibility of additional diminution of attention and motor skills. In addition to methylmercury, low-level lead exposure also damages children's intellectual development. In a study of 1,333 children, it was found that when blood lead levels went from 2.4 micrograms per deciliter to 30 micrograms per deciliter, IQ decreased by 6.9 points.²¹ These findings are consistent with earlier studies linking higher lead exposure to lower mental functioning and behavioral difficulties. There appears to be no "threshold" below which exposure is safe.²²

Research has also shown that PEDEs, which pass to infants via breast milk cause memory deficits, learning and hearing impairment and other sensory deficiencies.²³ PEDE exposure at critical moments in prenatal brain development can cause permanent harm. PEDE levels as low as four parts per billion (ppb) in animal brain tissue or 12 ppb in animal brain fat cause permanent brain damage. Thirty percent of U.S. women have more than 12 ppb of PEDE in the fat of their breast milk, and it is not known how that corresponds to resulting concentrations of PEDE in infant brain tissue.²⁴

Another toxic chemical, hexachlorobenzene (HCB) an organochlorine, used in agriculture and industry, crosses the placenta and also enter newborns via breast milk. A study looked at HCB levels in umbilical cord blood, and then tested for mental attributes of the same children at four years of age. Children exposed to HCB at higher concentrations exhibited significantly poorer social competence scores and attention-deficit-hyperactivity disorder (ADHD) scores.²⁵

²⁰ Axelrad, D. A., et al. "Dose-Response Relationship of Prenatal Mercury Exposure and IQ: An Integrative Analysis of Epidemiological Data." *Environmental Health Perspectives* 115 (2007): 609-615.

²¹ Lanphear, B., et al. "Low-Level Lead Exposure and Children's Intellectual Function: An International Pooled Analysis." *Environmental Health Perspectives* 113 (2005): 894-899.

²² Schnaas, L., et al. "Reduced Intellectual Development in Children with Prenatal Lead Exposure." *Environmental Health Perspectives* 114 (2006): 791-797 and Hu, H., et al. "Fetal Lead Exposure at Each Stage of Pregnancy as a Predictor of Infant Mental Development." *Environmental Health Perspectives* 114 (2006): 1730-1735.

²³ Lunder and Sharp, 16.

²⁴ Lunder and Sharp, 27-31.

²⁵ Ribas-Fito, N., et al. "Exposure to Hexachlorobenzene During Pregnancy and Children's Social Behavior at Four Years of Age." *Environmental Health Perspectives* 115 (2006): 447-450.

Exposure to heavy metals, chlorinated solvents, and DDE is also detrimental to neurological and psychomotor development. For example, in the San Francisco Bay area, concentrations of heavy metals and chlorinated solvents in ambient air proximate to children's homes were positively associated with incidence of autism spectrum disorders. Because the levels of various air pollutants are often highest in the same areas, the study was unable to identify the specific heavy metals or chlorinated solvents to which prenatal or early childhood exposure was the probable cause of the increased autism.²⁶ Furthermore, research indicates that prenatal exposure to DDE has a critical window during the first trimester of pregnancy, during which increased exposure reduces psychomotor development measured during the infants' first year after birth. Psychomotor index deficits are consistent from the first to the twelfth month of life.²⁷

Respiratory Disease and Anthropogenic Environmental Toxins

Children in the U.S. today are experiencing what can only be described as an epidemic of asthma. Childhood asthma doubled between 1982 and 1993.²⁸ Approximately 2.3 million children with asthma in the U.S. live in parts of the country with unhealthy ozone levels in the air, 2.1 million children with asthma live in areas with high levels of particulate pollution for part of the year and 1.3 million children with asthma live in areas with high levels of particulate pollution for all of the year.²⁹ Moreover, DDE, implicated above as a neurotoxin, has also been shown to cause childhood respiratory disorders. Researchers studied prenatal exposure to DDE in children whose umbilical cord blood was sampled in a study of asthma. Subsequent wheezing (at four years of age) increased with DDE concentration in umbilical cord blood at birth.³⁰

A study in which 2,496 rural households in Keokuk County, Iowa were analyzed indicated positive associations between living on a farm that raised swine and asthmatic conditions, and also for asthmatic conditions

²⁶ Windham, G. C., et al. Autism Spectrum Disorders in Relation to Distribution of Hazardous Air Pollutants in the San Francisco Bay Area. *Environmental Health Perspectives* 114 (2006): 1438-1444.

²⁷ Torres-Sanchez, L., et al. "In Utero p,p'-DDE Exposure and Infant Neurodevelopment: A Perinatal Cohort in Mexico." *Environmental Health Perspectives* 115 (2007): 435-439.

²⁸ United States. Centers for Disease Control and Prevention. "Asthma- United States, 1982-1993." *Morbidity and Mortality Weekly Report* 43 (1995): 952-955.

²⁹ United States. American Lung Association. 2007. State of the Air. 17 May 2007: 6. <http://lungaction.org/reports/sota07_full.html>.

³⁰ Sunyer et al. 1787-1790.

and living on a farm that added antibiotics to animal feed.³¹ Swine farms often have high levels of odor associated with increased levels of hydrogen sulfide, total reduced sulfur, and ammonia. A study of swine odors inside North Carolina schools determined that odor carried in by the wind was significantly more prevalent in schools that had a higher proportion of minority students or a higher proportion of poorer students.

Minority or poor students attended schools closer on average to swine operations (4.9 miles on average) than others (10.8 miles average).³²

When 691 newborn infants were assessed for respiratory issues for roughly 83 days in southwestern Virginia, atmospheric ozone levels were linked to increasing incidence of wheeze for children of nonasthmatic mothers. Asthmatic mothers had infants with increasing incidence of wheeze as ozone levels increased, and also resulted in infants experiencing difficulty breathing.³³ The ozone levels in this study were near or below levels currently permissible by the U.S. Environmental Protection Agency. It is also known that early-life susceptibility to bronchitis is linked to ambient polycyclic aromatic hydrocarbon (PAH) and fine particulate matter concentrations, with preschool age children apparently especially vulnerable to illnesses induced by air pollution.³⁴

Premature Birth, Birth Defects and Anthropogenic Environmental Toxins

Substantial health problems such as pulmonary and neurological difficulties are often associated with premature birth or low birth weight. Preterm birth in the U.S. has increased 23% from the mid 1980s to 2002.³⁵ In a study of birth records from four Pennsylvania counties, maternal exposure prior to birth to particulate pollution (PM₁₀) or sulfur dioxide increased the risk of preterm birth.³⁶ In California, a large

³¹ Merchant, J. A., et al. "Asthma and Farm Exposures in a Cohort of Rural Iowa Children." *Environmental Health Perspectives* 113 (2005): 350-356.

