



# Three-dimensional Printing in Developing Countries

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**Summary:** The advent of 3-dimensional (3D) printing technology has facilitated the creation of customized objects. The lack of regulation in developing countries renders conventional means of addressing various healthcare issues challenging. 3D printing may provide a venue for addressing many of these concerns in an inexpensive and easily accessible fashion. These may potentially include the production of basic medical supplies, vaccination beads, laboratory equipment, and prosthetic limbs. As this technology continues to improve and prices are reduced, 3D printing has the potential ability to promote initiatives across the entire developing world, resulting in improved surgical care and providing a higher quality of healthcare to its residents. (*Plast Reconstr Surg Glob Open* 2015;3:e443; doi: 10.1097/GOX.0000000000000298; Published online 6 July 2015.)

In science fiction, the ability to create a physical object expediently and rapidly is a commonly occurring theme. The advent of 3-dimensional (3D) printing technology has brought science fiction closer to reality by facilitating the creation of customized objects seemingly out of thin air. Indeed, we are getting closer to the matter compiler in Neal Stephenson's "The Diamond Age" or the replicator in "Star Trek."<sup>1</sup>

Despite many technological advancements over the course of human history, well over a billion people worldwide are living without food, water, shelter, or proper healthcare. Due to its enormity and complexity, this problem has remained unresolved.

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The lack of standard regulation in developing countries renders conventional means of addressing these issues very difficult.<sup>2</sup> 3D printing (or "additive manufacturing" as it is referred to by some authors<sup>3-5</sup>) may provide a venue for addressing many of these concerns in an inexpensive and easily accessible fashion. This review outlines the current uses of 3D printing in developing countries.

## WHAT IS 3D PRINTING?

3D printing technology has been in existence for the last 3 decades. Only recently has it become readily available and inexpensive enough to be used by the general public.<sup>1,6</sup> It is a means of generating physical models from digital designs.<sup>1,7</sup> The software tools needed for producing printable items, as well as the materials used, and repositories for sharing and downloading designs have become easily obtainable.<sup>1,6</sup> Michigan Technological University has already started the process of compiling an open library of 3D-printed components for optical devices. The most commonly used materials by 3D printers currently are polylactic acid and acrylonitrile butadiene styrene. In general, 3D printers function by constructing items from numerous thin

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