Second, substantial evidence indicates that a genetically targeted approach to health has demonstrated a population health benefit. For instance, newborn screening is the largest established precision medicine public health program in the United States. Other opportunities for near-term benefit on population health involve implementing evidence-based tier 1 genomic interventions (those with evidence-based recommendations for use)[6] such as for common genetic conditions associated with preventable premature death from cancer and heart disease. These include hereditary breast and ovarian cancer syndrome, Lynch syndrome, and familial hypercholesterolemia. In aggregate, an estimated 2 million people in the United States have one of these conditions, and most are not aware of their risk.[6]

Third and most important, precision medicine is not limited to genes, drugs, and disease. The same technologies and big data that are propelling precision medicine forward are leading to a new era of precision public health that goes beyond personalized treatment of individuals affected by disease.[7] Precision in the context of public health has been described as improving the ability to prevent disease, promote health, and reduce health disparities in populations by (1) applying emerging methods and technologies for measuring disease, pathogens, exposures, behaviors, and susceptibility in populations; and (2) developing policies and targeted implementation programs to improve health. One potentially important application of precision public health is the use of genomics in the investigation and control of infectious diseases. Pathogen whole-genome sequencing is rapidly changing both clinical and public health microbiology. In addition, genomics promises to become central to other economic sectors such as the environment, agriculture, animal health, biotechnology, and alternative energy.

Conclusions

There are clear tensions at the intersection of precision medicine and public health. There are, however, ways forward in which precision medicine could enhance collaborations between medicine and public health to address population health problems and disparities. Much of the current focus of precision medicine involves developing new drugs for personalized treatment of cancer and other diseases. Moving forward, health professionals need greater emphasis on joining biological with social and environmental determinants of health to develop precision approaches to interventions in individuals and populations. For example, biological knowledge of genetic susceptibility to environmental and occupational exposures could lead to population-wide policy protection based on thresholds determined by the most susceptible individuals in the population rather than individual genetic testing with exposure avoidance only in susceptible individuals.[8] A fundamental concern for population health must be with measuring and addressing health inequities. As with all new technologies, genomic technologies have the potential for widening the divide between the haves and the have-nots.

A major challenge for the future is how to use emerging information from multiple levels—from reductionist molecular markers (genomics, omics, etc) to holistic macrolevel risk factors (behavior, environment, policies)—to develop a better understanding of determinants of health. Precision public health relies on evidence that links population data to measurable