Commentary: Save the Children: Direct-to-Consumer Testing of Children is Premature, Even for Research

Andrea Farkas Patenaude, PhD
Dana-Farber Cancer Institute and Department of Psychiatry, Harvard Medical School

All correspondence concerning this article should be addressed to Andrea Farkas Patenaude, PhD, Center for Cancer Genetics Director of Psychology, Research and Clinical Services, Department of Psychosocial Oncology and Palliative Care, Dana-Farber Cancer Institute, 450 Brookline Avenue, Boston, MA, 02215, USA. E-mail: andrea_patenaude@dfci.harvard.edu

Received and revisions received July 26, 2011; accepted August 4, 2011

While I am in agreement with Tarini, Tercyak, and Wilfond (2011) about the need for more research on children and genetic testing, I strongly object to their main point, which is that this research should include studies of children’s involvement in direct-to-consumer genomic testing (DTC GT). I believe that this recommendation is premature. Having children undergo DTC GT now would expose them to a poorly regulated industry which often markets itself unreasonably (Federal Trade Commission, 2006) and provides information of highly variable accuracy with little or no established clinical validity (European Society of Human Genetics, 2011b; Robson, Storm, Weitzel, Wollins, & Offit, 2010). DTC GT testing occurs in the absence of involvement of the children or their parents with physicians and, often, with little or no genetic counseling before or after testing. While genomic testing offers great promise for the future, it seems unreasonable currently that medical decision making for children should be based on information available in DTC GT.

Having children undergo DTC GT would, as the authors acknowledge, also be in contradiction to many professional guidelines about genetic testing (American Medical Association, 1996; ASHG and ACMG, 1995; Bioethics Committee, Canadian Paediatric Society [CPS], Ethical and Public Policy Committee, Canadian College of Medical Geneticists, 2003, reaffirmed January 2011; British Society of Human Genetics, 2010; European Society of Human Genetics, 2009). It would deprive children of their autonomous right to decide as adults (when, presumably, genomic testing will be much improved) whether or not to learn this genetic information about themselves. It is also, I believe, difficult for the best interests of the child to be adequately considered in the circumstance of DTC GT without a medical intermediary to weigh the complicated risks and benefits of testing for over a hundred genetic conditions (as most DTC tests include) and with results of highly variable levels of accuracy, including many for which the predictive utility is currently unknown.

Tarini et al. (2011) give weight to the fact that many parents are interested in knowing their children’s genetic risk for many conditions, especially those which run in their own family. This is true, but parental interest is not necessarily in the best interests of the child; parents often want testing of their child even in the absence of medical benefit to the child (Patenaude, Basili, Fairclough, & Li, 1996). It would be critical to have a neutral professional like the child’s pediatrician involved to decide if the testing was actually sought to reduce parental anxiety, guilt or curiosity or whether it would be truly likely to benefit the child. The many professional guidelines which have set the age of majority as the minimal recommended age for genetic testing of a child except in cases where there was imminent medical benefit have reiterated that parental interest, which eliminates the future option of not knowing for the tested individual, is insufficient reason for childhood testing. At-risk adults, even those within the same family, differ enormously in whether or not they want to have genetic testing, at what points and ages they seek testing, and with whom they share the information with. Such autonomous actions seem important both psychologically and ethically to preserve. While the authors suggest the
current guidelines may be outdated, current scholars share views which support not involving children in DTC testing:

Traditional non-DTC genetic testing of minors is primarily a matter of parental discretion and consent. However, parental decision-making is usually challenged by professional service providers. This is to ensure that the decision whether or not to test reflects the minor’s best interests and is not simply intended to relieve the patients’ anxiety. Service providers professionally assess the putative benefits and harms of testing with the aid of the aforementioned guidelines, prior to deciding whether genetically testing the particular child is appropriate. Parents may obviously attempt to coerce service providers into performing such testing. However, not only can service providers not be forced to perform such testing, if they believe it is not in the minor’s best interests; in fact, they could be held liable for malpractice should they endorse such testing contrary to the minor’s welfare (Tamir, 2010, p. 225). Tamir concludes by recommending against involvement of children in DTC-GT.

DTC GT is under heavy scrutiny from major governmental administrative and professional bodies in the United States and elsewhere (European Society of Human Genetics, 2011a; SACGHS, 2011; Vorhaus, 2011b). In the United States, a major 2011 report by the Health and Human Services Secretary's Advisory Committee on Genetics, Health and Society:

- directs the Food and Drug Administration (FDA) Commissioner and the Centers for Medicare and Medicaid Services (CMS) to develop guidelines and regulations to close gaps in the oversight of these DTC tests and
- suggests that a joint HHS-Federal Trade Commission task force be convened to develop guidelines to evaluate claims made by the companies providing DTC testing.
- “directs the HHS Office for Civil Rights in conjunction with the HHS Office for Human Research Protections and other relevant HHS agencies to identify specific gaps in state and Federal research protections and privacy protections” related to DTC testing and to address these gaps under their existing authority to regulate research (SACGHS, 2011).