³² Mirabelli, M. C., et al. "Race, Poverty, and Potential Exposure of Middle School Students to Air Emissions from Confined Swine Feeding Operations." *Environmental Health Perspectives* 114 (2006): 591-596.

³³ Triche, E. W., et al. "Low-Level Ozone Exposure and Respiratory Symptoms in Infants." *Environmental Health Perspectives* 114 (2006): 911-916.

³⁴ Hertz-Picciotto, I., et al. "Early Childhood Respiratory Illness and Air Pollution." *Environmental Health Perspectives* 115 (2007): 1510-1518.

³⁵ Sagiv, S. K., et al. "A Time-Series Analysis of Air Pollution and Preterm Birth in Pennsylvania, 1997-2001." *Environmental Health Perspectives* 113 (2005): 602-606.

³⁶ Ananth, C. V., et al. "Rates of Preterm Delivery among Black Women and White Women in the United States Over Two Decades: An Age-Period-Cohort Analysis." *American Journal of Epidemiology* 154 (2001): 657-665.

study was conducted to examine the relationship between air pollution and undesirable birth outcomes for over six hundred thousand newborns. Researchers used birth certificate data on gestational age and birth weight, the addresses of mothers, and levels of carbon monoxide and particulate matter under ten microns in diameter (PM₁₀) measured during pregnancy at the closest air monitoring station to the mothers' homes. The prevalence of preterm birth was linked to high carbon monoxide exposures during the first trimester, and prevalence of low birth weight was linked to high carbon monoxide exposures during the third trimester. PM₁₀ exposures were linked to early and late pregnancy with preterm birth and low birth weight.³⁷ A strong correlation also existed between increasing ozone levels and decreasing birth weights during the second and third trimesters.³⁸

Researchers also discovered that disinfectant byproducts (DBPs) from municipal drinking water treatment facilities had effects on pre-natal human development. A study of all live births and fetal deaths (totaling 48,119 individuals) was conducted from 1998-2003 in an Arizona community that was served by three water treatment facilities producing varying levels of DBPs in drinking water. The study demonstrated that dibromic acid had a critical window of 33-40 weeks of gestation during which greater exposure produced low birth weights and intrauterine growth retardation. Dichloroacetic acid had a critical window of 37-40 weeks of gestation during which greater exposure also produced low birth weights and intrauterine growth retardation.³⁹

Hypospadias is a birth defect in which the urethra of infant boys develops abnormally, usually on the underside of the penis. Application of pesticides with estrogenic or anti-androgenic properties (mimicking female hormones or blocking male hormones) has been shown to produce hypospadias in laboratory animals. In Arkansas the presence of the herbicide diclofop-methyl on a field within 500 meters (roughly 500 yards) of a subject's home during gestational weeks 6 – 16 was associated with an increase in hypospadias.⁴⁰ Another birth defect impacting infant boys is

³⁷ Wilhelm, M., and B. Ritz. "Local Variations in CO and Particulate Air Pollution and Adverse Birth Outcomes in Los Angeles County, California, USA." *Environmental Health Perspectives* 113 (2005): 1212-1221.

³⁸ Salaam, N. L. T., et al. "Birth Outcomes and Prenatal Exposure to Ozone, Carbon Monoxide, and Particulate Matter: Results from the Children's Health Study." *Environmental Health Perspectives* 113 (2005): 1638-1644.

³⁹ Hinckley, A. F., A. M. Bach and J. S. Reif. "Late Pregnancy Exposures to Disinfection By-Products and Growth-Related Birth Outcomes." *Environmental Health Perspectives* 113 (2003): 1808-1813.

⁴⁰ Meyer, K. J., et al. "Agricultural Pesticide Use and Hypospadias in Eastern Arkansas." *Environmental Health Perspectives* 114 (2006): 1589-1595.

cryptorchidism (undescended testicles). Studies have linked this condition to mothers with higher levels of organochlorine pesticides in their breast milk. The total organochlorine load of the mother, rather than any specific pesticide, seemed to be related to this lack of testicular descent in the fetus.⁴¹ Prenatal PBDE exposure and higher PBDE levels in breast milk also increase rates of cryptorchidism.⁴²

Pediatric Cancer and Anthropogenic Environmental Toxins

Premature and newborn infants are masses of frenetic cellular activity as cells divide and differentiate, tissues emerge and organize themselves into vital organs, and a complete human body emerges. When environmental toxins are introduced into this situation they can cause many things, but if the cells begin to divide without their typical control mechanisms acting properly, cancers can develop. Two well documented increases in pediatric cancer are the 62% increase in acute lymphocytic leukemia from 1973-1999, and the 40% increase in childhood brain cancer from 1973-1994.⁴³

A study of childhood brain cancer in the eastern U.S. compared proximity between the mother's residence during pregnancy and the closest Environmental Protection Agency regulated Toxics Release Inventory (TRI) site. TRI sites are federally licensed to release toxins at specified maximum levels, and may be large or small scale commercial facilities. The study showed that increased risks of brain cancer, diagnosed before age five, existed for children of mothers who lived within one mile of a TRI facility, and especially if the TRI facility was releasing known carcinogens.⁴⁴ It has also been shown that maternal occupational exposure prior to or during pregnancy to alkanes, mononuclear aromatic hydrocarbons, 1,1,1-trichloroethane,

⁴¹ Damgaard, I. N., et al., and the Nordic Cryptorchidism Study Group. "Persistent Pesticides in Human Breast Milk and Cryptorchidism." *Environmental Health Perspectives* 114 (2006): 1133-1138.

⁴² Main, I. M., et al. "Flame Retardants in Placenta and Breast Milk and Cryptorchidism in Newborn Boys." *Environmental Health Perspectives* 115 (2007): 1519-1526. ⁴³ Robinson, L. L., J. D. Buckley, and G. Bunin. "Assessment of Environmental and Genetic Factors in the Etiology of Childhood Cancers: The Children's Cancer Group Epidemiology Program." *Environmental Health Perspectives* 111 (1999): 201-206 and . Schechter, C. B. "Re: Brain and Other Central Nervous System Cancers: Recent Trends in Incidence and Mortality." *Journal of the National Cancer Institute* 91 (1991): 2050-2051.

