

# **Pediatric Research Using Integrated Sensor Monitoring Systems (PRISMS): Applying Sensor Technology and Informatics to Better Understand Asthma**

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## **Abstract**

The Pediatric Research using Integrated Sensor Monitoring Systems (PRISMS) program was launched in 2015 to develop sensor-based, integrated health monitoring systems for measuring environmental, physiological, and behavioral factors in epidemiological studies of pediatric asthma. PRISMS will develop an open platform and associated suite of tools to enable a comprehensive spectrum of biomedical research into chronic diseases in pediatric populations. We describe the PRISMS program goals, operations, and organization, and informatics challenges.

## **Introduction**

The NIH launched a cross-institute initiative to examine the effects of the environment on children's health, including the Pediatric Research using Integrated Sensor Monitoring Systems (PRISMS) Program<sup>1</sup>. As part of its mission NIBIB conducts research and development of new bioengineering techniques and devices to improve the detection, treatment, and prevention of disease, including technologies for disease detection and assessment of health status.

## **Problem addressed/purpose**

Pediatric asthma is complex, with interactions between environmental, physiological, and behavioral factors. In PRISMS, researchers will develop a variety of novel sensors, sensor-based integrated health monitoring systems, and an interoperable data management platform to make environmental and health data available to epidemiologists and clinical researchers. The integrated effort will offer new insights into non-invasive health monitoring and pediatric asthma research. PRISMS is organized to address several informatics challenges.

## **Program organization**

Sensor Development Centers develop new sensors or redesign existing sensors to monitor environmental stressors and physiological parameters correlated with pediatric asthma. Informatics Platform Centers manage secure data acquisition and processing, integration of sensor data with other data sources, and secure transmittal to the Data and Software Coordination and Integration Center, which verifies data quality, harmonize data into a consistent model, and supports analysis. Key challenges to be addressed in the PRISMS Program include developing robust measurement devices to collect environmental and behavioral data. Devices must be feasible and acceptable for study participants and investigators to use. Informatics platforms must be flexible, interoperable repositories that embrace diverse approaches to environmental and behavioral measurement; calculate interim measures such as multiple asthma severity scores; and must be generalizable to other types of environmental epidemiology studies. The platforms must accommodate mobile health (mHealth) approaches and must be scalable for large multi-center studies. Other challenges include managing uncertainty and diverse quality inherent in sensor data, the need to integrate data collected at multiple levels of granularity and timing, and information models and standards that may not adequately encompass the detail needed for sensor-intensive research.

## **Conclusion**

Developing a sensor-based, integrated health monitoring system for measuring environmental effects on health offers challenges that require informatics innovations, methods and tools. Pediatric asthma research is likely to benefit from the comprehensive spectrum of biomedical informatics efforts developed through the PRISMS program.

## **References**

1. National Institute of Biomedical Imaging and Bioengineering [NIBIB]. Pediatric Research Using Integrated Sensor Monitoring Systems [Internet]. 2015 [cited 26 Feb 2016]. Available from: <http://www.nibib.nih.gov/research-funding/prisms>