

Preconception to Infancy (P2i) Program

Using exposomics to positively affect child health outcomes



When women, before and during pregnancy, and their infants, during their first two years, follow a regimen based on toxin avoidance, proper nutrition and healthy lifestyle choices, individually calibrated to the individual's biochemistry, the incidence of both poor pregnancy outcomes and chronic disorders among the infants is dramatically reduced. This regimen is the P2i Program.

What is the P2i Program Designed to Do?

P2i is a program designed to positively affect the health outcomes of children using the emerging technology of exposomics to both qualify and quantify environmental exposures of the mother and baby from preconception to infancy. It is perceived that 90 percent of chronic illnesses are a result of environmental factors¹, and that pregnancy complications can lead to increased risks for the offspring to develop chronic illnesses.

[LEARN MORE >](#)

P2i

P2i is a Paradigm Shift

The P2i vision has grown out of a paradigm shift occurring among scientists who study pregnancies and chronic childhood health conditions. Under the old paradigm, many pregnancy issues and childhood chronic health conditions were unpredictable, random events and/or perhaps genetic in origin.

[LEARN MORE >](#)

Dramatic Increase of Childhood Chronic Conditions

Studies show that chronic illnesses among children have risen such that one out of five children under the age of 18 have special health needs in the U.S.²

[LEARN MORE >](#)

Environment Determines Our Fate, or Genes?

Many chronic illnesses may be caused by environmental factors, which gives researchers a path to look for keys to prediction and prevention. Therefore, our fate may not be sealed by genetically certain outcomes, and potentially we could predict and prevent chronic diseases before they ever happen.

[LEARN MORE >](#)



How Prenatal Care Affects the Health of Mother and Baby

A mother's health during pregnancy has a profound effect on the health of her offspring, both in childhood and in later life.

[LEARN MORE >](#)

How Nutrition Affects the Health of Mother and Baby

The nutritional status of women when becoming pregnant and during pregnancy can have significant influence on both fetal, infant, and maternal health outcomes.

[LEARN MORE >](#)

P2i... Connecting the Dots

Can proper prenatal care based on measurements of the mother's body burden and nutritional profile produce healthy babies? Can physicians benefit from these measurements to better guide medical treatment of a newborn through the first two years of life?

[LEARN MORE >](#)

How P2i Will Accomplish This

This will be accomplished by measuring a range of chemical and physical environmental hazards in food, consumer products, water, air, noise, and the environment, in pre- and post-natal early life periods, and defining multiple exposure patterns and individual exposure variability.

[LEARN MORE >](#)

How Agilent Fits In

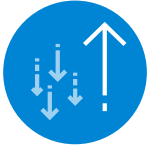
Exposomics is a complex research area that requires broad-based, sophisticated tools. Agilent provides exemplary hardware, software, and informatics solutions that can be utilized for this multi-omics research. [LEARN MORE >](#)



What is the P2i Program Designed to Do?

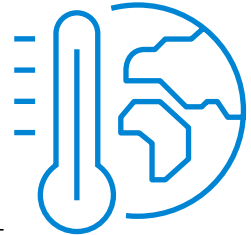
P2i is a program designed to positively affect the health outcomes of generations of children, using the emerging technology of exposomics to both qualify and quantify environmental exposures of the mother and baby from preconception to infancy.

[BACK TO PAGE 1 >](#)



P2i is a Paradigm Shift

Under the new paradigm, a high incidence of problematic pregnancies, and serious, chronic disorders among children are **in large measure the common result of environmental factors**. When women, before and during pregnancy reduce toxins, and follow proper nutrition, the incidence of both poor pregnancy outcomes and chronic disorder among the children is dramatically reduced.



[BACK TO PAGE 1 >](#)

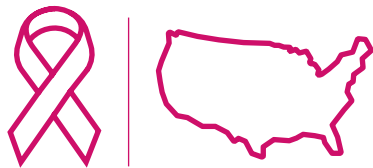


Dramatic Increase of Childhood Chronic Conditions

2000  2021
1 in 150 1 in 68

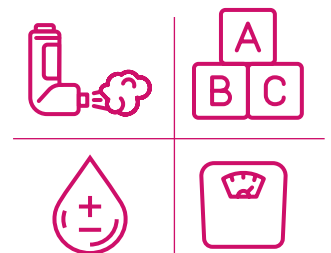
The Centers for Diseases Control and Prevention (CDC) reported that **autism rates have nearly doubled since 2000**.³

The overall rate of cancer among children is mounting steadily, and the increase for two of the most common childhood malignancies, **leukemia, and brain tumors**, is particularly sharp.



Childhood cancer is now the leading cause of death by disease past infancy among children in the U.S.⁴

Other childhood chronic illnesses that have sharply increased in the last decade include **asthma, developmental disorders, diabetes, and obesity**.⁵



[BACK TO PAGE 1 >](#)



Environment Determines Our Fate, or Genes?

In 2013, the CDC issued this statement that confirmed what many scientists and researchers have known for a long time:

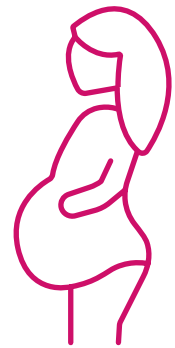
“One of the promises of the human genome project was that it could revolutionize our understanding of the underlying causes of disease and aid in the development of preventions and cures for more diseases. Unfortunately, genetics has been found to account for only about 10% of diseases, and the remaining causes appear to be from environmental causes. So, to understand the causes and eventually the prevention of disease, environmental causes need to be studied.”