⁴⁴ Choi, H., et al. "Potential Residential Exposure to Toxics Release Inventory Chemicals During Pregnancy and Childhood Brain Cancer." *Environmental Health Perspectives* 114 (2006): 1113-1118.

toluene, mineral spirits, and some other solvents found in work-places are associated with increased frequencies of acute lymphoblastic childhood leukemia.⁴⁵

Thyroid Function, Hormones, and Anthropogenic Environmental Toxins

The thyroid gland has been described as the thermostat of the human body, setting the rate at which metabolism operates. Too much or too little thyroid activity will prevent a person from living a normal life. Environmental toxins can produce a distortion in the typical thyroid function of infants and children. For example the chemical group PBDEs, already mentioned several times for its negative health impact in our analysis, may produce infant developmental deficits by reducing thyroid function in pregnant mothers. Women with low thyroid hormone levels are much more likely to have babies categorized as having IQs of less than 85 and IQs of less than 70. These IQ levels are likely to significantly limit their possibilities for a full life (two-thirds of children dropping out of high school have IQs below 85). PEDE effects on later thyroid level functions in children exposed before birth may or may not be as permanent as the neurological deficiencies produced.⁴⁶ In addition to PBDEs, dioxins and polychlorinated biphenyls (PCBs) in placental tissue significantly alter thyroid function in more heavily exposed infants. The levels of dioxins and PCBs that altered thyroid function were the result of typical bioaccumulation of toxins due to exposure of mothers to a contaminated world.¹⁷ Even low background levels of PCB exposure alter neonatal thyroid-stimulating hormone levels.⁴⁸

Another chemical group known as phthalates is an environmentally ubiquitous plastic softening agent often found in soft toys and flexible bottles. Mothers with higher phthalate concentrations in their breast milk had male infants with altered early sex hormone levels. Early

⁴⁵ Infante-Rivard, C. J., et al. "Maternal Exposure to Occupational Solvents and Childhood Leukemia." *Environmental Health Perspectives* 113(2005): 787-792.

⁴⁶ Lunder and Sharp 27-28

⁴⁷ Wang, S., et al. ("In Utero Exposure to Dioxins and Polychlorinated Biphenyls and its Relations to Thyroid Function and Growth Hormone in Newborns." *Environmental Health Perspectives* 113(2005): 1645-1650.

⁴⁸ Chevrier, J., et al. "Associations between Prenatal Exposure to Polychlorinated Biphenyls and Neonatal Thyroid-Stimulating Hormone Levels in a Mexican-American Population, Salinas Valley, California." *Environmental Health Perspectives* 115 (2007): 1490-1496.

disruption of sex hormone levels can alter important developmental processes and cause significant differences in later stages of sexual maturation.⁴⁹

Science and the Precautionary Principle

The scientific findings outlined above represent only a brief summary of recent research on the negative health effects of environmental toxicants on pre-born and newborn children, but they do in our estimation make a compelling case for additional studies. Nevertheless, in lieu of the lagging research on childhood exposure to environmental toxins, science offers an approach known as the precautionary principle that deserves serious consideration for public policy on children's health. Considered by many in the fields of environmental science and public health to be inherent to sound science, the precautionary principle- simple stated-requires that unless and until a material is demonstrated to be nontoxic, it should not be allowed to be released into commerce (and hence the environment) for the financial benefit of a few people or a company. We shall return to this principle in our final section.

Public Policy, Risk Assessment and Toxic Exposure

There are nearly twenty major laws and statutes that provide the regulatory and legal foundation for the Environmental Protection Agency (EPA) and its mission "to protect human health and the environment." Of these laws approximately a dozen-with varying degrees of concentration directly or indirectly impact human exposure to toxic substances. Given the focus of this paper on toxic chemical exposure to pre and postnatal infants and children, two of these laws are particularly significant. One, the Toxic Substance and Control Act of 1976 (TSCA), is important by virtue of its inadequacy and the other, the Food Quality Protection Act of 1996 (FQPA), is significant because it represents a major step forward in the EPA's regulation of pesticides, particularly in its attempt to protect infants and children from exposure to these harmful chemicals.

At first glance, if one were to read the EPA's description of TSCA, one would get the clear impression that this law is a significant piece

⁴⁹ Main, K. M., et al. "Human Breast Milk Contamination With Phthalates and Alterations of Endogenous Reproductive Hormones in Infants Three Months of Age." *Environmental Health Perspectives* 114 (2006): 270-276

of public policy designed to give the EPA considerable legal leverage in protecting humans from toxic exposure. The law was passed by Congress to provide the EPA with the authority to track, screen and test nearly 75,000 chemicals produced or imported into the U.S. TSCA gives the EPA a range of regulatory tools over all chemicals produced, used and distributed in the U.S. and includes the following:

- 1) authority to require testing of existing chemicals;
- 2) pre-manufacture review of new chemical substances;
- 3) authority to limit or prohibit existing chemicals;
- 4) recordkeeping and reporting requirements;
- 5) export notice to inform foreign governments of shipments of chemicals; and
- 6) import certification.⁵⁰

An important distinction in TSCA is made between existing and new chemical substances. All chemicals on the market prior to December 1979 are considered existing chemicals. These chemicals are included in the TSCA inventory and comprise approximately 99% of the chemicals currently manufactured and in commercial use in the U.S. This

is significant because, according to the Lowell Center for Sustainable Production (LCSP)⁵¹, "These chemicals are considered safe unless the EPA can demonstrate that they present an unreasonable risk to human health or the environment" (1). Most of these existing potential toxicants have never been tested for human safety. According to EWG's Body Burden report, "The vast majority of chemicals in use today do not have anywhere near sufficient data needed to assess their safety thoroughly, particularly their safety for the unborn baby or young child" (Houlihan 27). Regrettably the implementation of TSCA for existing chemicals inhibits the assessment of toxicants due to three major constraints. First, for the EPA to restrict a potential toxicant it must provide risk assessment data that proves that the suspected chemical "presents an unreasonable risk" to human health. Consequently the burden of proof falls exclusively on the EPA. Second, to issue restrictive regulations on a chemical the EPA must also show that it has taken, according to LCSP, "the least burdensome regulation to reduce risks to a reasonable level, and that the benefits of regulation outweigh the costs to industry" (3). Third, the EPA must do this on each individual chemical which is an exceedingly onerous task given the high cost and staff needed to conduct such tests. As a

⁵⁰ Demuth, Mark A., ed., and MADCON Consulting Services. Environmental Law Library. Description of Toxic Substance Control Act. 29 May 2007. <http://www.mad-con.com/law_lib/tsca!>.