Dr Jeffrey Shuren, Director of the Center for Devices and Radiological Health at the FDA testified before a Congressional subcommittee in June of 2010 that Congress had given the FDA has the right to regulate predictive genomic tests in circumstances where they are considered in vitro diagnostic tests (IVD) “intended for use in the diagnosis of disease or other conditions, including a determination of the state of health, in order to cure, mitigate, treat or prevent disease or conditions arising from a disease. Genetic tests are a type of IVD” (Shuren, 2010). Further, Dr Shuren stated that in May 2010 the FDA had sent letters to the five most prominent DTC companies and to a company making components of the test notifying them that FDA approval was needed for their products. These (DTC GT) tests, Shuren continued “have not been proven safe, effective or accurate and patients could be put at risk by making medical decisions based on data that has not reached independent or premarket review.” Additional DTC companies have since received similar notifications and the FDA is currently conducting meetings considering the potential regulation of DTC genomic tests (Vorhaus, 2011a, 2011b).

In the area of genetic testing, research has led almost seamlessly into clinical practice and there will be much more clinical genetic and genomic testing of affected and asymptomatic, high-risk children in the near future. We are just beginning to have data about factors affecting how parents impart maternal genetic test results to their children for single-gene hereditary pre-dispositions like BRCA1/2 (Bradbury et al., 2009; DeMarco et al., 2008, Tercyak et al., 2007) and there is much more we need to understand about child and family impact as these children come of age. DTC GT lacks the careful concern for the ethical rights of patients which has marked prior genetic studies. As a start, while some of the companies say that they want to test only adults, others leave it to parents to decide. There is no way in which parents can be absolutely prevented from sending their children’s DNA in for DTC testing; in fact, children themselves can sign up for DTC testing if they have access to a credit card.

A study of 37 DTC GT companies showed that a majority of the companies conduct genetic tests on minors (Howard, Avard, & Borry, 2011) in contradiction to both clinical and DTC GT-specific guidelines from established North American and European professional societies and governmental bodies. Howard et al. (2011) call professionals to action saying that overlooking these practices, “would invalidate the entire logic and value-based-framework on which the guidelines were originally built…The community of stakeholders in children’s health care and GT must be clear about which standards need to be upheld by DTC GT companies and ensure that these are met.” The European Society of Human Genetics report on DTC testing states, “The very context of DTC genetic testing does not allow for an adequate assessment
of the competence of a minor. Therefore, the ESHG considers that DTC genetic tests should not be offered to individuals who have not reached the age of legal majority” (European Society of Human Genetics, 2011a). The Nuffield Council on Bioethics in the UK states, “Firms should not knowingly analyse the DNA of children unless the requirement of clinical validity is met.” DTC GT is outlawed in the Netherlands without the involvement of a qualified health professional and is not permitted in 13 U.S. states (Howard et al., 2011).

The consequences of the potential for misunderstanding, misinterpretation and medical mistreatment in the circumstance of DTC GT are great. The number of conditions tested for is very large. Sufficient knowledge to provide informed consent in this context is not established nor are appropriate formats for genetic counseling about such a broad range of conditions. The limitations of the tests are not likely to be understood by most of those who are tested. Tarini et al., 2011 speak of the potential gains if an obese child were found to have a gene for diabetes and this knowledge could be used to help him and his parents work harder at lifestyle changes for him. But what of the computer-savvy early adolescent anorexic or bulimic girl who gets genetic information about her risk for obesity? Could this information not reinforce her dangerous relationship with food to the point where her physical safety was compromised? Who would protect an adolescent who submitted his DNA online without even parental knowledge and learned, without any available support, that he is a carrier of the Huntington’s disease mutation, which had previously ravaged his family members?

Most of the research which (Tarini et al., 2011) refer to psychosocial outcomes of cancer genetic testing was conducted in families with strong family histories who typically came into the research with the idea that the cancer in their family was hereditary. The testing programs often included psychologists and measures of distress and patients were carefully followed after disclosure to ensure they could effectively and safely integrate the genetic information; those with stress above clinical cut-offs were offered professional assistance. Adult studies of genetic testing show a fairly consistent subset of about 20–30% with clinical distress and report of family disruption or trouble with communication, self-esteem, or identity (Meiser, 2005). Issues of identity are aroused, grief, difficulties handling the resulting uncertainties about disease risks and potentially risk-reducing health options, family pressures can be great to take one or another course of action. For young people, worry about life planning and the impact of genetic information on establishment of significant relationships are common. There is much to explore about just how the lives of young people are affected by genetic information.

The authors also give considerable weight to the article by Wade et al., 2010, saying that, “risks may not be as great as once feared.” There is research to support this in adults undergoing genetic testing, but not in children. The Wade article itself states that, “Currently, there is insufficient evidence to inform a nuanced understanding of how children respond to genetic testing.” While Wade et al. reviews a very small number (n = 17) papers published between 1977 and 2008 which did not find statistically significant differences based on genetic test results, (possibly due to low sample size) the Wade review did not include more subtle findings from those papers, some of which are similar to findings for adults who have been tested which show, for example, that distress varies not just in response to an individual’s test result, but also with the pattern of positive and negative results of other family members (Smith, West, Croyle, & Botkin, 1999). For example, Codori et al., 2003 reported that mutation-negative children in families affected by familial adenomatous polyposis (FAP) where there were also siblings who tested positive were, ‘particularly vulnerable to clinical levels of anxiety symptoms after testing.’ We need to approach research on genetic testing of children with great care, as, even in circumstances which are much better defined than those in DTC GT, the vulnerabilities of children to genetic information are not yet well understood.