[BACK TO PAGE 1 >](#)



How Prenatal Care Affects the Health of Mother and Baby

For example, it is believed that smoking during pregnancy can potentially cause a baby to be born with complications such as low birth weight or prematurity.⁶ It is also believed that drinking alcohol during pregnancy can potentially cause scenarios such as miscarriage, pre-term birth, stillbirth, or fetal alcohol syndrome.⁷ Other environmental factors such as exposure of the mom-to-be to toxic chemicals or poor nutrition can also be passed onto the fetus.



[BACK TO PAGE 2 >](#)

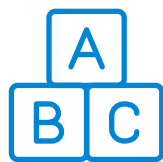
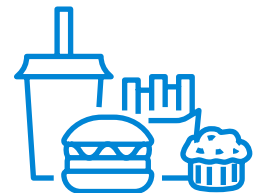


How Nutrition Affects the Health of Mother and Baby



Micronutrient deficiencies such as [calcium](#), [iron](#), [vitamin A](#) and [iodine](#) can lead to poor maternal health outcomes and pregnancy complications.

Poor maternal weight gain in pregnancy due to an [inadequate diet](#) can also increase the risk of premature delivery, low birth weight and birth defects.⁸



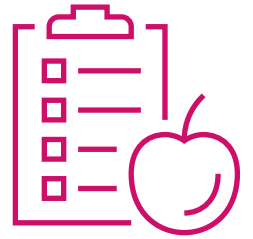
Worldwide, infections are among the leading causes of chronic, [developmental disabilities](#) in children, along with and sometimes interacting with genetic and nutritional causes.⁹

[BACK TO PAGE 2 >](#)



P2i... Connecting the Dots

Physicians can benefit from these measurements and make more accurate assessments to help a prospective mom strengthen her **health profile with proper nutrition, avoidance of negative environmental factors, and reduction of body burden**. Understanding how exposures from our environment, diet, lifestyle, etc., interact with our own unique characteristics such as genetics, physiology, and epigenetics impact our health is how the exposome will be articulated.



[BACK TO PAGE 2 >](#)



How P2i Will Accomplish This



To quantify uncertainty in **exposure estimates**.



To determine **molecular profiles and biological pathways** associated with multiple exposures.



To track the development of childhood diseases by studying **genetic information**.



To follow the progress of participants' children during their **first five years of life**.



To obtain **exposure-response estimates** for multiple exposures and child health.



To estimate the burden of childhood disease in the U.S. due to multiple **environmental exposures**.



To strengthen the knowledge base for **U.S. health policies** and provide a clear path to reform health care for future generations.



To globalize the P2i project **to reach all children worldwide**.

[BACK TO PAGE 2 >](#)

How Agilent Fits In

Agilent provides a wide range of hardware, software, and informatics solutions for this multi-omics research, including chemical and biological analysis systems ranging from research-grade liquid phase and gas phase quadrupole time-of-flight mass spectrometers, triple quadrupole mass spectrometers, inductively coupled plasma mass triple quadrupole mass spectrometers, real-time PCR, and sophisticated software such as Agilent Mass Hunter Profiler Professional.



Agilent 6546
LC/Q-TOF

Agilent 6470B
Triple Quadrupole LC/MS

Agilent 7250
GC/Q-TOF

Agilent 7010B
Triple Quadrupole GC/MS



Agilent 1290 Infinity II
High-Throughput System



Agilent 8890
Gas Chromatograph (GC) System

Visit [Agilent.com](https://www.agilent.com) to discover and learn more about the complete set of integrated biology solutions that scientists can apply to this research.

[BACK TO PAGE 2 >](#)

References:

1. Science - Environment and Disease Risks. <https://science.sciencemag.org/content/330/6003/460.long> Accessed May 2021
2. HRSA Maternal & Child Health Bureau. <https://mchb.hrsa.gov/sites/default/files/mchb/Data/NSCH/nsch-cshcn-data-brief.pdf> Accessed May 2021
3. Scientific American. The Real Reasons Autism Rates Are Up in the U.S. <https://www.scientificamerican.com/article/the-real-reasons-autism-rates-are-up-in-the-u-s/#:~:text=How%20has%20autism%20prevalence%20changed,in%2015%20rate%20in%202000> Accessed May 2021
4. NIH – National Cancer Institute. Cancer in Children and Adolescents. <https://www.cancer.gov/types/childhood-cancers/child-adolescent-cancers-fact-sheet> Accessed May 2021
5. Health Affairs. The Rise In Chronic Conditions Among Infants, Children, And Youth Can Be Met With Continued Health System Innovations. <https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2014.0832> Accessed May 2021
6. Centers for Disease Control and Prevention. Smoking, Pregnancy, and Babies. <https://www.cdc.gov/tobacco/campaign/tips/diseases/pregnancy.html> Accessed May 2021
7. The National Center for Biotechnology Information. Prenatal Alcohol Exposure and Miscarriage, Stillbirth, Preterm Delivery, and Sudden Infant Death Syndrome. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3860553/#:~:text=Research%20suggests%20that%20alcohol%20use,and%20sudden%20infant%20death%20syndrome.> Accessed May 2021
8. Scientific Reports. Effect of maternal pre-pregnancy underweight and average gestational weight gain on physical growth and intellectual development of early school-aged children. <https://www.nature.com/articles/s41598-018-30514-6> Accessed May 2021
9. The National Center for Biotechnology Information. Control of Infectious Causes of Childhood Disability in Developing Countries. <https://www.ncbi.nlm.nih.gov/books/NBK83707/> Accessed May 2021

To learn more about Agilent solutions visit: <https://www.agilent.com/en/solutions/environmental/environmental-exposure>
To ask a question email: pdl-business-pr@agilent.com

This information is subject to change without notice. © Agilent Technologies, Inc. 2017. Published in the USA, July, 2021