⁵¹ University of Massachusetts at Lowell. Lowell Center for Sustainable Production (LCSP). 10 October 2003. The Promise and Limits of the United States Toxic Control Act. 30 May 2007 <www.chemicalspolicy.org/downloads/10-30-Chemicals-Policy-TSCA.pdf>. 3-4.

result very few toxicity studies are ever done by the EPA. In fact, according to a report by the U.S. Government Accounting Office, as of 1994 the EPA had only prohibited five types of chemicals. (PCBs, some chlorofluorocarbons, dioxin, asbestos, and hexavalent chromium) (LCSP 3).

Section four of TSCA authorizes the EPA to require testing of new or existing chemicals if insufficient risk assessment data exist or if a particular chemical is or will be produced in such large quantities that it may pose a significant environmental risk to human exposure. According to LCSP's assessment, the EPA has had limited success collecting these data in large part because the EPA has had to rely on voluntary submission of industry testing, and much of the information supplied by the chemical industry is considered confidential and proprietary business information. LCSP states that "A 1998 EPA analysis found that 65 percent of the information in industry filings to the agency under TSCA was claimed as confidential" and that "About 40 percent of substantial risk notifications claim chemical identity as confidential" (4). As a result, the use of proprietary information as a shield for industry non-compliance has led to what the Body Burden report calls the "stagnation" of testing and restriction of dangerous chemicals under TSCA.

A related matter specific to TSCA and to the vast majority of public policy governing the environment and human health is the controversial model of risk assessment and management. Often referred to as cost-benefit analysis or risk-benefit analysis, this commonly used method of assessment, rooted in a utilitarian ethic, has produced the utilitarian "calculus" of decision making: the greatest good at the lowest cost for the greatest number of people over the longest period of time. In principle this model of risk assessment can yield valuable data on risks to human health provided the procedures and protocols are conducted in an inclusive and transparent manner. Unfortunately this is often not the case. While there have been federal attempts to improve environmental risk assessment and management (e.g. Framework of Environmental Health Risk Management, 1997), Thomas Kerns makes a compelling case that the results are often compromised by a number of factors such as its flexibility, the difficulty in predicting the future and, most importantly, the highly complex yet insufficient scientific data. He argues that,

Risk assessment and management, therefore, because they are such open ended processes, often leave an enormous amount of room for the effects of personal biases and self-interest. We know, for instance, that chemical corporations have been able

to manipulate these processes largely for their own benefit, and this is due to the highly flexible nature of the risk assessment process itself (110).⁵²

These are important considerations when evaluating public policy on environmental health matters but what is even more central to our analysis of health risks to infants and children is the fact that the human standard for toxicological testing upon which risk assessment decisions are made is the "typical" 155 pound white adult male. Maura Ryan affirms this observation when she states that "the study of children and childhood has always been accorded a marginal place in the health, human and social sciences" (14). In Ryan's view this is due to the widely held research assumption that "childhood is a temporary, private, or domestic (vs. social) state as well as from the tendency to treat children as a homogeneous group, without attention to difference of race, class, or sex".⁵³ It is precisely the developmental nature of infants' "temporary" state that renders them far more vulnerable to anthropogenic toxins than the typical adult male. On this issue Kerns' observations are noteworthy:

Children, Women, fetuses, the elderly, and even perhaps other ethnic groups, may well have different responses to a given dose of toxicant exposure. However, none of these possibilities are normally examined in standard toxicology testing.⁵⁴

In spite of the glaring weaknesses of TSCA-considered a failure by some-and the very real problems associated with risk assessment and management, there is a positive development in recent environmental health policy pertaining to children, the Food Quality Protection Act of 1996, otherwise known as FQPA. FQPA amended the Federal Insecticide, Fungicide and Rodenticide Act and the Federal Food, Drug and Cosmetic Act leading to fundamental changes in the way the EPA regulates pesticides. Supported by a coalition of diverse groups including public and pediatric health professionals and grounded in sound science, FQPA sought to create a more consistent and protective regulatory framework on pesticides. Moreover, the act mandated a health based standard for pesticides in all foods and included special protections for infants and children. It also signaled a shift from the standard risk-benefit model to a precautionary approach to children's health.

⁵² Kerns, Thomas. *Environmentally Induced Illnesses, Ethics, Risk Assessment and Human Rights*. Jefferson, North Carolina: McFarland and Co., 2001. 110, 138, 150, 154-201.

⁵³ Ryan, Maura A. "The Politics of Risk: A Human Rights Paradigm for Children's Environmental Health Research." *Environmental Health Perspectives* 14, No. 10 (2006): 1614

⁵⁴ Kerns, 150.

The significance of FQPA is grounded in the fact that, according to Gilbert, "food contaminants must meet a tolerance of 'reasonable certainty of no harm' standard" (527). EWG claims in *Body Burden* that the implementation of FQPA has "reduced or eliminated children's exposure to a number of highly hazardous pesticides..." (Houlihan 28). Consequently FQPA is an example of the type of public policy needed to reduce or eliminate the risk of toxic exposure in infants and children; a public policy framework that we believe is better served by a human rights standard rather than the typical risk assessment and management approach.

Human Dignity, Children and the Right to an Environment Free of Anthropogenic Toxins

In the modern Catholic tradition of human rights, from *Rerum Novarum* (1891) to the present, the entire edifice of human rights rest upon the interrelated affirmations that human beings are created in the image and likeness of God and, by this virtue, are endowed with dignity. This interpretation of the priestly assertion in Gen.1:26-27 is unique compared with other typical interpretations of this biblical text. Kieran Cronin suggests that the three primary ways of interpreting this passage are 1) that it is a validation of humanity as the apex of God's creation and consequently its lord and master; 2) that the Gene- sis text indicates the human capacity for a personal, dialogical relationship with God, and 3) that the image reflects the human role within creation as God's royal agent or steward.⁵⁵ To this we would add an additional common interpretation, that humanity's creation in the image of God indicates that human beings are rational and moral beings. Consistent with these varying interpretations the Catholic rights tradition interprets Gen. 1: 26-27 as the doctrine of the *imago Dei*, the theological cornerstone of human rights; a hermeneutical claim that is simultaneously ontological and axiological. It is ontological because humans in their "being-ness" represent the divine image and, consequently have intrinsic value. This axiological interpretation of the *imago Dei* leads to the valuation that human beings are endowed with transcendental worth and dignity. The focus of this paper, however, compels us to ask a key question: What does image of God and human dignity mean in light of toxic exposure in pre and postnatal infants and very young children and how should human dignity be interpreted

⁵⁵ Cronin, Kieran. *Rights and Christian Ethics*. Cambridge: Cambridge University Press, 1992. 254-256.

from the perspective of the vulnerability of infants and the health risks due to childhood exposure to environmental toxicants?