A central psychological question which deserves research attention is what difference does it make to the adoption of healthy or risk-reducing behaviors by adults and children for them to know that they personally are at increased hereditary risk for the disease in question and how much does the level of the hereditary risk matter? Adults who are carriers of the well-characterized BRCA1 or BRCA2 mutations [and, therefore, have risks up to 85% for breast cancer and up to 40% for ovarian cancer (Offit, 1998)] are urged to consider prophylactic mastectomy before menopause and to consider prophylactic oophorectomy before age 40 years or when finished with childbearing, whichever comes first. These are actions which noncarriers or those without very significant family history of breast or ovarian cancer would not consider. Hence, the genetic information plays a heavy role influencing the consideration and uptake of these prophylactic surgeries and affects life planning related to these considerations. This is rather different from the situation of an obese child in a family with a history of obesity. Knowledge that a particular child carries a small, hereditary predisposition to obesity might increase the likelihood that the
parents will rigidly enforce eating of healthy foods and exercise regimens for that child. However, even without the genetic testing, eating of healthy foods may be important to the family for a variety of reasons. Genetic testing is not the only way to know if the child is at increased risk for obesity and related diseases. A recent study suggested that, “The evidence for the effectiveness of using family history information as a personalized tool for disease prevention, in particular for raising motivation to adopt and maintain a healthy lifestyle, is very limited” (Classen et al., 2010, p. 253). Also, the only study of “ordinary people undergoing DTC” (Tarini et al., 2011) found no change in health behaviors following disclosure of the test results. Much research could usefully be done to learn which characteristics of the individual and family and which characteristics of the genetic information itself contribute to increasing motivation for behavior change in children, as, this likelihood of positive change will certainly influence the risk/benefit assessment for any genetic testing of a minor. At present, this research would more usefully be conducted using scenario-based models, rather than exposing children to DTC GT.

Another example of an area where research on children and genetic testing would be useful is for children in Li Fraumeni Syndrome (LFS) families where new screening techniques suggest that all at-risk children should be genetically tested early in life. Villani et al. (2011) showed a large survival advantage to proactive, repeated screening of asymptomatic children in LFS families who are identified through genetic testing to be p53 mutation carriers. Frequent biochemical and imaging studies of these children led to detection of cancers in early phases before they would have come to clinical attention. Follow-up at 3 years showed that 100% of the screened group were alive, but only 21% of the nonscreened group survived. The authors offered encouragement for early genetic testing of at-risk children in LFS families; several children were included in the study who had been identified in utero as being mutation carriers. Psychosocial impact on the children and families of this frequent screening, intended to be “continuous” for life due to the propensity for multiple cancers in LFS, would be important in identifying misconceptions or sources of possible distress in children undergoing this regimen or their parents to enhance communication with families undergoing this genetically directed regimen and to prevent screening burnout, which could adversely affect survival.

We may, indeed, in the future consider alterations in our approach to the ethical conduct of research in children and adults based on advances in genetic and genomic technology. Alan Guttmacher, Director of the National Institute for Child Health and Development and former acting director of National Human Genome Research Institute recently gave the Blackfan Lecture at The Children’s Hospital, Boston in which he described his vision of a time in 2025 where newborn screening might involve automatic, whole-genome sequencing which could inform pediatricians of a range of interventions for both childhood- and adult-onset conditions for which intervention or prevention activities could be initiated in childhood. The point of strong difference I have with the authors of the article in this issue of JPEPSY is that Dr Guttmacher’s vision, I believe, presupposed that the information given to parents and pediatricians from that genomic sequencing would be accurate and reliable, something which DTC testing is not consistently at this point. Testing would occur with appropriate education of parents and would involve genetically well-informed medical professionals. The interventions to be developed would be guided by solid, specific, targeted research. Parents would have been given clear information about the potential value of such screening and the risks of taking away the child’s right to be tested later in life if they wished and they would make their decision accordingly. But this is not where DTC testing is in 2011.

Hopefully, there will be pediatric psychologists available in 2025 to study the psychosocial impact of the genomic information and the intervention efforts which are then available and the factors predicting efficacy of the interventions, as well as the long-term consequences of removing the child’s right to autonomy with regard to these tests. In the meanwhile, there are many other important research questions involving children and genetics for pediatric psychologists to turn their attention to. Pediatric psychological research in genetics has much to offer in gathering data to provide information which can support and inform families about the risks, benefits and limitations of genetic and genomic testing of children. This can help insure the safe participation of children in genetic and genomic research. At present, however, I hold that involving children in DTC testing cannot be considered ethical either in a research or a clinical setting.

**Conflicts of interest:** None declared.

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