Diffusion of innovations

Diffusion of innovations theory has been used to explain the spread of new ideas and practices in a wide variety of settings for more than 60 years.^{1,2} It ranks as one of the most frequently used theories in health promotion and disease prevention³ and in many other fields.¹ Diffusion theory is appealing because it can help explain human behavior and provides a guide for the design of interventions to change behavior.⁴ For example, diffusion theory was used to argue that mass media interventions are best for raising awareness while interpersonal ones are needed to spur adoption.

The diffusion model has been extended in many ways and shown to operate at many levels. Geneticists will find diffusion factors operating everywhere in their scientific discipline. For example, the popularity of certain scientific ideas and the adoption of theoretical and methodological approaches will diffuse through the scientific community. The degree organizations and testing centers can and will adopt various techniques and technologies will diffuse throughout the health care system. Finally, when and how the general public—and specific subpopulations—learn about, try, and adopt genetic tests will become an increasingly interesting question of study.

Diffusion theory is being increasingly applied to the development of more active methods of dissemination designed to accelerate the pace of diffusion and close the gap between recommended and actual practice.⁵ The richness of diffusion theory comes from its explicit measure of the role of external influences and social networks in the adoption decision. Innovations flow through social networks which sometimes impede behavioral spread and sometimes accelerate it. Diffusion network models have shown that who adopts when affects the diffusion trajectory.^{6,7} These models have provided the first tentative attempts at improved strategies for accelerating behavior change.⁸

Armstrong et al.⁹ have made an interesting first study of the adoption of breast cancer screening using tests for the *BRCA1/2* mutation. They apply diffusion theory well and show how individual and innovation characteristics affect its rate of adoption. Importantly, they demonstrate how triggers, or cues-to-action, provide motivation for women to get tested.

These cues, however, do not affect people equally, but rather prompt those who are more innovative to seek counseling and get tested. They describe the correlates of early adopters and acknowledge that there will be a 20- to 30-year time span required for this technology to diffuse through the general populace. It will be interesting to determine whether the rate and character of the diffusion of genetic tests are similar across tests and similar to other innovations.¹⁰

Scientists and counselors will continue to struggle with the complexities and implications of human genetics. Diffusion of innovations theory provides a framework to understand how ideas and technologies developed from these efforts will impact society. More importantly, it provides a framework for analyzing the process as it unfolds so that we can make more informed choices and decisions about how to guide the dissemination and diffusion of these new ideas.

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References

- 1. Rogers EM. Diffusion of innovations, 4th ed. New York: Free Press, 1995.
- Valente TW, Rogers EM. The origins and development of the diffusion of innovations paradigm as an example of scientific growth. Sci Commun 1995;16:242–273.
- Glanz K, Lewis FM, Rimer BK, editors. Health behavior and health education, 3rd ed. San Francisco: Jossey-Bass, 2002.
- Valente TW. Evaluating health promotion programs. New York: Oxford University Press, 2002.
- Lomas J, Enkin M, Anderson GM, Hannah WJ, Vayda E, Singer J. Opinion leaders vs audit and feedback to implement practice guidelines: delivery after previous cesarean section. JAMA 1991;265:2202–2207.
- Valente TW. Network models of the diffusion of innovations. Cresskill, NJ: Hampton Press, 1995.
- Valente TW. Models and methods for innovation diffusion. In: Carrington P, Scott J, Wasserman S, editors. Models and methods in social network analysis. New York: Cambridge University Press, in press.
- Valente TW, Hoffman BR, Ritt-Olson A, Lichtman K, Johnson CA. The effects of a social network method for group assignment strategies on peer led tobacco prevention programs in schools. Am J Public Health. In press.
- Armstrong K, Weiner J, Weber B, Asch DA. Early adoption of *BRCA1/2* testing: who and why. *Genet Med* 2003;5:92–98.
- Casterline J, editor. Diffusion processes and fertility transition: selected perspectives. Washington, DC: National Academy Press, 2001.