From a historical point of view this is not an unimportant question. Prior to the Second Vatican Council, CST tended to interpret human dignity from a neo-scholastic natural law position which, according to David Hollenbach, "identifies the imago Dei with the fact that human beings are endowed with intelligence and freedom"⁵⁶ A good example of this is found in *Pacem in Terris* (1963)⁵⁷ which states that

in creating humans in God's image and likeness, God "endowed him with intelligence and freedom, and made him lord of creation" (no. 3). Recognizing the deficiency of interpreting the imago Dei in this fashion, Cronin makes an insightful observation when he writes, "If the image is related to reason and free will, then there are the problems of grounding the dignity of humans lacking these capacities-embryos, young children, the severely retarded, the comatose, the demented."⁵⁸

With Vatican II and afterwards, however, the Catholic rights tradition began to shift to a more historical understanding of human dignity. Hollenbach concludes that "The Council's most important contribution to the human rights tradition was its important new acknowledgement that the demands of human dignity are historically conditioned ones. The historical and developing character of human personhood is repeatedly affirmed in *Gaudium et Spes*".⁵⁹ The Council also emphasized that the underlying conditions of personhood and human rights are profoundly social. According to O'Brien and Shannon, the council recognized that "Individuals are not seen as solitary beings, for by the innermost nature persons are social beings, and unless they are related to others, they can neither live nor attain their full potential" (174).⁶⁰

In keeping with the spirit and intent of *Gaudium et Spes* and more recent documents by John Paul II that introduced the "ecological question," we propose that the current exigencies of humanity in general

⁵⁶ Hollenbach, David, S.J. *Claims in Conflict, Retrieving and Renewing the Catholic Human Rights Tradition*. New York: Paulist Press, 1979. 69-70, 90-91, 94-98, 109.

⁵⁷ John XXIII. *Pacem In Terris*. 11 April 1963. On Establishing Universal Peace in Truth, Justice, Charity, and Liberty. Vaticanweb site. The Holy See. 14 November 2007
<http://W\V\V.vatican.va/holy_father/john_xxiii/encyclicals/documents/hf_j-xxiii_enc_1041963_pacem_en.html>.

⁵⁸ Cronin, 254.

⁵⁹ Hollenbach, 69-70.

⁶⁰ O'Brien, David J. and Thomas A. Shannon, eds. *Renewing the Earth, Catholic Documents on Peace, Justice and Liberation*. Gru. den City, New York: Image Books, 1977, 171-177.

and children in particular require us to recognize that human dignity is, among other things, ecologically conditioned. One important characteristic of the ecological conditions that shape and impact human beings highlighted herein is the bioaccumulation of persistent toxins. The fact that this process is occurring in unborn fetuses, infants and young children with negative and potentially tragic health consequences confronts us with a central issue on the meaning of human dignity as it relates to human beings in the nascent stages of development. The simple fact is this: due to the unique characteristics of biological and behavioral growth and development, children are more vulnerable than adults to the bioaccumulation of toxicants. According to the National Research Council's study, *Pesticides in the Diets of Infants and Children*, "Because they are growing and developing, infants and children are different than adults in composition and metabolism as well as in physiological and biochemical processes".⁶¹ Regarding the "special characteristics of children," the study states:

Physical development of the body (overall growth), nervous and digestive systems, liver and kidneys, and the proportions of body water and body fat are of special concern in the study of developmental toxicology. Prior to full maturation, damage to an organ or organ system, such as the central nervous system, could permanently prevent normal physical maturation (23).

Because of these scientific observations, the human dignity of children must be interpreted biologically and developmentally. The demands of human dignity, as it relates to children, requires us to recognize that it is historically and socially conditioned, due to the proliferation of industrial toxicants; ecologically conditioned, due to the process of bioaccumulation, and biologically conditioned, due to the unique developmental characteristics of infants and children. The convergence of these conditions has conspired to produce the reality of body burden and consequential health risks to children that prevent them from reaching their full potential as human beings. It is our conclusion, therefore that this scenario poses a direct threat to children's dignity and health, and requires special consideration from within the Catholic rights tradition.

Human dignity, theologically grounded in the doctrine of the *imago Dei*, is the primary category at the foundation of Catholic rights theory. As such it is not a moral imperative or an ethical principle but the basis for all ethical imperatives. Because it is the primary norm, human dignity is a universal, ontological and transcendental principle that

⁶¹ United States. National Research Council. *Pesticides in the Diets of Infants and Children*. Washington, D.C.: National Academy Press, 1993.23.

applies to all persons and the full range of human action. Hollenbach states that "Dignity is thus a transcendental characteristic of persons. Human persons have a worth which claims respect in every situation and in every type of activity".⁶² On the other hand, as we have shown above, human dignity is also historically and socially conditioned and, consequently, human dignity makes very specific claims to ensure that it is promoted and preserved. These claims or moral imperatives are what CST construes as human rights. Simply put, rights are the minimal conditions necessary to preserve and promote human dignity or, as Hollenbach asserts, "Rights are the conditions of the realization of human worth in action".⁶³

We are convinced by our analysis that the exposure of infants and children to persistent environmental toxicants represents a serious affront to the dignity of children and necessitates the articulation of a specific ethical imperative-what we call a child's right to an environment free of anthropogenic toxicants. While this right applies to all persons and falls under the general claim of a right to a safe environment, our research indicates a special urgency in the case of toxic exposure in children. Where, however, would this right be categorized within the broad and comprehensive spectrum of human rights in the Catholic tradition? The immediate and obvious observation is that a right to an environment free of anthropogenic toxicants falls within those rights that seek to ensure the bodily dimension of human dignity. In other words, the bioaccumulation of toxicants in the prenatal period, newborn infants and children is a violation of bodily integrity and an incipient threat to health. According to Hollenbach's assessment of Catholic rights theory, the right to an environment free of anthropogenic toxicants can be expressed at three interrelated levels: personal, social and instrumental.⁴ At the personal level it reflects the requirement of protecting the individual child from harmful bodily exposure that is completely beyond their control. This situation however, is constituted by social realities-that is, toxic exposure in children is a social and public phenomenon that cuts across economic class, race, gender and ethnicity. Moreover this phenomenon also reflects institutional realities, particularly economic and political ones that mandate certain conditions in the interest of protecting the dignity of children. These conditions are what Hollenbach calls instrumental rights. Taken as a whole-personal, social and instrumental-the right to an environment free of anthropogenic toxicants becomes a strategic matter of

⁶² Hollenbach, 90.

