# Precision Medicine in Public Health

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## Introduction

According to the National Institutes of Health (NIH), precision medicine is "anemerging approach for disease treatment and prevention that takes into accountindividual variability in genes, environment, and lifestyle for each person."[1] One of the best examples of use of precision medicine is found in the process of blood transfusion, thedonor's blood type is matched to the recipient to reduce the risk of complications.

Some older literature use the term "personalized medicine" to imply that treatments and preventions are being developed uniquely for each individual.Both precision medicine and personalized medicine are highly related and genomics plays a big role. However, even highly personalized information may or may not be cost effective and may not yield a very favorable outcome as per expectation. Moreover, precision medicine approaches may lead to non-personalized interventions that can be used population-wide. As the focus has been broadened to identify which approaches will be effective for which patients based on his/ her genetic constituents, environmental, and lifestyle factors, precision medicine term sounds more logical.

The term P4 medicine has also been proposed (predictive, preventive, personalized and participatory medicine), but still, the terms personalized medicine and precision medicine have had most currency.[2]

## Current and potential uses of Precision Medicine

Although precision medicine is not a new concept, still it is anemerging and young area of action. It can be used in every sector of health care be it cancer treatment, prevention of non-communicable diseases or population health as a health- primitive intervention.

## Use in Public Health

Precision medicine is not only useful to clinical conditions but also in larger population for public good. Following areas where it can be useful:

1. Develop ways to measure risk for a range of diseases based on environmental exposures, genetic factors and interactions between the two;
2. Identify the causes of individual differences in response to commonly used drugs (commonly referred to as pharmacogenomics);
3. Discover biological markers that signal increased or decreased risk of developing common diseases;
4. Use mobile health (mHealth) technologies to correlate activity, physiological measures and environmental exposures with health outcomes;
5. Develop new disease classifications and relationships;
6. Empower study participants with data and information to improve their own health; and
7. Create a platform to enable trials of targeted therapies.

## Potential benefits of Precision Medicine

1. Can be used to design new tools for building, analyzing, and sharing large sets of medical data.

2. New approaches for protecting research participants, particularly patient privacy and the confidentiality of their data.
3. Improvement of Food and Drug Administration (FDA) oversight of tests, drugs, and other technologies to support innovation while ensuring that these products are safe and effective.
4. Opportunity for a million people to contribute to the advancement of scientific research with new partnerships of scientists in a wide range of specialties, as well as people from the patient advocacy community, universities, pharmaceutical companies, and others.
5. Wider ability of doctors to use patients' genetic and other molecular information as part of routine medical care.
6. Improved predictability in terms of outcomei.e., which treatments will work best for specific patients.
7. Better understanding of the underlying mechanisms by which various diseases occur.
8. Improved approaches to preventing, diagnosing, and treating a wide range of diseases.
9. Better integration of electronic health records (EHRs) in patient care, which will allow doctors and researchers to access medical data more easily.
10. Help every individual to use mobile devices like wrist watches, bands, phone sand tablets to adopt and monitor healthy behavior.

## Precision Medicine Initiative Cohort Program

The Precision Medicine Initiative (PMI) has been started in USA; a research effort focusing on bringing precision medicine to many aspects of healthcare. Through advances in research, technology and policies that empower patients, the PMI will enable a new era of medicine in which researchers, providers and patients work together to develop individualized care.

This will seek to extend precision medicine to all diseases which do not have a proven means of prevention or effective treatments by building a national research cohort of one million or more U.S. participants.The PMI Cohort Program[3] will be a participant-engaged, data-driven enterprise supporting research at the intersection of human biology, behavior, genetics, environment, data science and computation, and much more to produce new knowledge with the goal of developing more effective ways to prolong health and treat disease.This cohort will seek to extend that success to many other diseases, including common diseases such as diabetes, heart disease, Alzheimer's, obesity, and mental illnesses, as well as rare diseases.For this initiative, sophisticated electronic health records will be widely adopted, genomic analysis costs will drop significantly, and health technologies will become mobile.

## Precision Medicine and Public Health prospects

Health planning and disease prevention demand sproficient use of scanty resources. Therefore if one can direct the preventive, promotive and curative approaches to the more susceptible population groups based on their characteristics such as age, gender, and location, genetic susceptibility.

Primary and even primordial prevention can be achieved by the use of screening as a tool at different levels, like, premarital counseling and screening, newborn screening, and school based screening. These will definitely help to reduce the burden of non-communicable diseases and metabolic and genetic disorders.

Policy and public health interventions can be provided at some specific population strata which will make health programmes more cost effective.

Use of molecular and genetic information can not only give us knowledge about disease causation, but we can also learn about positive health free from any sickness, and that is the most desired thing for mankind.

Precision medicine can help public health experts and policy makers with available vast online and easily accessible population information. This can aid for disease tracking, outbreak investigation, environmental and public health engineering and might help to reduce health inequalities across the society.[4]

## Challenges of Precision Medicine

Precision medicine has many challenges, for example, the extraordinarily complex pathogenesis for cancer, a non-communicable diseases that will be the dominant causes of ill health in the coming decades can no longer be fully explained by gene and molecular level of knowledge, so precision medicine may actually may not be as beneficial as expected for understanding disease pathogenesis. For control of cancer and other disorders, genotype sampling may be possible but phenotypic expression can hardly be predicted, making this costly affair further more valuable for population perspective.

Even after identifying the at risk population groups, one can hardly change the behavior of the individual and the surrounding environment, thus it may be more challenging to prevent disease occurrence.

Newer concept, so many techniques and technologies yet to evolve.Social stigma for genetic and sectional approach to health carecan not be handled by precision medicine. There would be many ethical and legal issues for testing and implementing interventions which need to be resolved. Sequencing of genomics to correlate with different diseases can be a highly costly affair. There would be more dependency on molecular and biochemical interphase of health and diseases.

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