⁶³ Hollenbach, 91.

⁶⁴ Hollenbach, 94-98.

advocacy for the creation of public health policy designed and implemented to ensure the bodily dimension of human dignity for all persons and especially those who are particularly vulnerable to toxic exposure.

The Church and Public Policy: Advocating for Children's Health

As an expression of its faith and mission, the Church in the U.S. has always seen itself as an important public actor in the formation of public policy on a wide range of important national issues. On the matter of children and families, the United States Catholic Conference of Bishops (USCCB) issued an impressive pastoral statement in November 1991 called *Putting Children and Families First: A Challenge for our Church, Nation and World*.⁶⁵ According to the U.S. Bishops, the aim of the statement was "to shape a society and a world with a clear priority for families and children in need and to contribute to the development of policies that help families protect their children's lives and overcome the moral, social, and economic forces that threaten their future" (366). The document offers a comprehensive and detailed pre-scription for national policy on a spectrum of social and economic issues that directly impact children making the point that "Children don't vote; they don't contribute to political campaigns, and therefore, they are more likely to be ignored by governments and policy makers" (379). In setting the criteria for public policy on children the bishops outlined seven guiding principles four of which are particularly significant for our policy recommendations on toxic exposure in children:

- Put children and families first.
- Help; don't hurt.
- Those with the greatest need require the greatest response. This is the "option for the poor" in action.
- Fight economic and social forces which threaten children and family life (378)

Significant steps have also been taken at the institutional level of the USCCB. In 1998, responding to the 1991 pastoral statement on children and the growing research on the vulnerability of children to toxic exposure, the USCCB's Environmental Justice Program and the Office

⁶⁵ United States Conference of Catholic Bishops. "Putting Children and Families First: A Challenge for our Church, Nation and World." Pastoral Letters and Statements of the United States Catholic Bishops. Volume VI 1989-1997, ed. Patrick Carey. Washington, D.C.: United States Catholic Conference, 1998. 366, 378-379.

for Domestic Social Development created a new structure called the Catholic Coalition for Children and a Safe Environment (CASE). A coalition of ten Catholic agencies and organizations, CASE has outlined a number of excellent initiatives aimed at disseminating information, providing education, and promoting advocacy on children's health risks to environmental toxicants. One of these initiatives is "Advocating for public policies at the national, state, and local level that promote a safe environment for children".⁶⁶ One of the CASE partners, the National Council of Catholic Women (NCCW), is undertaking an important grassroots educational initiative in a number of dioceses across the country. The NCCW is currently administering a \$26,000 grant from the USCCB for parish-based education on the environment and children's health. The purpose of the program is to train parish leaders and will focus on how parishioners "can make changes that will improve the health of infants and children."⁶⁷

In addition to CASE initiatives the USCCB office of Social Development and World Peace (SDWP) has posted a statement on "Children's Health and the Environment" acknowledging that the developmental nature of childhood renders children more vulnerable than adults to toxic exposure. The statement recognizes that health impacts on children from exposure to toxic chemicals includes such illnesses as asthma, cancer and learning disabilities, and that children in poverty are more susceptible to exposure related diseases. The website also includes update on CASE related activities in the interest of children and health.⁶⁸

CASE is a significant first step in the creation of a national Catholic infrastructure for the purpose of influencing the public and political sector for better policy to protect children from toxicological harm. In light of the fact the USCCB has been trimming budget and staffing, it is our hope that CASE will receive the necessary funding and staff to carry out their initiatives the most important of which is-arguably- advocacy for better public policy. For Catholic action to be successful in this social, political arena, CASE will have to collaborate with other public actors who share the basic principle of protecting children from toxic exposure. Among them are organizations such as the American

⁶⁶ United States Conference of Catholic Bishops. Catholic Coalition for Children and a Safe Environment (CASE). 31 May 2007 <www.usccb.org/case>.

⁶⁷ National Council of Catholic Women. Make the Case for Children's Health. 14 November 2007 <<http://home.catholicweb.com/NCCW/index.cfm>>.

⁶⁸ United States Catholic Conference of Bishops. Social Development and World Peace. Children's Health and the Environment. 14 November 2007 <wmv.usccb.org/sdwp.national/childshealth0406.shtml>.

Public Health Association, American Pediatric Association and the Union of Concerned Scientists. It must be remembered that the enactment of FQPA in 1996 was successful because of the broad based national coalition that advocated for and supported the measure.

The question remains, however, what should public policy look like and upon what principles should it be designed if it is going to protect the human dignity of children by reducing and/or eliminating toxic exposure? A good place to begin is with the two policy measures already discussed: FQPA and TSCA of 1976. FQPA is important because it is a model for what is possible and to some degree sets a precedent for better legislation. As noted above, FQPA shifted away from the standard of risk assessment to a precautionary approach to pesticide exposure and gave children priority. TSCA is important because it is notoriously weak and needs massive overhaul in the interest of children. Regardless of the approach, overhauling TSCA or an entirely new policy enactment, we propose the following recommendations for Catholic advocacy for the public health of children through the restriction and/or elimination of anthropogenic environmental toxicants.

Give Children Priority

In setting new or overhauling old public policy on hazardous substances whether they are industrial chemicals, pesticides, herbicides or metals, the standard for analyzing health risks must shift from the typical adult male to those who are most vulnerable to toxic exposure: pre and postnatal infants and young children. The scientific evidence, particularly from pediatric toxicology, is overwhelming. We can no longer ignore that children at all levels of development are the most susceptible to the dangers of environmental toxicants, to the risk of long term health impairment, and life threatening illness. Moreover, even though toxic exposure in children appears ubiquitous, justice dictates that children in poverty, according to scientific research, are the most vulnerable and require special consideration in public policy. Making children the standard and litmus test for public policy on anthropogenic toxins is a direct application of the preferential option to address the needs of those most vulnerable.

The Precautionary Principle

The best way to ensure that infants and children in the perinatal period are given priority is to adopt the precautionary principle as the primary stratagem in the formation of public health policy. The permanence of the consequences of prenatal, infant and childhood exposure to

toxins calls for a clear scientific reply to this growing health crisis. Arising out of medical practice and scientific methodology, the precautionary principle has been proposed as the only viable approach to materials that may be toxic to infants and children.⁶⁹ Often referred to as "do no harm," the precautionary principle, according to Kerns, "affirms that when there is inadequate scientific data to clearly determine a chemical's safety or toxicity, the operative assumption should be in favor of protecting the public health rather than in favor of the manufacturer's interest in dispersing the product into the marketplace and environment".⁷⁰ This would replace the risk assessment approach as the primary decision making standard for chemical toxicants. This standard is already employed by the U.S. Food and Drug Administration (FDA), but only when specific legislation is being enforced. Before food or drug additives can be employed commercially, the manufacturer must carry out a rigorous scientific evaluation: of the material and submit the data to the FDA for review. As noted earlier, the precautionary principle is also a component of FQPA and has already achieved positive results for children. The precautionary principle raises "Help; don't hurt" to a new level of diligence and is perhaps one of the most potentially effective policy means for safeguarding human dignity and health.

Shift the Burden of Proof

Utilization of the precautionary principle would effectively shift the burden of proof of a product's safety or toxicity to the producers of chemical and toxic agents-before they are put on the market and enter the environment. This must apply to new as well as the vast majority of existing chemicals currently in use. This would effectively address the primary weakness of TSCA, which forces the EPA to prove the toxic risk of existing chemicals before they can be restricted. For this to be efficacious, however, public policy must contain adequate measures for enforcement and ought to include the following:

- Give the EPA the necessary and unambiguous authority to require from manufacturers impartial scientific studies on all new and existing chemicals to ensure safety and appropriate commercial use.
- Restrict or remove from commerce all existing chemicals, particularly those that are suspected to be dangerous to infants and children, from commercial and residential use until adequate tests have been performed.

⁶⁹ Gilbert, 525-527.

⁷⁰Kearns, 133,

- Eliminate the primacy of claims of proprietary knowledge and business confidentiality for all health, safety and environmental data.
- Require that material safety data sheets (MSDS) that comply with testing protocols contain data on children and are made available to everyone impacted by the use of hazardous and toxic substances. Make MSDS sheets comprehensible to citizens.
- Provide chemical manufacturers with positive incentives to reduce the use of environmental toxicants and the development of "green" or alternative chemicals that are safer for both producers and consumers of industrial products.
- When and if a risk assessment approach is taken in analyzing product safety and risk, its transparency, impartiality, and public accessibility must be ensured.⁷¹

Right to Know, Full Disclosure and Informed Consent

Public policy governing the production of consumer products that contain hazardous or dangerous substances must include the public's right to know what chemical ingredients were used in production. Parents, for example, have the right to know what was used in products specifically designed for children such as toys. The principle of informed consent is closely linked to the right to know and full disclosure. Informed consent is widely practiced in biomedical research, clinical medicine and pharmaceutical products and clearly states, according to Kerns, "that it is unethical to expose a human being to any procedure, substance, or risk without that person's informed consent".⁷² This principle should be adopted in policy measures designed to protect public health. It would require that the public be informed about the potential health risks-especially for infants and children-of any consumer product used in the home that contains hazardous substances. Combined with the public's right to know, the principle of informed consent would require the manufacturer of consumer products to fully disclose the chemical ingredients used in a particular commodity. An example of this is Kern's quotation of the Center for Ethics and Toxics and their Toxic Bill of Rights, that "Labeling, disclosure and explanation of testing, ingredients or components with potential toxicity in any commercial commodity shall be conveyed voluntarily and fully without regard

⁷¹ Houlihan et al. 28-29 and Kerns 154-201.

⁷² Kerns, 172.

to proprietary privileges".⁷³ Under current law producers of such things as household pesticides and herbicides are not required to provide full disclosure of ingredients. On the labeling of these products it is entirely possible that the majority of toxic substances in the product are hidden under the term "inert."

Safety Standards for Children

It is reasonable to assume that physical places (e.g. schools) and habitats (e.g. public parks) that are frequented by children, or where they are the primary inhabitants would be strictly regulated regarding the use of hazardous substances. At present there is no specific component of public policy that safeguards children in these public places from commonly used products that often contain toxic chemicals. Perhaps the most important of these public spaces, where children spend much of their time is the school. It is our contention that public policy should target schools-public and private-for improved safety standards to reduce and eliminate toxic exposure in these facilities. Public policy of this nature would have to address the use of indoor and outdoor toxicants and would include the elimination of industrial solvents, toxic cleaning agents, pesticides and herbicides.

Increase Funding for Pediatric Toxicological Studies

We have made the point in this analysis that the primary issue is not more research but the development of better public policy to protect children from toxic exposure. The irony is the fact that public policy often earmarks the distribution of federal funding to and for those groups that make the most noise and have the greatest power. As the

U.S. Bishop's stated, "Children don't vote" and "they don't contribute to political campaigns."⁷⁴ Protecting children is not the standard research goal in risk assessment tests for product safety and toxicity and yet the growing evidence from recent pediatric toxicological studies is clear that children are the most vulnerable. Consequently, any public policy act designed to protect children from exposure to anthropogenic toxicants must contain funding for increasing the quantity and quality of toxicological studies aimed at the entire range of their development. In particular the following areas require concentrated research:

⁷³ Kearns, 171.

⁷⁴ United States Conference of Catholic Bishops. "Putting Children and Families First: A Challenge for our Church, Nation and World." Pastoral Letters and Statements of the United States Catholic Bishops. Volume VI 1989-1997, ed. Patrick Carey. Washington, D.C.: United States Catholic Conference, 1998. 379.

- The toxicological and health impact potential of in utero exposure to multiple chemicals, since chemical interactions may increase toxicity.
- The impacts of ambient air on the increase and etiology of asthma.
- The toxicological impact on the increase in neurodevelopmental disorders.
- The health impacts of endocrine disruptors in young men and women.
- The environmental etiology behind the dramatic rise of childhood leukemia, brain cancer (glioma), and other emergent cancers.

Conclusion: Church and the Faith that does Justice

How, exactly, the above recommendations would be articulated and integrated into new public policy enactments is, at this time, still speculative. Philip Landrigan of New York's Mount Sinai School of Medicine suggests that at the federal level the passage of a "Children's Environmental Health Act" and a "Children's Environmental Protection Act" or at the state level a "School Environmental Protection Act" could establish the necessary policy framework to prevent harm and promote the health and safety of young children.⁷⁵ Regardless of specific policy proposals, there is no doubt that any attempt to overhaul the current legal status quo on anthropogenic environmental toxicants will be met with serious and sustained resistance by chemical corporations and their social and political allies. To achieve success it will require the Church and its social and political allies to—in the words of the U.S. bishops—"fight economic and social forces which threaten children and family life."

In the mean time the Church's strategy to promote parish-based education such as the educational initiatives of the NCCW are promising endeavors that could have immediate positive results in reducing toxic exposure in children. We make this claim based on newly released data from a study entitled "Pollution in People, a Study of 'Toxic Chemical in Oregonians" released in 2007 by the Oregon Environmental Council.⁷⁶ One of the participants in the study who donated her blood and urine to be tested for the presence of 29 toxic chemicals was a young mother who had decided to reduce her unborn child's exposure to two types of hormone disrupting

⁷⁵ Landrigan, Philip J. "Environmental Pediatrics and the Ecological Imperative." *EcoHealth* 3(2006): 75-76.

⁷⁶ Oregon Environmental Council, *Pollution in People, a Study of Toxic Chemicals In Oregonians*. 12 November, 2007. 26 November 2007 <http://oeconline.org/pollutionin-people/index.html>.

chemicals, phthalates (contained in many plastics and personal care products) and Bisphenol A (found in some baby bottles, plastic toys and food containers, etc.). She had the lowest number of chemicals detected in her body of any study participant, her total phthalate level was under half of that of the second lowest participant, and her body alone contained no detectable level of Bisphenol A. Her simple actions to protect her unborn and subsequently infant child from the consequences of exposure to phthalates and Bisphenol A were successful. The affordable steps taken by this prudent mother (removing a vinyl shower curtain, eliminating plastics from her kitchen and home, choosing nontoxic personal care products for mother and child) were effective even in our complicated contaminated world. We discovered that guidance to do this is available from free, simple, and readily accessible website information such as www.safecosmetics.org; <http://www.cosmeticsdatabase.com/special/parentsguide/index.php?nothanks=1>; <http://www.oeonline.org/>, and www.checnet.org/health-the-House/pdf/plasticchart.pdf. Similar resources to reduce dietary mercury and PCB consumption are also readily available from <http://www.nrdc.org/health/effects/mercury/walletcard.pdf> and http://www.environmentaldefense.org/documents/1980_pocket_seafood_selector.pdf. Developing curricular materials based on these and other resources is well within the capacity of parish educational programs, and parents would welcome this information to protect their children's health.

A related issue to the impact on children's health from exposure to anthropogenic toxicants is that this situation is seriously exacerbated by the disturbing fact that, according to the U.S. Census Bureau, between nine and ten million children in the U.S. are uninsured for health care (American Medical Student Association).⁷⁷ While it is beyond the scope of this paper to probe this connection in any depth, we must assume, given the increase in such illnesses as asthma, autism, leukemia and glioma, that it represents a significant economic burden for many families. The total number of children without health care is further complicated by the fact that 70% come from families with incomes below the federal poverty level and 60% or more are racial or ethnic minorities—who are particularly vulnerable to toxic exposure. Overall children compose 70% of all recently uninsured Americans.⁷⁸ The AMSA estimates that "children without private health insurance grows by roughly 3,000 every day" (1). Moreover the CCHC reports

⁷⁷ American Medical Student Association. Facts on Uninsured Children. 15 November 2007. <www.amsa.org/cph/CH1Pfact.cfm>.

⁷⁸ American Medical Student Association and Campaign for Children's Health Care. America's Uninsured Children: Minority Children at Greater Risk. 15 November 2007 <www.childrenshealthcampaign.org>.

that 13.5 million or 18.5% of children under 18 have special health care needs".⁷⁹ Children with special health care needs are defined as those "who have or are at increased risk for a chronic physical, developmental, behavioral, or emotional condition and who also require health and related services of a type or amount beyond that required by children generally".⁸⁰ A review of the chronic illnesses in the category of special health care needs includes such maladies as asthma, autism, ADHD, mental retardation and sensory impairments. The scientific research clearly indicates that exposure to anthropogenic toxicants accounts for some of the etiological conditions for a range of chronic illnesses in children including those identified above. Viewed from the Catholic rights tradition, the ethical imperative to provide care for special needs children is clear and the ethical demand to reduce childhood toxicant exposures that increase the number of children requiring special care is equally clear.

In spite of the worrisome trends of toxic exposure to children and health care there is some cause for hope. The current National Children's Study that is in its early stages promises to address the research gap on children's health and acknowledges that the proportions of children with chronic illnesses-conditions to which environmental toxins contribute-seems to be growing. The study will look at over 100,000 kids across the U.S. in a representative sampling of locations from pre-birth to 21 years of age. The study will research pregnancy outcomes including birth weight and birth defects, neurodevelopment and behavior, asthma, obesity, exposure to air pollution, hormonally active environmental agents and reproductive development, etc. A large number of toxic metals and synthetic organic compounds in children's body burden will be tested. There will also be data collected on the characteristics of the neighborhoods and homes, child care sites and schools of the children involved in the study.

This project, endorsed by the USCCB's CASE partners, could provide much needed data on the health status of the nation's children particularly in relation to toxic exposure. There are limitations in the study but the most pernicious is the availability of funding. There is a lack of long term commitment to funding this study and, like many legislative measures in the U.S. government; it is funded by annual acts of Congress. Consequently, funding for the National Children's Study will

⁷⁹ Campaign for Children's Health Care. Children and Youth with Special Health Care Needs. 15 November 2007 <www.childhealthcampaign.org>.

⁸⁰ McPherson, M. et al. "A New Definition of Children With Special Health Care Needs," *Pediatrics* 102 (1998): 137-140.

always be up for grabs among competing interests and will necessitate constant lobbying efforts to maintain the breadth of the research and the project's momentum.

The U.S. Church utilizing its institutional apparatus can and must play a key lobbying role in supporting the National Children's Study. Nevertheless, based on our research on the health impacts to children exposed to anthropogenic toxicants and the concomitant issue of health care, we believe the magnitude of the current situation warrants a significant pastoral response by the USCCB. Perhaps a follow-up statement to Putting Children and Families First would be appropriate in refocusing the Catholic communities' attention on the current status of children. Given the National Children's Study and the national debate on health care, a major pastoral statement would be a timely public endeavor. It is our obligation to protect the human dignity of children through participation in the public domain by defending the rights of the most vulnerable in our midst. In doing so, the Church publicly expresses its faith as the faith that does justice and, according to Pope Paul VI, promotes "the concrete demands of the Christian faith for a just, and consequently necessary, transformation of society" (no. 51).⁸¹

⁸¹ Paul VI. *Octagesima Adveniens*. 14 May 1971. The Eightieth Anniversary of "*Rerum Novarum*" (A Call to Action). Vatican web site. The Holy See. 14 November 2007 <<http://www.papalencyclicals.net/Paul06/p6oct.htm>>.